PT 1701

Technical Report
Intelligent Transport Systems

Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

Final Report: April 2016

This Technical Report has been commissioned and funded by The European Commission
V60.01

PT 1701

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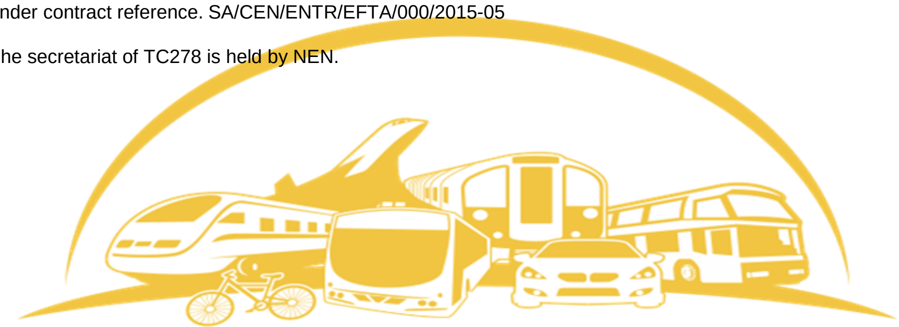
Foreword

This document has been prepared by CEN/TC 278 “Road transport and traffic telematics” Project Team PT1701, with support from the European Commission,

under contract reference. SA/CEN/ENTR/EFTA/000/2015-05

The secretariat of TC278 is held by NEN.



Project Team PT 1701

Technical Report
Intelligent transport systems:

Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

1. Executive Summary

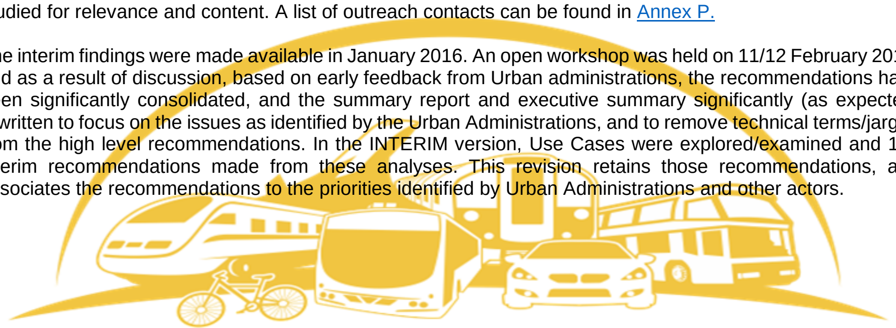
1.1 Context

CEN TC278 PT1701 was established to advise the European Commission in respect of which standardisation related projects should be supported under an upcoming Commission Implementing Decision. (*standardisation request to the European standardisation organisations as regards Intelligent Transport Systems (ITS) in urban areas.* Ref M/546 (Published February 2016).

The task of PT1701 was to identify gaps and overlaps in ITS standards that may be needed by Urban Administrations to assist them to implement Urban-ITS. The PT was further charged to outreach into the Urban Administration community and EC Urban-ITS related projects community to identify the scope and issues relating to its work, and subsequently, to validate its interim findings. The project team itself comprised 11 persons comprising: Urban Administrations; practitioners and advisers to Urban Administrations; professional standards developers; ITS industry; automotive industry.

Some 116 urban authority/related outreach direct contacts have been made, and more than140 projects/reports studied for relevance and content. A list of outreach contacts can be found in Annex P.

The interim findings were made available in January 2016. An open workshop was held on 11/12 February 2016, and as a result of discussion, based on early feedback from Urban administrations, the recommendations have been significantly consolidated, and the summary report and executive summary significantly (as expected) rewritten to focus on the issues as identified by the Urban Administrations, and to remove technical terms/jargon from the high level recommendations. In the INTERIM version, Use Cases were explored/examined and 103 interim recommendations made from these analyses. This revision retains those recommendations, and associates the recommendations to the priorities identified by Urban Administrations and other actors.



1.2 Perspective

This report, and the work of project Team PT1701, is approached from the perspective of identifying standardisation aspects in the areas of "*Multimodal Information Systems", "Traffic Management" and "Urban Logistics"* that need support in order to assist Urban Administrations to implement Urban-ITS.

This report does not purport to consider all standardisation aspects involved in Urban-ITS, and the PT has been charged to consider only three aspects of ITS, and from the perspective of requirements to assist Urban Administrations to implement Urban-ITS. By limit of its remit, PT1701 does not directly consider the objectives and issues facing other actors in Urban-ITS (service users, service providers etc.) save in respect that for the efficient enablement/implementation/support of Urban-ITS within the domains of Urban Administrations, certain requirements of other actors need to be fulfilled, and that the prime objective of an Urban Administration in enabling/supporting Urban-ITS is to serve the requirements of its population.

1.3 Current status

It turns out that, in respect of standards to assist Urban Administrations to implement Urban-ITS, the sector is already quite well served, but there are a number of major gaps that will weaken the ability of Urban Administrations to implement urban-ITS efficiently, and in some aspects, gaps may prevent its introduction unless faced and provided as a matter of urgency.

There are, additionally, a number of highly desirable aspects that could much better assist Urban Administrations to implement Urban-ITS, and a number of aspects of lower priority that need to be addressed at some point in time.

NOTE: shortage of resources named by most respondents as a principle barrier. This is recognised by the presence of this note, but is not, of course, a Standardisation issue.

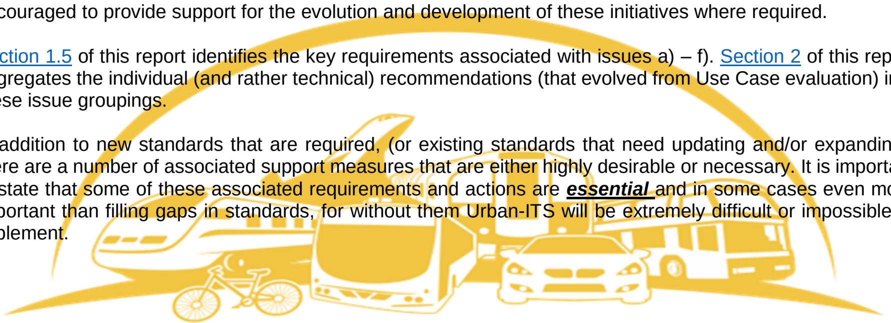
Key issues identified by Urban Administrations as identified barriers to implementation of Urban ITS, where Standards are needed to remove/reduce the barrier to the implementation of urban-ITS are identified as follows:

a) Awareness of what is available
b) Location referencing
c) Vendor lock-in
d) Standards for "New Modes" and "new measures
e) Data exchange/data management
f) Immaturity of some concepts

The success of the introduction of Urban-ITS will also depend on the evolution and upgrades of existing work programmes and deliverables (such as the Transmodel family of standards developed by CEN TC278 WG3, DATEX II by CEN TC278 WG8, and cooperative-ITS security [ISO TC204 WG16/ ETSI TC-ITS/IETF/IEEE]), and these committees are urged and encouraged to continue their good work, and EC is encouraged to provide support for the evolution and development of these initiatives where required.

Section 1.5 of this report identifies the key requirements associated with issues a) – f). Section 2 of this report aggregates the individual (and rather technical) recommendations (that evolved from Use Case evaluation) into these issue groupings.

In addition to new standards that are required, (or existing standards that need updating and/or expanding), there are a number of associated support measures that are either highly desirable or necessary. It is important to state that some of these associated requirements and actions are ***essential*** and in some cases even more important than filling gaps in standards, for without them Urban-ITS will be extremely difficult or impossible to implement.



1.4· Automated/autonomous vehicles

Although not specifically mentioned in the remit to the Project Team, it would be wrong not to address the topical subject of autonomous /automated vehicles. The role of the autonomous vehicle will be mixed, and will change over time. Security will be a key factor for autonomous/automated vehicles

The introduction and take-up of this enhanced connected/automated paradigm will be dependent on three key factors: Technical capability; Legal and regulatory framework; User acceptance.

The remit to PT1701 has been directed to focus its work on standards deliverables that can be finalised within the three-year span of the CID mandate, and to focus on early measures to assist Urban Administrations to implement Urban-ITS, but PT1701 recognises that the integration of autonomous vehicles into the ITS and Urban-ITS environment is a major issue, but well beyond the scale and remit of this PT, or the timespan of the CID, but one that needs a project team to study at an early stage, and makes a recommendation to create a project team to address this issue.

See 6.2 and Annex C.8 for more detailed consideration of aspects concerning autonomous/automated vehicles.

1.5 Recommendations

Annex A of this Report provides a detailed list of 103 recommendations: specific standards deliverables required and actions that are essential or desirable, and work required by other Committees and ESO's.

The following 8 priority areas of this Executive Summary (Table 1) address the key priority issues listed above. Table 1 summarises the areas for high level recommendations that PT1701 considers should be supported by the Commission Implementation Decision M/546 .

(Section 2 of this report now aggregates the individual (and rather technical) recommendations (that evolved from Use Case evaluation) that aggregate into the project groupings shown in Table 1.

Table 2 identifies priority areas that are already being prioritised under the EC ICT 'Rolling Plan' or should be for the attention of other Committees or ESOs.

Table 3 identifies priority areas where action is required, to enable/support Urban-ITS but the action required does not result in a standards deliverable (therefore outside of the scope of the CID). In order to achieve its objectives for Urban-ITS, the European Commission is therefore challenged to find means to support these priority actions.

For detail of each of the aspects of this report and the process leading to, and logic behind, each of the recommendations, there is a detailed Annex, Annex A. (see Table of Contents [below recommendations] for detail). A high level compilation of the constituent recommendations behind these priority areas is also summarised in Section 2 of this summary report.

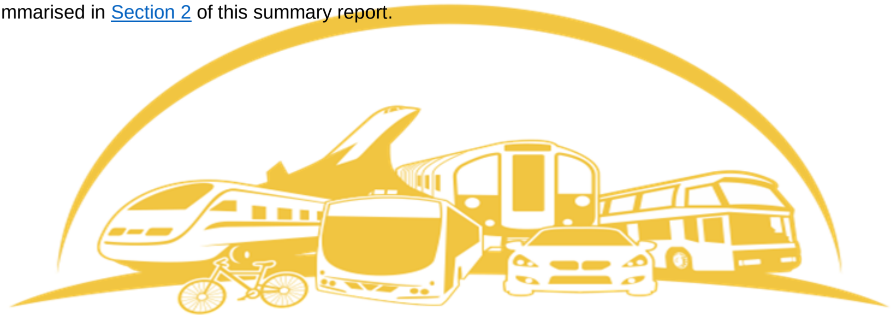


Table 1 – Summary areas for high level recommendations for Standardisation Projects under the CID.

A	**1701- HLRa**	**Location referencing Harmonisation**
B	**1701- HLRb**	**Mixed Vendor Environments.(MVE)**
	1701-HLRb-1	**Mixed vendor environments Methodologies & Translators**
	1701-HLRb-2	**Mixed Vendor Environment Guide (CONOPS)**
	1701-HLRb-3	**Mixed Vendor Environment Standards**
C	**1701-HLRc**	**Urban-ITS issues associated with autonomous/automated vehicles**
D	**1701-HLRd**	**Traffic Management System status, fault and quality standards**
E	**1701- HLRe**	**EU-ICIP. European ITS communications and information protocols**
	1701-HLRe-1	**EU-ICIP Protocols**
	1701-HLRe-2	**EU-ICIP Guide**
F	**1701-HLRf**	**Data models and definitions for new modes**
I	**1701-HLRi**	**Emissions management in urban areas**
J	**1701-HLRj**	**Traffic Management Data Models and interfaces**
	1701-HLRj-1	**TM Data Models**
	1701-HLRj-2	**TM interfaces and information**

PT1701, in addition to standards deliverables that it recommends to be supported under the CID, also identified several other areas where the area are already initiatives within CEN TC278, or other European or global standards organisations, is also required in order to support Urban administrations to implement/support Urban-ITS. Table 2 summarises these strategic subject areas.

Table 2 – Priorities for existing work under other lead, other Committees and ESO's

	PRIORITY RECOMMENDATIONS	
G	**1701-HLRg**	**Update/Develop Transmodel/ IFOPT and NeTEx/ SIRI.** These subjects are already prioritised in the EC ICT Rolling Plan.PT1701 encourages and supports CEN TC278 WG3 in pursuing the following projects which are essential if these standards are to remain relevant
	ISO TC204/IEEE/IETF/ETSI	
H	**1701-HLRh**	**Application of C-ITS security in Urban-ITS paradigm (TR)** These subjects are already prioritised in the EC ICT Rolling Plan.
	1701-HLRh-2	**Security in the Urban-ITS Paradigm** These subjects are already prioritised in the EC ICT Rolling Plan.
L	**DATEX Community/ISO TC204/TISA** **Harmonisation of data concepts , extensions to DATEX II**	

Table 3 summarised areas where support measures other than standards developments are required.

Table 3– Priorities recommendations for other required support measures (that do not lead to a formal standards deliverable)

	Priority: EC Requirement to meet CID timetable	
K	**1701-HLRk**	**Data exchange/data management**
	1701-HLRk-1	**Establish data registry (Support Action)**
	1701-HLRk-2	**Harmonise Data concepts**

1.6 Panoptic (Multi-category) standards and support issues

1.6.1 Although the pre-study was directed to consider three aspects of Urban-ITS, PT1701 has been careful to consider these in the context of the interoperable Urban-ITS paradigm and careful not to create three new 'silos' by dealing with these issues independently.

1.6.2 There are a number of policy and strategy issues that need consideration by the EU and CEN.

PT1701 makes some recommendations to streamline the process in order to get deliverables to the marketplace earlier. Recommendations are also made to re-strategize standards development to fit the interoperable Urban-ITS paradigm, and propose measures (such as the use of C-ITS communication architecture procedures and protocols) in order to provide migration paths from the current legacy silo situation to the new interoperable Urban-ITS paradigm.

1.6.3 Urban-ITS application services or infrastructure provision is rarely a 1:1 relationship with its supporting standards. A number of standards are normally required to implement such application services or support infrastructure. Alone, Urban Administrations cannot be expected to have the expertise to know what is required, and they should not have to rely on external advisors. Therefore, a guide, "EUropean ITS Communications, Information and Protocols", (EU_ICIP) will be necessary, and is required urgently. (Use Case ULG-0001).

The role envisaged for EU-ICIP would be to act as a focal point to guide, inform and advise about the existing large set of standards, and how and in which combinations to use them. Such a guide and support framework would assist the introduction and instantiation of Urban-ITS in a consistent manner across Europe, without binding the Nation States to implement a large raft of measures and standards, but by guidance as to the best options available, and would be beneficial in the wider context of the ISO community worldwide.

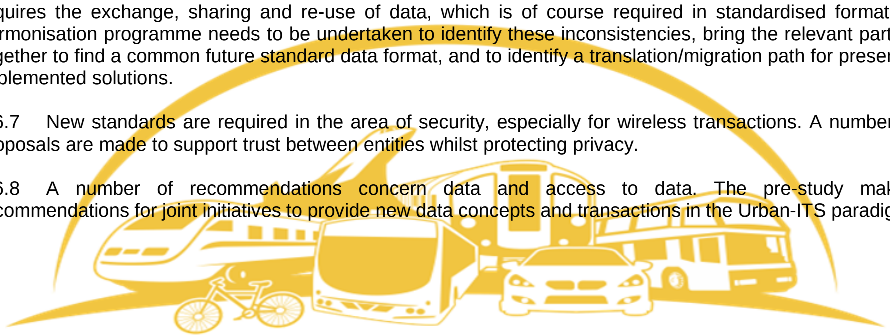
1.6.4 It has been subsequently been proposed that the project 1701-HLRc, Urban-ITS issues associated with automated/ autonomous vehicles, could be incorporated into the EC_ICIP project 1701-HLRe.

1.6.5 Many of the recommendations in this report are concerned with the development of standardised data models, data formats, and exchange of standardised data. However, the meta-data relating to this data, and indeed common definition of terms used, need to exist in a freely available central meta-data registry. Without such a meta-data registry, even if data formats are standardised, their presence will be largely unknown, and new projects will re-invent similar (but different) data definitions, thus creating silos and impeding interoperability. This is already a large, and growing problem, that does not have an easily soluble business case. If the European Commission wishes to enable Urban Administrations to implement Urban-ITS, it needs to establish and maintain such a central meta-data registry. (To be clear this is a registry of meta-data [restricted to data definitions] not a repository of live data).

1.6.6 Even with such a meta-data registry, data has been defined in ITS standards and common practices over a period of more than 25 years. The specifications for this data are in most cases inconsistent. Urban-ITS requires the exchange, sharing and re-use of data, which is of course required in standardised format. A harmonisation programme needs to be undertaken to identify these inconsistencies, bring the relevant parties together to find a common future standard data format, and to identify a translation/migration path for presently implemented solutions.

1.6.7 New standards are required in the area of security, especially for wireless transactions. A number of proposals are made to support trust between entities whilst protecting privacy.

1.6.8 A number of recommendations concern data and access to data. The pre-study makes recommendations for joint initiatives to provide new data concepts and transactions in the Urban-ITS paradigm.



1.7 ‘Multimodal Information Services’

The base of current standards for many multimodal information services, come from the ‘Public Transport’ sector (called ‘transit’ in many countries), and one of the core standardisation initiatives relevant to Urban-ITS in this area are the “Transmodel/ IFOPT” series of Standards, including the associated NeTEx and SIRI Standards. This work is undertaken by CEN TC278 WG3. This is already recognised in the European Commission “*Rolling Plan for ICT Standardisation 2016*” (DG GROW).

Initiatives to extend and improve Transmodel are already overdue, and the Transmodel standards may need revising to better fit into the new “Multimodal Information Services” paradigm, and this pre-study encourages CEN TC278 WG3 to proceed with this work with as much urgency as possible, and recommends that EC funding is found to support project teams where this is deemed to be necessary. This work is considered essential by public transport experts to enable Urban-ITS to function efficiently,

Further attention and standards are needed in the area of location referencing.

A significant number of the other new MIS proposals in this area concern enabling “new modes” and “trip planning” service provision. Most are not provided for in Transmodel. Similarly, this pre-study encourages CEN TC278 WG3 to proceed with this work with as much urgency as possible, and recommends that EC funding is found to support project teams where this is deemed to be necessary.

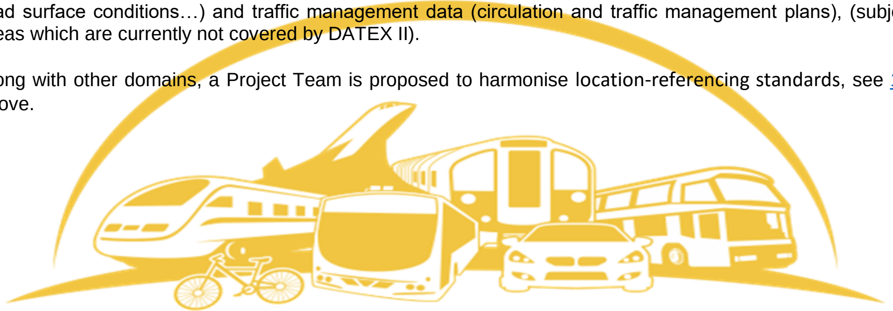
1.8 ‘Traffic Management’

Traffic management is reasonably mature and locally well served with solutions for traffic management. Unfortunately, many of these lock Urban Administrations into particular vendors, and many of the proposals in this report face the issues of opening the ‘European Single Market’, removing vendor lock-in while at the same time enabling good relations to be maintained with system providers. Further work is required to enable the interoperable exchange of data. Two new data modelling standards, data standards, and interface standards, and a number of support measures, such as a ‘Concept of Operations’ (CONOPs) to assist Urban Administrations to move to the new multimodal business paradigm of Urban-ITS, and avoid vendor lock-in, are proposed.

A Project Team is proposed to develop standard(s) supporting multi-vendor integration interface providing vendor independent remote configuration of integrated and interconnected TM subsystems; linkage of roadside devices (such as signal controllers) to a central system; status and fault messaging for the monitoring of field-level sub-systems and their (semi-automated) fault clearance; and integration of widely used traffic adapted control and data processing methods in a traffic signal controller environment.

A Project Team is proposed to develop a domain overarching data exchange standard, supporting the exchange of traffic & network condition data (traffic volume, occupancy rates, average speed, travel times, traffic conditions (LoS) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) and traffic management data (circulation and traffic management plans), (subject areas which are currently not covered by DATEX II).

Along with other domains, a Project Team is proposed to harmonise location-referencing standards, see 1.5 above.



1.9· ‘Urban Logistics’

Urban logistics is the least mature and least organised/more diverse of the three subject areas that form the core of this pre-study.

New measures proposed as priorities by Urban Administrations include standards for emissions monitoring, geofencing, low emission zones data and applications; standardised emissions data; Geofencing data and applications. A project team is required urgently to develop technical specifications to fulfil these requirements. (UL-0301;UL-0302; UL-0303).

Energy efficient intersections services, and delivery vehicle real-time mapping/route optimisation, are considered desirable and a project team will probably be required meet these needs. Adaptations of existing standards and new standards have to be engaged for future ‘Valet Parking’ applications. New Mode examples of priorities suggested by Urban Administrations are smart ‘Park & Ride’ bicycles services (detection, communications); parking, reservation of parking; green waves; etc.

Many other concepts for urban logistics use-cases have been proposed, but at this stage are not well enough developed to make firm proposals.

1.10 Communications and security

It turns out that the C-ITS architecture, security and protocols are not only essential in order for Urban-ITS to operate and co-exist in the upcoming world of Cooperative-ITS, but provide an efficient migration path from current silos to the interoperable Urban-ITS paradigm, and provide solutions to security issues that have largely yet to be addressed in the Urban-ITS paradigm. The existing SDO’s that are working on these issues are encouraged to complete their work on C-ITS security as a matter of urgency.

The reader is also directed to the work of the DG MOVE C-ITS Platform. WG5, Security. See Section 7 of:

http://ec.europa.eu/transport/themes/its/doc/c-its-platform-final-report-january-2016.pdf

1.11 Coherence with ‘FRAME’ ITS architecture

The remit to PT1701 requires the PT to consider coherence to the ‘FRAME’ ITS architecture. An analysis of the Use Cases developed by PT1701 shows a good degree of coherence the FRAME architecture. Where coherence is lacking it is usually because either what is identified in the particular Use Case is not explicit in the FRAME architecture, or the Use Case represents an evolution of ITS that has taken place since the architecture was last updated.

Two of the recommendations in Annex K of this report are for updates to be made to the FRAME Architecture. Implementation of these would enable the coherence issues to be resolved and would also provide the opportunity for further promotion of the benefits to European ITS stakeholders that arise from using the FRAME architecture. However, this work is not identified as a priority, and in many cases not seen even as relevant, by Urban Administrations responding giving outreach feedback to this project.

1.12 Structure of this Summary Report

This report is structured as follows:

Executive summary (S.1)
Recommendations (S.2)
Remit, Scope, Background, (S.3 - 4)
Situational factors etc. (S.5 - 6)
Summary of the results for each of the areas considered (S.7-14)

Annexes for each of the areas of the report providing the detailed work of the study, leading to (and including) the detailed recommendations, and where appropriate, the Use Cases and gap/overlap analysis.

See the Table of Contents (following Section 2) for detail.

1.13 *Caveats*:

By its remit, this report is deliberately approached from the perspective of servicing Urban Administrations to implement Urban-ITS. It is recognised that the reader may have additional or different interests/requirements.

2. Summary of Recommendations

2.1 Key issues

This pre-study makes 103 recommendations for standards development or support actions to support/enable Urban Administrations to enable/introduce/maintain Urban-ITS. Each recommendation addresses a 'gap', a requirement, for an identified 'Use Case' for Urban-ITS. See Annex A for detailed recommendations.

Some Use Cases are near-term, or can already be implemented, some are for the near future. Some are capability enhancing and desirable, others are considered essential prerequisites.

While each of these recommendations emanates from a 'Use Case', and is justified within this document, it cannot be ignored that 103 recommendations is a long list of requirements, and, especially as resources available to implement the CID are limited, some prioritisation is required. This study therefore consolidates the most urgent actions into 11 priority projects, of which 8 can be assisted under the provisions of the CID; 2 can be supported under existing issues identified and prioritised in the EU ICT Rolling Plan.

Some 13 of the recommendations enabling Urban Administrations to support Urban-ITS are for support actions that do not result in Standards deliverables, and therefore cannot be assisted by the normal measures to support the CID (Project Teams funded from the Standardisation budget).

In respect of these recommendations, the principal task facing proponents of Urban-ITS, and the European Commission in particular, is to find sources of funding to enable these recommendations to be carried out.

2.2 Additional priorities identified by stage 2 outreach

Ensuring input and influence from real implementers- *the urban authorities* – on the basis that the objective of this pre-study is to focus the recommendations on *their* needs in order to enable them to quickly enable and implement Urban-ITS, is a recurrent theme of this pre-study, and a clear goal of the sponsor of this work – the European Commission, and the Chair of CEN TC278 (which proposed the pre-study).

It has to be stated that the compact timescale of the pre-study (effectively the 6 months covering the 4th quarter 2015 and 1st quarter 2016), was not conducive to obtaining constructive outreach consideration and feedback, particularly from such complex organisations as Urban Administrations. Nevertheless, by far the bulk of the feedback received has indicated that Urban Administrations recognise that implementing urban ITS is important, significant and putting the building blocks in place is necessary and urgent. But as to what building blocks are required, they, the urban authorities, consider that they are not in a position to advise us what is needed, but they look to our study for that expert advice. Thus providing us with a conundrum.

To ask Urban Administrations for their priorities for Urban-ITS is, as one respondent stated, "*a little like asking someone at their first lesson in Algebra, what equations they need to know to pass an exam in five years time, when, in lesson one, they probably have not yet grasped what an equation is*". The problem is that, unless they have already studied Urban-ITS, or some aspect of it, they do not yet know what building blocks they need. This feedback is important, but does not help the pre-study prioritise its recommendations.

The most valuable feedback comes from areas where Urban Administrations have already cooperated and some organisational studies have been conducted. OCA in the German speaking states, UTMC in the United Kingdom, the 'Dutch Profiles Table' in the Netherlands, and AFIMB in France. A few authorities in complex and developed cities, such as TfL (London), STIF (Paris), Amsterdam ad La Metropole de Lyon have also started to encounter these issues and have made solid proposals, and it is no coincidence that experts associated with all of these activities were put forward to be members of the pre-study team.

Of those authorities and organisations who have invested resource, the recommendations all centre on avoiding vendor lock-in, standardising data concepts and enabling data exchange, and updating and expanding the underlying architecture behind public transport (Transmodel, NeTEx, IFOPT etc.), and getting guidance in this complex and largely unknown paradigm of Urban-ITS.

In respect of specific services, harmonising location referencing has been a recurrent issue across different domains. And in respect of areas that clearly lack and need standards, managing pollution aspects has rated most highly.

Given the make-up of the PT experts and their association with these urban organisations, that this aligns with the prime recommendations made by the PT, we cannot consider to be either a coincidence, nor an endorsement, … in any event it is no surprise. But perhaps it does provide the clearest advice on the areas where the CID should concentrate its support measures.

The lifespan of the CID is just three years, and if these nominated priorities, together with garnering, as the project progresses, an understanding of where the Urban-ITS initiative should move in its next phase after the CID lifespan, then the pre-study, and the CID will have done a good job providing these first steps.

The interim report identified prioritised 6 project Team proposals to address these areas as a matter of urgency. A further two areas of ‘High Level Recommendations’ for support actions (3 project teams), outside of CID support for standardisation deliverables, were also identified as priority areas. Each of these “High Level” recommendations emanate from a number of Use Cases, and embrace a larger number of specific recommendations. Annex P.3 provides outreach feedback for these interim recommendations, and largely affirms them. However, some additional areas were considered priorities by the outreach feedback.

The outreach response form asked for some simplified statistical information to identify the use of existing measure. Table A.1 shows the result from which it can be seen that the most widespread use/understanding tends to be localised- some administrations for example, use Transmodel, others do not, some use OTS/OCIT others use UTMC. DATEX II has the widest awareness and use. Few use or see the relevance of the FRAME architecture at the Urban Administration level. It would be wrong to imply any precision to these results because of the elsewhere discussed lack of balance in statistical representation.

Turning to the Recommendations, Table A.2 (reproduced below) summarises the top 10 responses from outreach.

Table A.2 - most prioritised 10 recommendations

Rc_Gn12	**Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)**
Rc_TM05	**An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)**
Rc_TM07	**A control interface standard to link roadside devices such as signal controllers to an instation system, to support multi-vendor integration. (H.4)**
Rc_TM03	**A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (E.4.3.2)**
RcPl01	**PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP**
Rc_SM13	**It is recommended to that the EC financially and institutionally supports the creation and existence of an organisationin order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles verification). (F.4.14)**
Rc_TM02	**A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (E.4.3.2)**
Rc_TM01	**A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (E.4.3.2) May be linked with MI20)**
Rc_TM08	**System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (H.4)**
Rc_TM06	**Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)**

The reader is advised not to pay too much attention to the relative ranking as the sample is small and not statistically representative.

2.3 Summarised recommendations

The outreach feedback largely endorsed the priority list put together at the outreach meeting, and supported most of the recommendations proposed by the PT experts, but enabled further clarification and some additional priority projects to be identified.

Table 4 replicates Table 1, in the Executive Summary but with the component individual recommendations added.
Table 5 replicates Table 2, in the Executive Summary but with the component individual recommendations added.

Table 6 replicates Table 3, in the Executive Summary but with the component individual recommendations added.

Table 4 – Elements for summary areas for high level recommendations for Urban-ITS Projects under the CID.

A	**1701- HLRa**		**Location referencing Harmonisation**
		Rc_GN01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
		Rc_GN02	To develop GDF 5.1 data model covering the connection between Transmodel and GDF and the corresponding data exchange format (G.4.11)
		Rc_GN12	Standard harmonisation: To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
		Rc_SO03	ESO/OEC: It is recommended that Standards be developed for New elements to include in Local Dynamic Map related to a Car Park internal description including :Available spots locations; Evolution of MAP standard to describe different paths to reach a spot; Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. This work is probably best led by the DATEX standards community. (I.2.10.3.4)
		Rc_SM09	A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services. A new or existing project is proposed to handle this issue. (E.4.3.5)
		Rc_Gn11	Develop standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate. (E.4.3.5)
		Rc_Gn12	Standard harmonisation: To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
		Rc_MI30	New standard development To define a standard for data accuracy criteria and publication referring to space and time data. (G.4.6)
B	**1701- HLRb**		**Mixed Vendor Environments.(MVE)**
		.701-HLRb-1	**Mixed vendor environments Methodologies & Translators**
		From Outreach meeting Rc_TM10	Stage A: MVE (mixed vendor environment) Protocols. A project team to collect technical and implementations details per method; propose a translator (Rosetta Stone); write guideline of when and how to use which method. The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined. (H.4)
		Rc_GN15	PT1701 recommends that CEN develop a guide (Technical Report) to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm. The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm (D.2.3.18; E.5.1, P.3.2.3)
		1701-HLRb-3	**Mixed Vendor Environment Standards**
		Rc_TM05	An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)
		Rc_TM06	Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)
		Rc_TM07	A control interface standard to link roadside devices such as signal controllers to an instation system, to support multi-vendor integration. (H.4)
		Rc_GN01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
C	**1701-HLRc**		**Urban-ITS issues associated with the introduction of autonomous/automated vehicles.**
			NOTE: This project may be joined with EU-ICIP
		Phase 1 outreach feedback	Funded European Project Team to study the Urban-ITS issues associated with the introduction of autonomous/automated vehicles. The work will study operational, technical and relevant legal issues related to introduction for AVs in the Urban environment. The PT will analyse the current

•			status of AV standards, and propose new work that is needed for safe operation and seamless integration in the challenging urban environment (C.8; 6.2; A.3)
		Rc_PI04	It is recommended that there is a funded European project to study the ITS/Urban-ITS and regulatory framework issues associated with the introduction of autonomous vehicles. Automated vehicles: Funded European project to study the Urban-ITS issues associated with the introduction of autonomous vehicles. See PI04 NOTE: Created as a result of phase 1 feedback (therefore no opportunity for outreach response)
D	**1701-HLRd**		**Traffic Management System status, fault and quality standards**
		Rc_TM04	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. (H.4)
		Rc_TM08	System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (H.4)
E	**1701- HLRe**		**EU-ICIP. European ITS communications and information protocols**
			1701-HLRe-1 EU-ICIP Protocols
		Rc_PI01	PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP (9.2, F.1.2; F.1.12;)
			1701-HLRe-2 EU-ICIP Guide (F.1.13)
F	**1701-HLRf**		**Data models and definitions for new modes**
		Rc_MI13	To develop a standard reference data model for network topology for New Modes (car/cycle sharing areas, car pooling areas, battery recharging places) in coherence with Transmodel V6 and Part 7: Driver Management.. (F.4.1)
I	**1701-HLRi**		**Emissions management in urban areas**
		Rc_UL03	Emissions monitoring - Project Team to determine standard for Air Quality outstations and Traffic Management Systems Priority: Medium (in relation to other Urban Logistics recommendations). (I.7)
		Rc_UL04	Geofencing: A project team is probably required in respect of standardising geofencing protocols. (I.5.7.)
		Rc_UL01	A combined project "Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics" is therefore recommended whose scope is to (at least) include: Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement. (I.5.8.; I.7)
	1701-HLRj		**Traffic Management Data Models and interfaces**
			1701-HLRj-1 TM Data Models
		Rc_TM02	A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (H.4.3.2)
		Rc_TM03	A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (H.4.3.2)
			1701-HLRj-2 TM interfaces and information
		Rc_TM01	A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (H.4.3.2) May be linked with MI20)
		Rc_UL08	Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats.(Possibly part of Rc_UL01)

Table 5 – Elements for summary areas for high level recommendations for priorities for existing work under other lead, other Committees and ESO's

			PRIORITY RECOMMENDATIONS
G	**1701-HLRg**		**Update/Develop Transmodel/ IFOPT and NeTEx/SIRI.**
		CEN TC278 WG3	These subjects are already prioritised in the ECICT Rolling Plan.PT1701 encourages and supports CEN TC278 WG3 in pursuing the following projects which are essential if these standards are to remain relevant
		Rc_SM13	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisation in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles, verification). (G.3.9)
		Rc_MI08	OESO/OEC To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4) – see recommendation MI11. (G.4.11)
		Rc_MI01	OESO/OEC This report recommends that the EC, as a matter of urgency, makes call for experts and offers funding for the Transmodel update project so that it can align Transmodel with the Urban-ITS paradigm and accommodate new modes. (G.1.4.2)
		Rc_MI15	To develop a standard data model for cycling network in coherence with Transmodel V6 and GDF. (G.4.1)
		Rc_MI16	To develop a standard exchange format for New Modes planned data (topology, service description and fares). (G.4.1)
		Rc_MI17	New standard development : To develop a standard data model for New Modes operational aspects (in coherence with Transmodel). (G.4.2)
		Rc_MI02	OESO/OEC: Standard update To develop Transmodel v6 – Part 4: Operations Monitoring and Control, i.e. the update of Transmodel Operations Monitoring and Control with the requirements of SIRI standard, EBSF project & align with DATEX II part 3 (Situation Publication). (G.4.3)
		MI13; MI14; MI15; MI16: MI03; MI04; MI05; MI24; SM12	To develop a standard reference data model and data exchange format for network and service description (incl. booking, fares, etc.) for New Modes (incl cycling) in coherence with Transmodel V6 Part 1 to 7 (G.4.1)
			ISO TC204/IEEE/IETF/ETSI
H	**1701-HLRh**		**Application of C-ITS security in Urban-ITS paradigm (TR)**
		Rc_PI11	A PT to study how C-ITS security shall be applied for Urban use. Specifically : practical advice to city authorities, and national/regional level needs to get going based on recommendations.
		1701-HLRh-2	**Security in the Urban-ITS Paradigm**
		Rc_PI10	Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_PI05	The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_SO01	OESO/OEC :The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_PI13	One specific task is identifying the missing security standards regarding interfaces between Roadside/Personal/Central ITS Stations, patterned on well-established Vehicle ITS Station security standards.
			Other PT1701Recommendations that ESOs/OSCs should consider progressing CEN TC278 WG3
		Rc_MI03	OESO/OEC :Standard update: To develop Transmodel V6 – Part 5: Fare Management (incl. validation and control part). (G.4.1)
		Rc_MI04	OESO/OEC :Standard update: To develop Transmodel v6- Part 6: Passenger Information to take into account complex queries and filters as requested by NeTEx -informative annex. (G.4.13)
		Rc_MI05	OESO/OEC To develop Transmodel v6-Part 7: Driver Management. (G.4.3)
		Rc_MI06	OESO/OEC Standard update : To develop Transmodel v6- Part 8: Management Information & part 7: Driver Management). (G.4.3)

.		Rc_MI07	OESO/OEC Standard update: To develop the update of the TR "Transmodel informative documentation". (G.1.4.2)
		Rc_MI11	OESO/OEC To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files). (G.4.2)
		Rc_MI21	New standard development: To develop a standard stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner or information service. (G.4.4)
		Rc_MI22	New standard development: To develop standard APIs and/or query/ data exchange format for interconnection of Journey Planning Systems in coherence with Transmodel v6 (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). (G.4.5)
		Rc_MI26	New standard development: To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence. (G.4.1)
		Rc_UL02	Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas Car Park Operators deliver information about parking space availability using DATEX. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged. To be included in work proposed in MI10. (I.2.3.10.1)
		Rc_MI09	OESO/OEC Standard update : To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw operational data needed for the Study and Control stage. (G.4.3) May be linked to TM01
			DATEX Community/ISO TC204/TISA
		Rc_SO02	OESO/OEC Further development of DATEX II. a) An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. b) Development of standards based on ITS-station broadcasted services, to describe equivalent Local Dynamic Map elements related to: Available places; Cost of parking lot €/hr; etc… And transmit it towards vehicles. This work is probably best led by the DATEX standards community. (I.2.3.10.2)

Table 6 – Detailed Priorities recommendations for other required support measures (that do not lead to a formal standards deliverable)

			CEN POLICY
		Rc_PI02	PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as "Technical Specifications" (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards.
			Priority: **EC Requirement to meet CID timetable**
K	**1701-HLRk**		**Data exchange/data management**
	1701-HLRk-1		**Establish data registry (Support Action)**
			A project team to review existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry. This requires 'Support Measures' (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures.
		Rc_SM01	This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary.
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM03	Other action: To develop a unique access point for urban data repositories, in particular an urban meta-data registry. (G.2.4.3.1)
		Rc_SM04	b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (D.1; D.2.4; D.2.7; E.3.1)
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)

		Rc_PI06	Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.
		Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
	1701-HLRk-2		**Harmonise Data concepts**
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_Gn09	Intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).

8 of the priority requirements are therefore for areas that can be assisted as projects under the CID; 2 of the priority areas are already priority areas identified in the EC ICT Rolling Plan; and one is a support action activity which will not result in a standards deliverable so needs a different means of support.

The 8 CID priority projects embrace 28 of the specific interim recommendations of PT1701. The 2 projects for support other committees/ESOs/existing WG items embrace 20 of the specific interim recommendations of PT1701.(and a further 15 associated interim recommendations are forwarded to the groups leading these activities, but without a request for priority). The 2 projects for other types of support cover embrace 15 of the PT 1701 interim recommendations. Thus 75 of the interim recommendations are accommodated in these 11 projects. Taken together with the further 15 associated interim recommendations, some 90 of the recommendations are therefore accommodated. The PT1701 withdraws remainder of the original recommendations as the result of negative feedback from outreach. This does not, however mean that these projects are not needed nor important, only that there are higher priorities for the CID, and these recommendations require further consideration and consultation before progressing.

Further, some of the recommendations concern areas where there is already well established standardisation activity and programmes (such as Transmodel and associated standards), and it is the intention to support the continuation and furthering of such work within the existing committees, and to identify them as priority areas for action within existing committees (and not to claim domain over these areas for Urban-ITS). This pre-study encourages these committees to use the recommendations of this pre-study in pursuance of seeking funding to continue this important work. Attention is drawn particularly to projects associated with the enhancement and extension of Transmodel and associated Standards (NeTEx, IFOPT, SIRI), DATEX II, and C-ITS security.

The analysis of the 103 recommendations in Annex A is organised by functional domain

While Table 1 identified the summary project headings, and Table 4 detailed the individual recommendations behind the headings, Table 7 provides the suggested proposed actions required for these 'High Level Recommendations', under the support measures of the CID M/456.

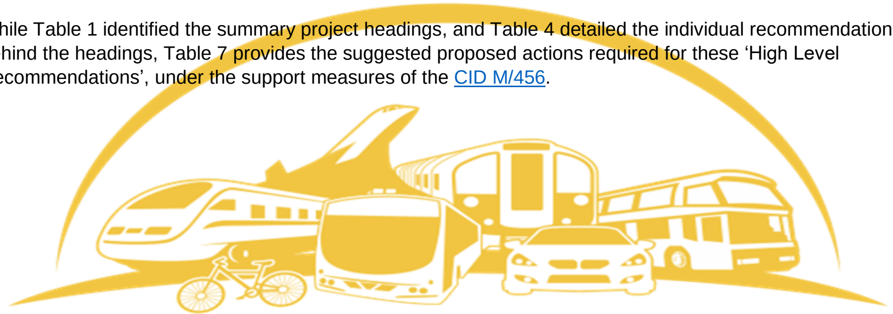


Table 7 – proposed actions required for the list of 'High Level Recommendations',

A	**1701- HLRa** **Location referencing Harmonisation** Interoperable location referencing (all domains), mostly harmonization of multiple standards and sometimes need for new standard(s); intersections topology. Necessary for data exchange for ITS services (essential for planned and real-time data processing and information dissemination, and also for in-vehicle signage). USE CASES: ULG-0001; GEN-0001; ULG-0002; MIS-0002; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0007; MIS-0008; TM-0001; TM-0005; TM-0006	**Project Team** • Location Referencing for Urban-ITS to: • Collect technical and implementation details per method • Propose a translator (Rosetta stone) between methods • Write guideline for when to use which method (PT estimate 200 man days: Team of 3 est. €150k)
B	**1701- HLRb** **Mixed Vendor Environments.(MVE)** Prevention of vendor lock-in in future systems. Legacy systems and migration paths out of vendor lock-in. Vendor lock-in free procurement of ITS systems, and vendor independent usage of IT systems for synchronized Traffic Management. USE CASES: TM-0001; TM-0003; TM-0009; UL-0301	
	1701-HLRb-1 **Mixed vendor environments Methodologies & Translators**	A) Vendor lock-in mitigation and migration: Protocols Content: • Collect technical and implementation details per method • Propose a translator (Rosetta stone) between methods • Write guideline for when and how to use which method (PT estimate 170 mandays – 130 k€: Team of 3)
	1701-HLRb-2 **Mixed Vendor Environment Guide (CONOPS)**	B) Vendor lock-in mitigation and migration: Guide (Concept of Operations' (CONOPs)) Guidance document: Guidance to foster open deployment and avoid vendor lock-in Content: • Analyse: what interfaces must be open • Describe migration path from current to open • Propose policies for authorities (PT estimate 170 mandays: 130k€ Team of 3)
	1701-HLRb-3 **Mixed Vendor Environment Standards**	C) Mixed vendor environmental standards (PT estimate 130 mandays: 100k€ Team of 3)
C	**1701-HLRc** **Urban-ITS issues associated with autonomous/automated vehicles** (6.2; A.3; C.8)	Technical Report: Urban ITS issues associated with autonomous/automated vehicles (PT estimate 130 mandays: 100k€ Team of 3)
D	**1701-HLRd** **Traffic Management System status, fault and quality standards** (H.4)	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (PT estimate 170 mandays: 130k€ Team of 3-4)
E	**1701- HLRe** **EU-ICIP. European ITS communications and information protocols** Guidance to Urban Authorities/understanding standards combinations/clusters USE CASE: ULG-0001 (See also 9.2, F.1.2; F.1.12;F.1.13)	

.		
	1701-HLRe-1 **EU-ICIP Protocols**	• EU-ICIP Protocols (PT estimate circa 100 man days: 75k€ Team of 3)
	1701-HLRe-2 **EU-ICIP Guide**	• EU-ICIP Guide (PT estimate circa 250 man days: 190k€ Team of circa 7)
[redacted]		
F	**1701-HLRf Data models and definitions for new modes** New Mode examples of priorities: Smart P&R bicycles services (detection, communications); Parking, reservation of parking; green waves etc. USE CASES: MIS-0001; MIS-0002; MIS-0005; MIS-0005-3; MIS-0005-4; UL0701; UL0801; UL0901; UL-1003; UL-1004; UL-1101; UL-1201	Technical Specification 'data models and definitions for 'new modes' (PT estimate 130 mandays: 100k€ Team of 3)
[redacted]		
I	**1701-HLRi** **Emissions management in urban areas** New Measures: examples of priorities: emissions monitoring. Low Emission zones data and applications; Geofencing data and applications; Energy efficient intersections services USE CASES: UL-0104; UL-0108; UL-0112; UL-0213; UL-0215; UL-0226; UL-0301; UL-0302; UL-0303	Emission Management in Urban areas • Technical Standard: Standards and data definitions for Emission management in urban areas Use Case: Low Emission Zones Use Case: Emissions enforcement measures Use Case: Geofencing Content: • Functional Specifications based on Use Cases • Design consistent data concepts and interfaces • Geofencing management requirements for hybrid vehicle busses, taxis, (potentially private vehicles) for use of EV modes in pollution hotspots and residential areas (PT estimate 130 mandays: 100k€ Team of 3)
[redacted]		
J	**1701-HLRj Traffic Management Data Models and interfaces** Seamless and vendor independent data exchange within and between ITS systems and services for multi-modal information services, synchronized traffic control, signage (road side and in-vehicle). Access to and update of data models and extension of data models. Enable data integration and data re-use. USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL-0102; UL-0103; UL-0104; UL-0105; UL-0106; UL-0107; UL-0108; UL-0109; UL-0110; UL-0111; UL-0203; UL-0204; UL-0206; UL-0207 ; UL-0208; UL-0209; UL-0210; UL-0213; UL-0214; UL-0215; UL-0217; UL-0220; UL-0221; UL-0226; UL-0301; UL-0302; UL-0303; UL-0304; UL-0401; UL-0501; UL-0601; UL-0602; UL-1001; UL-1003; UL-1004; UL-1101; UL-1201	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.
	1701-HLRj-1 TM Data Models	Harmonization project team to find common data concepts and migration paths for extant 'silo' developed work items. Access to and update of data models and extension of data models. Enable data integration and data re-use. (PT estimate circa 100 man days: 75k€ Team of 3)
	1701-HLRj-2 TM interfaces and information	Seamless and vendor independent data exchange within and between ITS systems and services for multi-modal information services, synchronized traffic control, signage (road side and in-vehicle). (PT estimate circa 100 man days: 75k€ Team of 3)

2.4· Location referencing

1701- HLRa - Project team to develop Technical Specification regarding Provision of a real time continuous location referencing data for the Urban-ITS environment. The referencing system should allow for planned and real-time data.

Location information has been a requirement since before the digital era, and most of it was founded on the Victorian principal of the "look-up table", and physical reference books and tables, and not related to actual physical position. But while some data is based on a latitude/longitude system (and there are multiple versions of such systems, others ae based on the gazetteered reference to physical objects (for example bus stops or parking bays in a car park). Because gazetteered referencing is institutionally entrenched, and migration to a geo-referencing based on physical location may be protracted, in the medium term we may expect to see the use of translators for some time to come.

An ITS deployment needs to draw data (for MIS, TM or UL purposes) from different modal systems, so that control systems for the various modes can interact to provide seamless services to the urban traveller, and to provide a location and time determination system that will work in the urban canyon and provide positioning and timing information in enclosed spaces.

Satellite positioning systems work well in the inter-urban space where there is no shielding of satellites by trees or tall buildings. However, they do not work well in some urban environments where a reduced number of satellites in line of sight due to the shielding effects of tall buildings (the urban canyon).

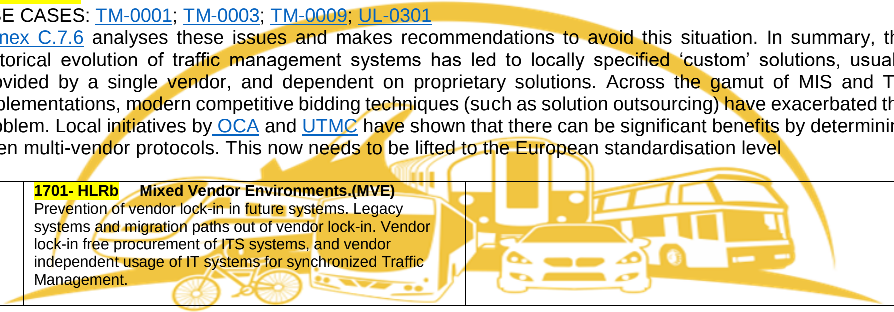
There will also be applications where positioning inside buildings such as multi-storey car parks requires other forms of location determination. (E.4.3; F.3.1.2)

USE CASES: GEN-0001; ULG-0001; ULG-0002; MIS-0002; MIS-0005-1; MIS-0005-2; MIS-0007; MIS-0008; TM-0001; TM-0005; TM-0006.

A	**1701- HLRa** **Location referencing Harmonisation** Interoperable location referencing (all domains), mostly harmonization of multiple standards and sometimes need for new standard(s); intersections topology. Necessary for data exchange for ITS services (essential for planned and real-time data processing and information dissemination, and also for in-vehicle signage).	**Project Team** • Location Referencing for Urban-ITS to: • Collect technical and implementation details per method • Propose a translator (Rosetta stone) between methods • Write guideline for when to use which method (PT estimate 200 man days: Team of 3 est. €150k)

2.5 Vendor lock-in/legacy systems and migration paths

1701- HLRb – : Mixed Vendor Environments.
USE CASES: TM-0001; TM-0003; TM-0009; UL-0301
Annex C.7.6 analyses these issues and makes recommendations to avoid this situation. In summary, the historical evolution of traffic management systems has led to locally specified 'custom' solutions, usually provided by a single vendor, and dependent on proprietary solutions. Across the gamut of MIS and TM implementations, modern competitive bidding techniques (such as solution outsourcing) have exacerbated this problem. Local initiatives by OCA and UTMC have shown that there can be significant benefits by determining open multi-vendor protocols. This now needs to be lifted to the European standardisation level



B	**1701- HLRb** **Mixed Vendor Environments.(MVE)** Prevention of vendor lock-in in future systems. Legacy systems and migration paths out of vendor lock-in. Vendor lock-in free procurement of ITS systems, and vendor independent usage of IT systems for synchronized Traffic Management.	

This high level recommendation comprises 3 stages:

Stage A:

	1701-HLRb-1 Mixed vendor environments Methodologies & Translators	A) Vendor lock-in mitigation and migration: Protocols Content: • Collect technical and implementation details per method • Propose a translator (Rosetta stone) between methods • Write guideline for when and how to use which method (PT estimate 170 mandays – 130 k€: Team of 3)

Stage B:

	1701-HLRb-2 Mixed Vendor Environment Guide (CONOPS)	B) Vendor lock-in mitigation and migration: Guide (Concept of Operations' (CONOPs)) Guidance document: Guidance to foster open deployment and avoid vendor lock-in Content: • Analyse: what interfaces must be open • Describe migration path from current to open • Propose policies for authorities (PT estimate 170 mandays: 130k€ Team of 3)

Stage C:

	1701-HLRb-3 Mixed Vendor Environment Standards	C) Mixed vendor environmental standards (PT estimate 130 mandays: 100k€ Team of 3)

2.6 Autonomous/automated vehicles

Funded European Project Team to study the Urban-ITS issues associated with the introduction of autonomous vehicles. The work will study operational, technical and relevant legal issues related to introduction for AVs in the Urban environment. The PT will analyse the current status of AV standards, and propose new work that is needed for safe operation and seamless integration in the challenging urban environment.See also 6.2 and C.8.

C	**1701-HLRc Urban-ITS issues associated with autonomous/automated vehicles**	Technical Report: Urban ITS issues associated with autonomous/automated vehicles (PT estimate 130 mandays: 100k€ Team of 3)

2.7 Traffic Management System status, fault and quality standards

HLRd is one of the priority recommendations elevated to priority status as a result of outreach feedback.

D	**1701-HLRd Traffic Management System status, fault and quality standards**	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (PT estimate 170 mandays: 130k€ Team of 3-4)

2.8· Awareness of what is available/understanding standards combinations/cluster

Recommendation HLRe proposes a project team (multi-discipline) to develop a Technical Specification or Technical Report, "European ITS communications and information protocols" (EU-ICIP) followed by an ongoing maintenance programme. Based on Use Case ULG-0001.

Section 9.2 presents the case for EU-ICIP. In summary, once you move away from standardisation specialists, and into the offices of implementers, engineers and administrators, there is a poor understanding of ITS standards, or even the reasoning behind their need. It is unreasonable to expect to find in the offices of Urban Administrations, a high level of expertise concerning the complex mesh of standards required to support Urban-ITS, and it is unreasonable to require dependency on armies of advisors to plug this gap in each urban authority. See also 9.2, A.3, C.5, D.2.6, F.1.2, F.1.12. F.1.13.

PT1701 is of the opinion that it is essential to also make guidance, information and support available to those who will have to make use of or require compliance to these standards. A guide and support framework is needed to assist the introduction and instantiation of Urban-ITS in a reasonably consistent manner.

EU-ICIP will explain to and enable Urban Administrations, road authorities and EU Member states to understand the mesh of standards needed to attain their goals for Urban –ITS, and ITS in general, and provide guidelines to move from abstract architectural concepts to effective instantiation.

EU-ICIP will support a family of open (existent) standards, referencing both common communications protocols and data definitions, that in combinations enable Urban-ITS/ITS to function and be managed, and will reference application standards where appropriate/available.

EU-ICIP will provide guidance, information and consistency for agencies implementing and operating Urban-ITS/ITS. EU-ICIP will assist interagency coordination and allows equipment of different types and different manufacturers to be mixed within the same or communicating systems; informing potential users of the compatibilities and incompatibility issues of various options, and provide the opportunity for training opportunities, and guidance to universities to assist training programmes for ITS experts. (1.6.3; 9.2, A.3, C.5, D.2.6, F.1.2, F.1.12. F.1.13.).

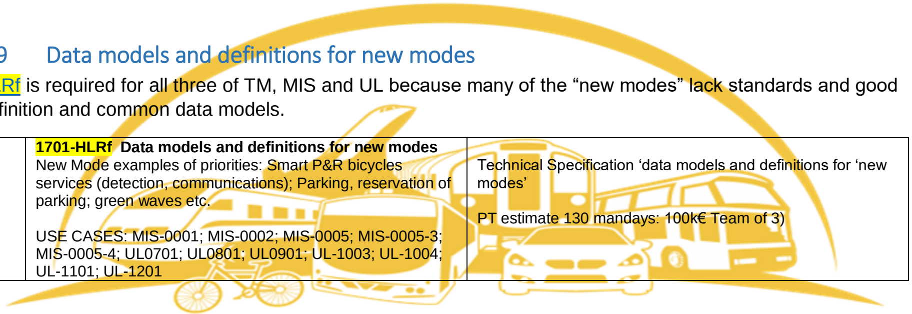
The work required is proposed in 2 parts a) identification and description of ITS protocols and standards required to support Urban-ITS, and, b) the production of a 'Guide' to explain how aspects of Urban-ITS can be achieved through combinations/clusters of standards, and what additional management measures are required.

E	**1701- HLRe** **EU-ICIP. European ITS communications and information protocols** Guidance to Urban Authorities/understanding standards combinations/clusters USE CASE: ULG-0001		
	1701-HLRe-1	**EU-ICIP Protocols**	• EU-ICIP Protocols (PT estimate circa 100 man days: 75k€ Team of 3)
	1701-HLRe-2	**EU-ICIP Guide**	• EU-ICIP Guide (PT estimate circa 250 man days: 190k€ Team of circa 7)

2.9 Data models and definitions for new modes

HLRf is required for all three of TM, MIS and UL because many of the "new modes" lack standards and good definition and common data models.

F	**1701-HLRf Data models and definitions for new modes** New Mode examples of priorities: Smart P&R bicycles services (detection, communications); Parking, reservation of parking; green waves etc. USE CASES: MIS-0001; MIS-0002; MIS-0005; MIS-0005-3; MIS-0005-4; UL0701; UL0801; UL0901; UL-1003; UL-1004; UL-1101; UL-1201	Technical Specification 'data models and definitions for 'new modes' PT estimate 130 mandays: 100k€ Team of 3)



2.10 Emission management in urban areas

As cities grow ever larger, the concentration of pollution becomes not only more important, but a significant health hazard. Cities are therefore turning to “low emission zones”, emissions sensing, as short term measures, and geofencing to control the mode of driving for hybrids, or to create exclusion zones. However, this is currently being explored on a piecemeal city level. Development of Technical Specification(s): Standards and data definitions for emission management in urban areas is considered a high priority so that these measures can be implemented quickly and consistently across Europe.

UL-0301	Emissions monitoring –General
UL-0302	Urban Low Emission Zone Management
UL-0303	Monitor Emissions Compliance in Urban Zone Use Case: Low Emission Zones
UL-0307	CO2 Footprint Monitoring and Estimation

Content:
- Functional Specifications based on Use Cases
- Design consistent data concepts and interfaces
- Geofencing management requirements for hybrid vehicle busses, taxis, (potentially private vehicles) for use of EV modes in pollution hotspots and residential areas

I	**1701-HLRi Emissions management in urban areas** New Measures: examples of priorities: emissions monitoring. Low Emission zones data and applications; Geofencing data and applications; Energy efficient intersections services	Emission Management in Urban areas • Technical Standard: Standards and data definitions for Emission management in urban areas Use Case: Low Emission Zones Use Case: Emissions enforcement measures Use Case: Geofencing Content: • Functional Specifications based on Use Cases • Design consistent data concepts and interfaces • Geofencing management requirements for hybrid vehicle busses, taxis, (potentially private vehicles) for use of EV modes in pollution hotspots and residential areas (PT estimate 130 mandays: 100k€ Team of 3)

2.11 Traffic management data models and interfaces

This is a requirement not only for traffic management, but in order to provide the traffic content for multimodal information systems and urban logistics., therefore is a priority for all three aspects of Urban-ITS

J	**1701-HLRj Traffic Management Data Models and interfaces** Seamless and vendor independent data exchange within and between ITS systems and services for multi-modal information services, synchronized traffic control, signage (road side and in-vehicle). Access to and update of data models and extension of data models. Enable data integration and data re-use. USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL-0102; UL-0103; UL-0104; UL-0105; UL-0106; UL-0107; UL-0108; UL-0109; UL-0110; UL-0111; UL-0203; UL-0204; UL-0206; UL-0207 ; UL-0208; UL-0209; UL-0210; UL-0213; UL-0214; UL-0215; UL-0217; UL-0220; UL-0221; UL-0226; UL-0301; UL-0302; UL-0303; UL-0304; UL-0401; UL-0501; UL-0601; UL-0602; UL-1001; UL-1003; UL-1004; UL-1101; UL-1201	At the ‘city’ or ‘Urban Administration’ level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.

.	**1701-HLRj-1 TM Data Models**	Harmonization project team to find common data concepts and migration paths for extant 'silo' developed work items. Access to and update of data models and extension of data models. Enable data integration and data re-use. (PT estimate circa 100 man days: 75k€ Team of 3)
	1701-HLRj-2 TM interfaces and information	Seamless and vendor independent data exchange within and between ITS systems and services for multi-modal information services, synchronized traffic control, signage (road side and in-vehicle). (PT estimate circa 100 man days: 75k€ Team of 3)

2.12 Elements for summary areas for high level recommendations for priorities for existing work under other lead, other Committees and ESO's

Table 5 provides details of the recommendations of PT1701, endorsed by outreach response, as priority issues for standards developments, where PT1701 has established that these are already priority areas under the lead of other working groups of CEN TC278, of other CEN or other ESO's.

PT1701 brings to the attention of these committees the importance and priority of these recommendations.in respect of Urban Administrations introducing and supporting Urban-ITS.

PT1701, however, respects the current lead in these areas and does not presume to do any more than bring these requirements to their attention, and leave it to their expertise and prioritisation strategies to address these issues. We have identified where these are already prioritised in the EC's ICT 'Rolling Plan', and offer to the lead groups our identification and confirmation of these areas as of priority in respect of supporting Urban Administrations to implement Urban-//ITS, and suggest that they cite our prioritisation of these recommendations in their submissions for financial assistance to progress these standards deliverables.

2.13 Detailed Priorities recommendations for other required support measures (that do not lead to a formal standards deliverable)

The CID M/546 is designed to provide assistance to ESO's to identify and deliver standards to enable or support Urban-ITS. However, some of the requirements identified by PT1701 are for measures that do not result in a "Standards deliverable" and the European Commission is challenged to find means to support these measures. Annex A, and in particular Annex A.5, provides greater detail in respect of these measures. Three of these issues are highlighted as priority recommendations in Table 6.

2.13.1 Deliverables first published as Technical Specifications

A simple recommendation is made that CEN TC278 first develops all of its ITS work items, but especially Urban-ITS work items, as Technical Specifications, as this brings the work items into the public domain much more quickly, and provides opportunity for earlier test of the standard, and opportunity to make any modifications required that have been identified in early implementation before the deliverable is finalised as an EN. See 9.7, E.8, F.1.12.

			CEN POLICY
	Priority: EC Requirement to meet CID timetable	Rc_Pl02	PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as "Technical Specifications" (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards.

2.13.2 Establish data registry

HLRk-1- A project team to revue existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry.

As can be seen from the number of referenced Use Cases, most MIS, TM, and UL Use Cases depend on the interoperable exchange of data, and this is only possible if standardised meta-data concepts (data about data: definitions of the form and content of data. This does not currently exist, and a commercial business case is difficult to find. However, it will be the ambitions of Urban Administrations to implement and support Urban-ITS that will suffer without the existence of such a meta-data registry. This needs to be followed with a process to harmonise (and provide migration paths/translation for) legacy data concepts.

This requires 'Support Measures' (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures. Set-up costs circa €150k; annual maintenance/operating cost, circa €75k).

USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL-0102; UL-0103; UL-0104; UL-0105; UL-0106; UL-0107; UL-0108; UL-0109; UL-0110; UL-0111; UL-0203; UL-0204; UL-0206; UL-0207 ; UL-0208; UL-0209; UL-0210; UL-0213; UL-0214; UL-0215; UL-0217; UL-0220; UL-0221; UL-0226; UL-0301; UL-0302; UL-0303; UL-0304; UL-0401; UL-0501; UL-0601; UL-0602; UL-1001; UL-1003; UL-1004; UL-1101; UL-1201

K	**1701-HLRk**		**Data exchange/data management**
		1701-HLRk-1	**Establish data registry (Support Action)**
			A project team to review existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry. This requires 'Support Measures' (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures.
		Rc_SM01	This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary.
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM03	Other action: To develop a unique access point for urban data repositories, in particular an urban meta-data registry. (G.4.5)
		Rc_SM04	b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (D.1; D.2.7; E.3.1)
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires(E.3.1)
		Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
		Rc_PI06	Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators. (E.4.5.1)
		Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)

HLRk-1- **Support Measure Establish EU ITS/Urban-ITS Meta-Data Registry (Support Action [not CEN]** Set-up costs circa €150k; annual maintenance/operating cost, circa €75k)

2.13.3 Harmonise Data concepts

HLRk-2 Harmonization project team to find common data concepts and migration paths for extant 'silo' developed work items.
Cost circa €250k

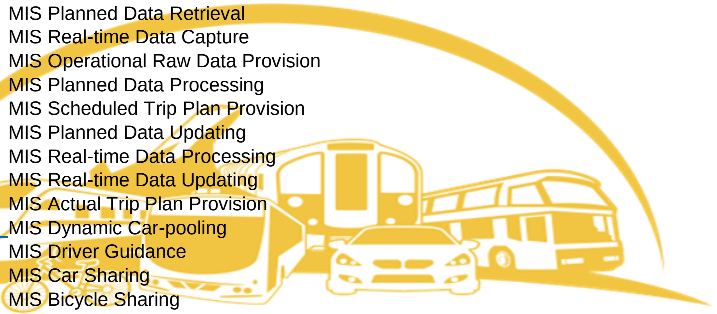
USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL-0102; UL-0103; UL-0104; UL-0105; UL-0106; UL-0107; UL-0108; UL-0109; UL-0110; UL-0111; UL-0203; UL-0204; UL-0206; UL-0207 ; UL-0208; UL-0209; UL-0210; UL-0213; UL-0214; UL-0215; UL-0217; UL-0220; UL-0221; UL-0226; UL-0301; UL-0302; UL-0303; UL-0304; UL-0401; UL-0501; UL-0601; UL-0602; UL-1001; UL-1003; UL-1004; UL-1101; UL-1201

1701-HLRk-2		**Harmonise Data concepts**	
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_Gn09	Intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).

2.14 List of 'Use Cases' analysed/assessed in this pre-study

GEN & ULG+ General/Panoptic; Multimodal Information Systems; TM=Traffic Management; UL= Urban Logistics.

<*> indicates still under development



1. GEN-0001 Urban-ITS Interoperable Location Referencing
2. GEN-0002 Urban-ITS Location and Time Determination
3. ULG-0001 EU-ICIP Use Case
4. ULG-0002 Urban-ITS Interoperable Location Referencing
5. MIS-0001 MIS Planned Data Retrieval
6. MIS-0002 MIS Real-time Data Capture
7. MIS-0002-1 MIS Operational Raw Data Provision
8. MIS-0003 MIS Planned Data Processing
9. MIS-0003-1 MIS Scheduled Trip Plan Provision
10. MIS-0003-2 MIS Planned Data Updating
11. MIS-0004 MIS Real-time Data Processing
12. MIS-0004-1 MIS Real-time Data Updating
13. MIS-0005 MIS Actual Trip Plan Provision
14. MIS-0005-1 MIS Dynamic Car-pooling
15. MIS-0005-2 MIS Driver Guidance
16. MIS-0005-3 MIS Car Sharing
17. MIS-0005-4 MIS Bicycle Sharing

18.	MIS-0005-5	MIS Demand Responsive Systems
19.	MIS-0006	MIS Information Structuring
20.	MIS-0007	MIS Information Dissemination
21.	MIS-0008	MIS Query Structuring
22.	MIS-0000	User Support
23.	TM-0001	TM Planning and system configuration data retrieval
24.	TM-0002a	TM Real-time Field Data Capture
25.	TM-0002b	TM External System Real Time Data Capture
26.	TM-0003	TM Planned Data Processing & Subsystem Configuration
27.	TM-0004	TM Real-time Data Processing
28.	TM-0005	TM Traffic Condition calculation and Event/Incident detection
29.	TM-0006	TM Decision and Measure Selection & Structuring
30.	TM-0007	TM Measure realization
31.	TM-0008	TM Information dissemination
32.	TM-0009	TM Procurement and maintenance of Traffic Management infrastructure
33.	UL-0101	Optimising Modal Choice <*>
34.	UL-0102	Providing Delivery Service
35.	UL-0103	Exchange information with other authorities in area of security <*>
36.	UL-0104	Exchange information with other authorities in area of environmental risk <*>
37.	UL-0105	Pre-trip planning – Freight
38.	UL-0106	Dynamic navigation <*>
39.	UL-0107	Embedded digital maps <*>
40.	UL-0108	Last mile parcel tracking <*>
41.	UL-0109	Freight Manager and driver assistant <*>
42.	UL-0110	Access to Traffic information
43.	UL-0111	Customer/Receiver databases
44.	UL-0112	Delivery vehicle real-time mapping/route optimisation
45.	UL-0113	Comply with regulations
46.	UL-0201	Access Control and Management
47.	UL-0202	Remote Tachograph Monitoring
48.	UL-0203	Emergency messaging system/eCall
49.	UL-0204	ADR management
50.	UL-0205	Driver Work Records Monitoring
51.	UL-0206	Vehicle Mass Measurement
52.	UL-0207	Mass information for control and enforcement
53.	UL-0208	Vehicle Speed Monitoring
54.	UL-0209	Consignment and location monitoring
55.	UL-0210	Vehicle Parking Management/Facilities
56.	UL-0211	Vehicle weigh-in-motion
57.	UL-0212	Vehicle enforcement using roadside sensors
58.	UL-0213	Urban Consolidation Centre Management
59.	UL-0214	Oversize management
60.	UL-0215	Scheduling infrastructure (restrictions – day- time of day- length of stay- other limitations)
61.	UL-0216	Description of freight offer <*>
62.	UL-0217	Monitor Compliance <*>
63.	UL-0218	ICT framework handling RT heterogeneous mobility resources <*>
64.	UL-0219	Network management (<*>
65.	UL-0220	Freight Fares <*>
66.	UL-0221	Freight Delivery schedule timetables
67.	UL-0222	Optimise Resources <*>

68. UL-0223 Improve E2E Freight efficiency <*>
69. UL-0224 Vehicle Technology <*>
70. UL-0225 Innovative load units <*>
71. UL-0226 Restriction Zones Information Harmonisation
72. UL-0227 Intelligent Truck Parking and Delivery Areas Management (ITP/DAM)
73. UL-0228.1 Priority and Speed Advice Service
74. UL-0228.2 Priority and Speed Advice Service (Macro Approach)
75. UL-0301 Emissions monitoring –General
76. UL-0302 Urban Low Emission Zone Management
77. UL-0303 Monitor Emissions Compliance in Urban Zone <*>
78. UL-0304 Cross Border
79. UL-0305 Green balancing and controls <*>
80. UL-0306 Eco-drive Support Service
81. UL-0307 CO2 Footprint Monitoring and Estimation
82. UL-0401 Loading unloading places
83. UL-0501 Measurement place : weight no of axles etc./ covered area/freightlines/limitations- time of day-day-size/ADR rules) <*>
84. UL-0601 Cargo Identification- Predetermined <*>
85. UL-0602 Cargo Identification – Dynamic <*>
86. UL-0701 Use of alternatively fuelled vehicles for urban logistics
87. UL-0801 Charging alternatively fuelled vehicles
88. UL-0901 Charging (e.g. during loading/unloading at the specific bays) <*>
89. UL-1001 Parking Availability in multimodal areas
90. UL-1002 Intelligent parking for light vehicles: Off-street Parking Access and Availability
91. UL-1003 Intelligent parking for light vehicles: On-street Parking Availability
92. UL-1004 Intelligent parking for light vehicles: Parking spot internal access management
93. UL-1101 intelligent parking for light commercial vehicles <*>
94. UL-1201 Intelligent parking for heavy goods vehicles <*>
95. UL-1301 Automated/autonomous vehicles in the Urban-ITS environment

Project Team PT 1701

Technical Report
Intelligent transport systems:

Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

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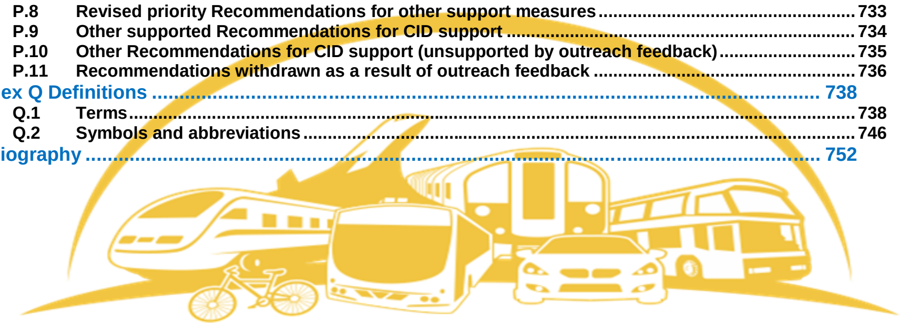


3. Introduction

Cities are home to over 70% of the EU population and account for some 85% of the Union's GDP. Most journeys begin and end in cities. In many urban areas, however, increasing demand for urban mobility has created a situation that is not sustainable: severe congestion, poor air quality, noise emissions and high levels of CO^2 emissions. Urban congestion jeopardises EU goals for a competitive and resource-efficient transport system.

With its declared '*Urban Mobility Package'*, the Commission reinforces its supporting measures in the area of urban transport by:

- Sharing experiences, show-casing best practices, and fostering cooperation
- Providing targeted financial support,
- Focusing research and innovation on delivering solutions for urban mobility challenges

In accordance with Article 8 of Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of 'Intelligent Transport Systems' in the field of road transport and for interfaces with other modes of transport, the Commission may request the European standardisation organisations (ESOs) to develop necessary standards to provide interoperability, compatibility and continuity for the deployment and operational use of ITS. Such standards are scoped by Articles 2, 3, 4 (1), and Annex J of Directive 2010/40/EU [2] to specific priority areas and priority actions in the field of ITS. (Annex J also stresses the need for urban and interurban interfaces for data exchange, and the interoperability and compatibility between the urban and European ITS architectures.)

Within the overarching ITS objectives set by Directive 2010/40/EU [2], the urban dimension has its own needs envisioned in the Action Plan on ITS (2008) [33] and the Action Plan on Urban Mobility (2009)[38]. In 2010, the European Commission set up an Expert Group on Urban-ITS, with the participation of representatives of local authorities and their main partners, from the fields of research, industry, transport authorities and operators, standardisation bodies, etc. This 'Expert Group on Urban-ITS' developed guidelines on the deployment of key applications of Urban-ITS (namely: multimodal information, smart ticketing, traffic management and urban logistics), collected a number of best practices and reflected upon the need for further standardisation in the domain of Urban-ITS. The 'Expert Group on Urban-ITS' recommended better integrating the urban dimension within European standardisation activities and focusing standardisation efforts on multimodal information services including new mobility services, traffic management including access management, and urban logistics including reservation of loading bays. The standardisation efforts should cover existing gaps, upgrade and complement existing standards and ensure the establishment of the needed urban-interurban interfaces.

The EC Communication *"Against lock-in: building open ICT systems by making better use of standards in public procurement"* [41] points to the benefits of using standards and open specifications to avoid vendor lock-in of technological solutions, and promote the deployment of more cost-effective solutions. Its accompanying 'Staff Working Document' *"Guide for the procurement of standards-based ICT – Elements of Good Practice*" [42], lists a number of examples of open specifications in the transport domain, but also shows a lack of common standards for ITS.

The 'Expert Group on Urban-ITS' recommended involving local authorities and experts with specific urban knowledge in the ITS standardisation process. Therefore, the European standardisation organisations are invited to liaise with relevant bodies representing urban mobility and interested in Urban-ITS, such as standardisation coordination groups and organisations, local standardisation frameworks, experts and stakeholder platforms, cities and regions associations, user associations, transport operators and service provider's representatives. The resultant Project Team (CEN TC278 PT1701) therefore comprises a mix of standardisation experts and experts from within or associated with Urban administrations, and organisations such as POLIS, and, importantly is linked to a wider outer network of experts, largely associated with Urban administrations, with whom it will consult and seek opinion and feedback to its initial proposals. The composition of the project team, in accordance with CEN project team selection procedures, was dependent on, and limited by, those who responded to the call for experts. While it was hoped that many Urban Administrations would be inclined to apply, applications were limited by the fact that public sector applicants could not be recompensed for their time costs. PT1701 have therefore worked to create contacts from other Urban Administrations to review and comment on its work (and acknowledge the help received from the European Commission in this respect), and the Interim Report is being used as a key outreach tool to achieve this participation and feedback.

The European Commission is in the final stages of processing and publishing a *"COMMISSION IMPLEMENTING DECISION" (CID) on a standardisation request to the European standardisation organisations as regards Intelligent Transport Systems (ITS) in urban areas in support of Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport."* [1] The measures provided for in this Decision are in accordance with the opinion of the Committee established by Article 22 of Regulation (EU) No 1025/2012 [43].

In this Decision, the European Committee for Standardisation (CEN), the European Committee for Electrotechnical Standardisation (CENELEC) and European Telecommunications Standards Institute (ETSI), hereafter referred as the ESOs (European standardisation organisations), are requested to draft new European standards and European standardisation deliverables in support of the implementation of Article 8 of Directive 2010/40/EU[2] for multimodal information, traffic management and urban logistics in the Urban-ITS domain. The CID[1] is required to be supported by a list of targeted standards to be developed as a priority. And it is within this context that this pre-study has to identify the (high level) requirements, identify available standards, and thereby identify the 'gaps' where the EC should target financial support in order to obtain/accelerate the provision of the Standards necessary to fill these gaps in order to enable efficient Urban-ITS to be instantiated.

The requested European standards and European standardisation deliverables shall be developed to be consistent and compliant with the requirements of the Delegated Acts adopted by the Commission under Directive 2010/40/EU[2], in particular the specifications for the provision of EU-wide real-time traffic information services adopted on 18 December 2014 [44], and the specifications for the provision of EU-wide multimodal travel information service [46].

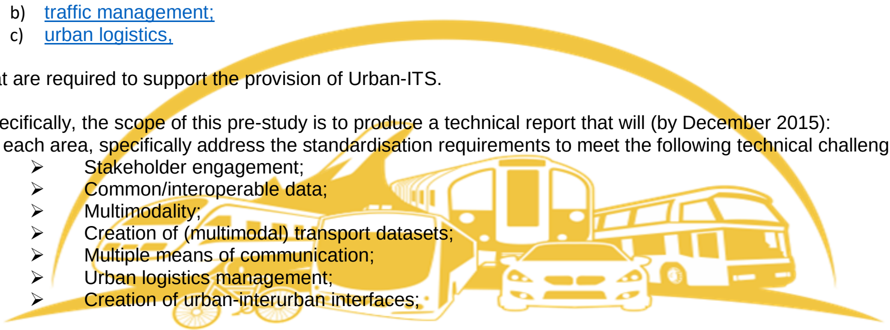
This pre-study report is therefore designed to assist the European Commission to target where to provide such financial support for standards development in the areas of 'Multimodal Information Systems', 'Traffic Management', and 'Urban Logistics'.

4. Scope

The scope of this project is to undertake a pre-study providing stakeholder mapping, framework identification, gap analysis and identification of Standards and related actions required to address the urban infrastructure aspects: the provision of

a) multimodal information services;
b) traffic management;
c) urban logistics,

that are required to support the provision of Urban-ITS.



Specifically, the scope of this pre-study is to produce a technical report that will (by December 2015):
for each area, specifically address the standardisation requirements to meet the following technical challenges:

- Stakeholder engagement;
- Common/interoperable data;
- Multimodality;
- Creation of (multimodal) transport datasets;
- Multiple means of communication;
- Urban logistics management;
- Creation of urban-interurban interfaces;

- Use of open standards, architectures and specifications;
- Enable rather than prescribe or proscribe.

It is the intention that, while the formal deliverable of this pre-study will be a technical report, that the project team will also identify areas for draft 'New Work Item Proposals' (and justifications) for work items to fill the identified gaps, where those gaps can be filled by Standards deliverables, and that the pre-study will also consider and make recommendations for any other support measures that are considered important or essential in order for the successful implementation, management and support of Urban-ITS in an environment where this is an administration controlled and led activity and not a community-wide managed or controlled activity.

The pre-study report, in addition to its submission to the European Commission, shall be in a format suitable for adaptation to a European standardisation deliverable on Use Cases addressing the three areas of this request and highlighting their possible interdependencies. Specifically, a gap analysis identifying additional requirements and priorities for:

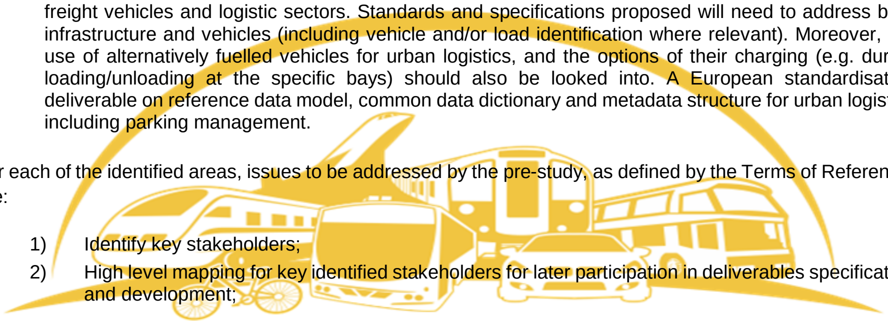
a) Architecture: high level proposals outlining the parameters for a European standardisation deliverable for Urban-ITS architecture integrating the three areas of this request and highlighting connexions or interfaces with surrounding ITS applications as well as compatibility or coherence with existing standards, technical specifications, data models.

b) Multimodal Information Services: Standardisation deliverables in support of new mobility services, such as car sharing, car-pooling, public bike sharing services, park & ride, bike & ride, etc. Alternative fuel infrastructure, including information on location and availability of stations, charging models and capacity at stations, (integrated) payment schemes, etc. A European standardisation deliverable on reference data model, common data dictionary and metadata structure for multimodal information services.

c) Traffic Management: Standardisation deliverables in support of European standards for: a set of traffic management measures (encompassing the necessary infrastructure / static road data, dynamic road status data, traffic data or traffic control data, weather data), a set of traffic re-routing, traffic prioritisation and access regulation measures including intersections management (supplemented by vehicle identification data). In particular, the different types of road user charging models set up in various cities as well as the modalities of shared use of dedicated lanes by different types of vehicles (e.g. freight, public transport, emergency vehicles) should be considered. European standards or European Standardisation deliverables on reference data model, common data dictionary and metadata structure for traffic management including access regulation.

d) Urban Logistics (Including parking management): Standardisation deliverables in support of European standards for: Intelligent parking for light vehicles, commercial vehicles and trucks. The option of extending existing technical specifications or profiles regarding parking or adapting them to the needs of the urban areas should be considered; loading bays information and reservation services for specific freight vehicles and logistic sectors. Standards and specifications proposed will need to address both infrastructure and vehicles (including vehicle and/or load identification where relevant). Moreover, the use of alternatively fuelled vehicles for urban logistics, and the options of their charging (e.g. during loading/unloading at the specific bays) should also be looked into. A European standardisation deliverable on reference data model, common data dictionary and metadata structure for urban logistics including parking management.

For each of the identified areas, issues to be addressed by the pre-study, as defined by the Terms of Reference, are:



1) Identify key stakeholders;
2) High level mapping for key identified stakeholders for later participation in deliverables specification and development;

3) Identifying the overall framework required for interoperability and interchangeability, particularly in respect of central communications architectures and centre-to-field communications (and providing use-case examples);
4) Identifying the systems and devices that could take advantage of common structuring and implementation guidelines;
5) Identifying barriers and constraints to the operation of the open single European market;
6) Identifying transitional and migration issues;
7) Providing a high level generic Concept of Operations for city/administration support for multimodal travel, traffic management and urban logistic aspects of Urban-ITS;
8) Identifying standards requirements to assist/guide/support cities and administrations to provide support for Urban-ITS such as:
    - **Information level** (standards and support measures for defining the meaning of data and messages);
    - **Application standards** (to define the rules and procedures for exchanging information data);
    - **Communications transport standards** (to provide specifications for common rules and procedures guidelines that cities and administrations may wish to consider adopting to exchange application data between point 'A' and point 'X' on a network);
    - **Subnetwork standards** (to define the rules and procedures guidelines that cities and administrations may wish to consider adopting for exchanging data between two 'adjacent' devices over some communications media) Identifying existing standards and widely used technical means (such as DATEX II, XML, FTP, SNMP, SMTP, TCP, UDP, PPP, Ethernet, ASN.1, UTMC, OCA etc.);

9) Identifying standardisation gaps and providing a list of potential work items to be developed during the early tenure of the Standardization Request (CID) to support and enable cities and administrations to effectively implement Urban-ITS and to enable the functioning of the Single European open market in the Urban-ITS sector;

10) Identifying any other measures that would be a prerequisite to/or priority for the implementation of Urban-ITS to enable multimodal travel, traffic management and urban logistic aspects.

5. Summary of Remit to PT1701

Within the contexts described in Section 4, the remit to CEN TC278 PT1701 is to undertake a PRE-STUDY - *"Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS*", the pre-study to identify standards requirements, and identify resources required to develop them.

The requirements on the PT and the instructions to the PT were comprehensive and are detailed in Annex B.4.

The summary of the remit to PT1701 can of course be gleaned from the Scope of the project (4. Above).

In essence, the key factors being to identify what Standards and associated measures are likely to be required to assist Urban Administrations to implement Urban-ITS; what standards are already in place that can assist with this objective, and thereby identify what gaps (and overlaps) exist, and which of these would be enabled or significantly benefit from assistance under the CID.

The project team itself comprised a broad mix of experience comprising: Urban administrations; practitioners and advisers to Urban Administrations etc.; professional standards developers/ITS industry; automotive industry.

And the PT was given a specific remit to outreach to Urban Administrations, both in identifying the gaps, and in validating the result of the interim work.

The PT comprised experts from Belgium, France, Germany, Netherlands, Norway, United Kingdom.

6. Summary of situational factors affecting the study

6.1 The Commission Implementing decision on ITS in urban areas

The COMMISSION IMPLEMENTING DECISION *on a standardisation request to the European standardisation organisations as regards Intelligent Transport Systems (ITS) in urban areas in support of Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport* [1] focuses on three areas of Urban-ITS, namely:

- multimodal information services;
- traffic management including access regulation;
- and urban logistics including parking management.

In order to enable ITS connectivity (avoiding silos or lock-in effects) the ESOs shall demonstrate how the three areas above mentioned are linked together within a broader Urban-ITS architecture, and accommodate their relationships and interfaces with other related ITS applications (not directly in the scope of this request).

The work shall recommend the necessary organisational arrangements supporting an effective cooperation and good coordination across ITS standardisation initiatives and working groups, keeping in mind the need to address the variety of users' needs (from consumers to operators and providers), the ranges of environments (including urban-interurban interfaces), and the different types of vehicles or modes of transport or mobility services (including for mobility impaired) related to the three areas above-mentioned.

For this purpose, the PT shall demonstrate how it has engaged appropriate (urban) experts and stakeholders throughout the whole process (planning, standard making, deployment). The diversity of local situations and policies should be considered.

6.2 Autonomous vehicles

6.2.1 Although not specifically mentioned in the remit to the Project Team, it would be wrong not to address the topical subject of autonomous vehicles. It is now clear that there is heavy investment in this area, and most of the technical hurdles are likely to be overcome within the next couple of years, and a paradigm of so called ‘autonomous vehicles’ is now a potential reality. PT1701 must then consider, how does this affect the pre-study on Urban-ITS?

Autonomous driving will in time become a feature of future mobility solutions. It is significant that the Silicon Valley giants Google, Apple and Tesla are making investments to become significant actors in this field, and are either already offering a form of automated driving, or developing them.

6.2.2 The role of the autonomous vehicle will be mixed, and will change over time. But many of the concepts being studied by PT1701 could be effected, at least in part, by autonomous vehicles. In metro systems and guided pathway systems, largely at airports, autonomous vehicles have been in use for many years, and their span of use has moved from just moving passengers between terminals, to moving passengers from cars to terminals, and from moving passengers from other transport modes to the airport. In recent years, metro systems around the world have been introducing driverless trains However, the current emphasis is on driverless road vehicles, and here the paradigm is quite different from that for guided pathway systems.

6.2.3 Continuous communications form an integral part of autonomous driving. At the moment Apple and Google are relying on WiFi, but the automotive manufacturers, supported by US DoT are combining this with 5.9 GHz communications, and, because of the need to support multiple media and switch from one to another, the ISO 21217 communications air-interface for land mobile architecture, or something similar, will become the accepted norm.

6.2.4 Autonomous driving can only be successful with highly developed and continuously updated maps. The map required for an autonomous vehicle will be far more precise and accurate than maps used today because it is presenting -continuously updated- detailed information about the world to the car.

6.2.5 Security will be a key factor for autonomous vehicles. Currently the research vehicles can be effectively secured and operated in a closed environment. In an open road situation with many autonomous vehicles, this will not be possible. In the Urban-ITS paradigm, where dial-up services may call a driverless pod or taxi, the threat of hacking - making the pod not arrive or the taxi take the passenger to a different destination (even kidnap the occupant), or even deliberately crash the vehicle, - is a major issue of concern. Annex J.3 of this pre-study addresses these security issues for Urban-ITS, and its exposition is equally apposite for the autonomous vehicle paradigm.

6.2.6 The introduction and take-up of this enhanced connected/autonomous paradigm will be dependent on a number of factors:

a) Technical capability;
b) Legal and regulatory framework;
c) User acceptance.

It is now reasonably clear that the remaining technical issues relating to autonomous vehicles will quickly be solved. However, legislation and regulations are currently focussed around control of the vehicle and ‘the driver’. In order for autonomous vehicles to be allowed on the roads, the legislative and regulatory regimes will have to be revised, and just what revision is needed will not be clear until some of the remaining technical issues are solved. That will happen soon, but changing regulations and getting legislative change is not a rapid process, and is likely to take many years. In the meantime, autonomous vehicles will require to be under the control of a supervising driver who is able to overrule and take control at any time. (For example autonomous ‘platooning’ is already available as ‘adaptive cruise control’ with the vehicle automatically maintaining position behind the preceding vehicle, but with the ability of the driver to override at any time).

This clearly limits the near term use of any autonomous features that would be in the Urban-ITS paradigm, such as autonomous driverless ‘pods’ or taxis providing on-demand mobility services in the urban context.

The third factor to consider, especially in Europe, will be that of user acceptability. The speed at which European vehicle users will adapt to autonomous vehicles, and the proportion of the population that will ever want to hand over this control of the vehicle, remains an unanswered question, and will certainly be one that will require some time both for the user community to adapt, and may, in democratic regimes, also affect the speed at which legislative change progresses, because of resistance from the electorate.

At the recent TU-Auto conference in Stuttgart (Automotive Europe 2015: Telematics Autonomy Mobility) the independent consultant Holger Meinel, stated from the floor that a recent study cited showed that, while 90% of Brazilians want to have a self-driving car, only about a third of all Germans and just a bit more than a quarter of Japanese feel the same way. This suggests that many consumers in markets where self-driving cars will no doubt first be launched still need to be convinced.

Turning back to this pre-study, the remit to PT1701 has been directed to focus its work on standards deliverables that can be finalised within the three-year span of the CID mandate, and to focus on early measures to assist Urban Administrations to implement Urban-ITS, but PT1701 recognises that the integration of autonomous vehicles into the ITS and Urban-ITS environment is a major issue, well beyond the scale and remit of this PT, but one that needs a project team to study at an early stage, and makes a recommendation to create a project team to address this issue.

Within the PT1701 pre-study, the emphasis has been on creating, obtaining and using data to enhance multimodal information services, traffic management and urban logistics. As such Urban-ITS information exchanges will form a major contribution to the operation of autonomous vehicles in urban domains. But the emphasis of ITS/Urban-ITS or for that matter Cooperative ITS, is the availability of relevant information on which to base decision making. The issue of whether that decision is made by a system or a human operator is important, but it is secondary to the provision of data in order to make such decisions. Thus the pre-study encompasses the use of autonomous vehicles (autonomous decision making) to potentially provide the services described in the Use Cases, but do not take into any account additional information requirements (if any) for autonomous vehicles, as any such additional requirements are not yet identified/characterised, but a project team should be funded to investigate these issues at an early stage.

See Annex C.8 for more detailed consideration of these issues

7. Summary of Standards framework

The framework of existing standards relevant for Urban-ITS is provided in Annex D. (Principal existing ITS standards are shown in Annex O).

Urban-ITS is considered a new paradigm, and ITS considered paradigm of the future, but in practise, ITS standards have been developed since 1991 (date of CEN TC278 formation), and to some extent, ITS is endemic in everyone's vehicles already. Full ITS-station communications are not yet embedded but the US Government has determined that C-ITS technology will be required in US vehicles. In Europe, eCall becomes mandatory for new vehicle types in 2018; remote tachograph reading has passed through the EU parliament, and remote weigh-in-motion legislation is following; and regulation for C-ITS in EU will inevitably follow. Not because of political aspirations, but the simple safety of life issues.

ITS standards have been published since the formation of CEN TC278 in 1991, and ISO TC204 in 1993, and more latterly by ETSI, since 2006.

Urban-ITS is considered a new paradigm, and in terms of its demands for interoperability of data, and consideration of the multimodality options for travellers, indeed, does represent a new paradigm, but the building blocks for Urban-ITS, have been layered into place over more than 20 years. This is both a good and bad thing,

It is a good thing in that ITS, Cooperative-ITS, Urban-ITS, become possible, and is only possible, because of these building blocks, but a bad thing because, to date, most ITS have been developed in a go-it-alone, 'silo' approach.

Researchers, developers and implementers, have worked hard over a quarter of a century to achieve their developments and successful systems, and are reluctant to change to benefit some other users somewhere else. Indeed, changing the attitude of these communities is a greater challenge than making the necessary technical changes. So, as of today, we sit with similar but different data concepts that are not interoperable; with different meanings for the same term, and different terminology for the same thing.

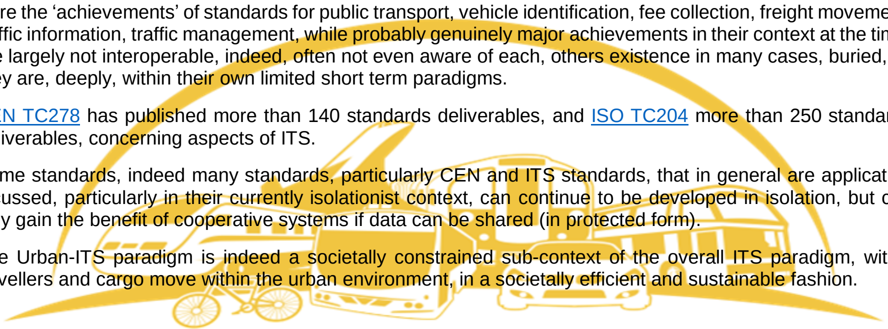
To achieve the interoperability/multimodality required to achieve Urban-ITS; availability, comprehension, and re-use, of data, and common definition of terminology, is essential.

Here the 'achievements' of standards for public transport, vehicle identification, fee collection, freight movement, traffic information, traffic management, while probably genuinely major achievements in their context at the time, are largely not interoperable, indeed, often not even aware of each, others existence in many cases, buried, as they are, deeply, within their own limited short term paradigms.

CEN TC278 has published more than 140 standards deliverables, and ISO TC204 more than 250 standards deliverables, concerning aspects of ITS.

Some standards, indeed many standards, particularly CEN and ITS standards, that in general are application focussed, particularly in their currently isolationist context, can continue to be developed in isolation, but can only gain the benefit of cooperative systems if data can be shared (in protected form).

The Urban-ITS paradigm is indeed a societally constrained sub-context of the overall ITS paradigm, within travellers and cargo move within the urban environment, in a societally efficient and sustainable fashion.



The framework of the main existing standards, relevant for Urban-ITS, is provided in Annex D. A full list of principal ITS Standards is given in Annex O.

The most significant of these Standards that has implication and potential benefit for the Urban-ITS paradigm include Transmodel, IFOPT, SIRI, NeTEx, DATEX II, TPEG, and the CALM architecture and related Standards supporting ITS-station communications, and generic standard approaches to modelling and interoperability such as UML, XML, ASN.1.

See Annex D for detail of these extant standards.

8. Summary of Stakeholders and structuring

8.1 Stakeholders

Urban-ITS "Stakeholders" can be viewed as four categories of stakeholder, comprising those who:

- *Want* Urban-ITS, such as 'Urban administrations' and in many cases, 'Public Transport Authorities';
- *Use* Urban-ITS, such as travellers, freight shippers, road operators, transport operators, etc.;
- *Govern* Urban-ITS, usually National and/or Regional Governments, the EU, (and perhaps indirectly those who create standards);
- *Make* Urban-ITS, such as system and component suppliers, communications and infrastructure providers.

Service providers fall into any combination of the categories "Want", "Make", "Govern" and "Use", depending on what they do. All stakeholders will have different expectations for what the services that ITS can provide will mean to them and their organisations. See Annex E for greater detail.

8.2 Actors

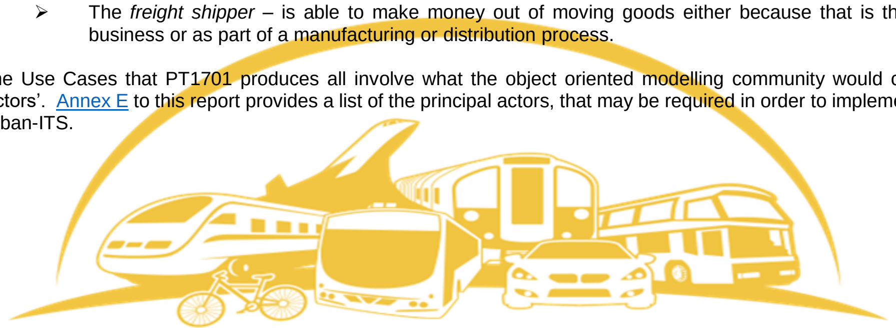
An actor is someone, or something that actively contributes to the provision and operation of a service and in so doing may be a beneficiary of the service. The actual benefit will be different for each actor, and for some the benefit may be indirect, or something that is done for others. The following are examples of the benefits:

- The *road network manager* – is able to reduce congestion, which may be one of their KPI's, or it may help them to fulfil a policy objective of national, regional or local government;

- The *traveller* – benefits from being able to complete their journey in a safe, efficient, and comfortable manner;

- The *freight shipper* – is able to make money out of moving goods either because that is their business or as part of a manufacturing or distribution process.

The Use Cases that PT1701 produces all involve what the object oriented modelling community would call 'actors'. Annex E to this report provides a list of the principal actors, that may be required in order to implement Urban-ITS.



9. Summary of panoptic 'across the board' Requirements

9.1 The panoptic context

PT1701 makes recommendations to assist the three sectors, identified in the remit to PT1701, as the three key areas to enable Urban Administrations to implement Urban-ITS, but the greater impact of the work of PT1701 will be those recommendations that help to pull existing systems out of their silos and enable them to migrate to the interoperable paradigm of Urban-ITS. But although the pre-study was directed to consider three aspects of Urban-ITS, PT1701 has been careful to consider these in the context of the interoperable Urban-ITS paradigm and careful not to create three new 'silos' by only dealing with these issues independently.

As such, many of the most significant recommendations of PT1701 are not those that improve technical support within existing paradigms, but those which have cross boundary impact and enable existing applications to support the urban-ITS paradigm, and introduce new criterion that are not constrained by legacy.

The Annexes to this pre-study contain analysis and consideration of the key components that will enable Urban-ITS.

Regarding panoptic requirements, Annex B (Situational Factors affecting the study), Annex E (Stakeholders and structuring), and Annex F (Panoptic (Multi-category) requirements) carry the detailed panoptic results of this pre-study, and, particularly Annex E.3 considers the "Overall framework required for interoperability and interchangeability", and E.4 considers "Systems and devices that could take advantage of common structuring and implementation guidelines".

In summary, the key panoptic conclusions of PT1701 are as follows:

9.2 EU-ICIP

(HLR1e) Regardless of the standards that are developed as a result of this pre-study, or other demands of the marketplace to enable Urban-ITS, (or whatever measures prise existing 'silo' developed systems into the interoperable world), we have learned that awareness and communication are key factors in developing interoperable systems. Systems developers, standards developers, unless for specific market interest to lock a market, do not define their systems to be 'silos', they generally do this because, like most people these days, they work under pressure, and this is the easiest solution. It is easier to define a new data concept than to hunt for an existing data concept in another standard that could be used (and thus enable re-use and interoperability). Where, indeed, would they start to look? Would they be expected to search through the 400-500 ITS standards developed by SDOs around the world? *It is not going to happen.*

If Urban-ITS were simply a local issue involving local assets and services, differences between instantiations would be of lesser significance. However, travellers, vehicles of all descriptions, and passenger service vehicles (from the local bus to the intercity train), move not only within conurbations, but between them, and between countries and states. Therefore, some level of consistency is essential. Further, as described at some length in Annex C.4, to achieve efficiency in a mixed vendor environment, open standards are required.

CEN TC278 PT 1603, with the remit to provide outreach for PT1602's "Roles and Responsibilities in Cooperative-ITS" quickly established that, once you moved away from standardisation specialists, and into the offices of implementers, engineers and administrators, there was a poor understanding of ITS standards, or even the reasoning behind their need.

PT1701 is of the opinion that it is essential to also make guidance, information and support available to those who will have to make use of or require compliance to these standards. A guide and support framework is needed to assist the introduction and instantiation of Urban-ITS in a reasonably consistent manner.

Such guidance, which we provisionally call the "European ITS Communications and Protocols" – (EU-ICIP, [there would be benefits keeping a similar sounding acronym to NTCIP]) would be designed to be an educational tool, created to assist planners, specification writers, and implementers in understanding the various EU-ICIP adopted standards and how to use them.

EU-ICIP would support a family of open (existent) standards, referencing both common communications protocols and data definitions, that in combinations enable Urban-ITS/ITS to function and be managed.

EU-ICIP would explain to and enable Urban Administrations, road authorities and EU Member states to understand the mesh of standards needed to attain their goals for Urban –ITS, and ITS in general, and provide guidelines to move from abstract architectural concepts to effective instantiation. It would provide EU and the member states with the basis for regulated requirements to achieve its political objectives, and effective instantiation of Urban-ITS in the context of a general ITS environment. The principles of EU-ICIP would be available and adoptable in the context of the wider global ITS community, although some constraints will be regionally appropriate, and the EU-ICIP will always have to be explicit about both global benefits and benefits/constraints as they affect the EU Member States.

EU-ICIP will provide to those outside of EU who wish to cooperate/integrate with the ITS environment in EU, with clear reference points of the standards compatibility/compliance required to achieve compatibility with EU systems. This need has been expressed to PT members by ministers and senior civil servants from countries such as Turkey, Israel, and the Russian Federation.

The proper use of EU-ICIP open-standards in an ITS deployment will allow future expansion of the system to benefit from true competitive bidding, as well as allowing other types of ITS to be added. EU-ICIP would embrace and recommend an entire family of standards designed to meet the communications and data needs of actors in the ITS environment (for example I2I (TMC<>roadside devices, TMC<>TMC, road operator<>emergency services<>jurisdiction etc.), V2V, V2I, I2V, etc.).

EU-ICIP would provide guidance, information and consistency for agencies implementing and operating Urban-ITS/ITS. EU-ICIP will assist interagency coordination and allows equipment of different types and different manufacturers to be mixed within the same or communicating systems.

Even in situations where EU-ICIP protocols cannot be initially implemented because of legacy or other similar problems, operating agencies will benefit from specifying that EU-ICIP recommendations be included in all future acquisitions and upgrades, to provide a better migration path to interoperability and an open market.

The objective will be to promote that all future devices will logically support the appropriate EU-ICIP protocols, at least as an option, and that manufacturers will seek to offer the appropriate EU-ICIP protocols in order to remain competitive in the market place, thus providing operating agencies with the mixed-vendor opportunities espoused.

PT1701 recommends that the CID supports a project Team to develop and publish EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}). (1.6.3; 2.2**;** Annex C.5; Annex A.2.2; D.2.6; D.2.7; F.1.12; F.1.13; F.1.14; F.3.1.1)

9.3 Concept of Operations

Annex E.5 provides description of a very high level "Concept of Operations" (CONOPS) from the perspective of the Urban Administration implementing/supporting Urban-ITS. This aligns with Recommendation HLRb-2. (see 1.8 and 2.5).

At the business level, and in addition to the EU-ICIP, it is necessary to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm.

CONOPS is a document describing the characteristics of a proposed system from the viewpoint of an individual who will provide and/or use that system. It is used to communicate the quantitative and qualitative system characteristics to all stakeholders.[70]. CONOPS are widely used in the military, governmental services and other fields, and are considered highly appropriate for all areas of joint operations planning. Increasingly, CONOPS are used in ITS design to ensure that all relevant aspects of the system are being considered and controlled.

A CONOPS guide is needed to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm.

See Annex E.5.

PT1701 recommends that CEN develop a guide (Technical Report) to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm.

The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm.

9.4 Common meta-data registry

Closely linked with the requirement for the EU-ICIP to provide guidance and be a single source where systems implementers can see the interrelationships and standards needed, and linked with the need to provide a CONOPS to advise administrations regarding the Urban-ITS business paradigm, much of the requirement for Urban-ITS centres on the common definition, sharing and use of common data.

In this interoperable world, data objects characterise only the data, not the use to which it is being put. Data concepts comprise constructs of a sequence of defined data objects which may themselves be considered as data concept objects because they are always or frequently used together. Data objects and data concepts should be unambiguously named and made available for reuse.

This approach will enable data reuse and data exchange in a connected world (where data may be used for purposes other than that for which it was originally designed, or even imagined that it may be used for) and enable the realisation, in this pre-study, of Urban-ITS and beyond.

It should be made clear that the meta-data registry is something different from locally maintained real-time databases that hold the current data. Those dynamic databases are hosted, created, and maintained, locally (usually at the ‘city’ or ‘Urban Administration’ level), and make dynamic data available to actors in the Urban-ITS paradigm.

The meta-data registry is required to ensure that each of the locally maintained databases are defined consistently using the same data definitions (meta-data). This is of course required because travellers, using whatever transport means, travel between Urban Administrations and therefore the data concepts used need to be consistent.

However, it is inadequate that the data object and data concept definitions are buried in Annex D of EN12345, or Clause 14 of ISO 98765. Who knows that they are there - other than the standards writers and a few early users? And what is the incentive to use these, as opposed to other, data definitions?

It is therefore essential that there is *one* data registry that makes the data definitions (meta-data) available to all Urban Administrations, and to all actors in the urban-ITS paradigm, across the EU.

All of this is well known to probably almost every reader of this document, so PT1701 is telling you nothing new. But it is the job of this pre-study to identify gaps, and until there is:

a) a funded and publicly and freely ITS meta-data registry;
b) standards developers are obliged to submit their data object and data concept definitions to the ITS meta-data registry as part of the standards approval;
c) data already defined in extant and used TS standards are uploaded into that meta-data registry;

d) standard data objects already defined for general ICT use outside of the ITS paradigm (for example time, day, date, etc.) uploaded into that meta-data registry;
e) Every entry in the ITS meta-data registry is assigned an unambiguous/unique Name,

it is the belief of the experts in this PT that unless the actions listed above are taken, Urban-ITS, as envisaged in the CID, will not be possible.

This report recommends that the EC, as a matter of urgency, makes call for, and offers financial support for, a project to establish such a meta-data registry/data dictionary.

And further, once the ITS meta-data registry is in place and populated there needs to be a major harmonisation exercise to identify duplications, and find a consensus route to migration to the use of agreed common data objects and data concepts in the future.

This report recommends that EC also provides support for consequential requirements (e.g. maintenance of common data registries).

In order to successfully achieve such migration, it has to be recognised, as stated above, that existing and used data objects and data concepts will not be discarded just in order to meet a new standard, unless it is mandated by legislation or regulation.

See also 2.13; (HLRk-1); Annex C.7.4; Annex D.2.6; Annex D.2.7; Annex E 3.1; Annex E.4.1; Annex F.1.5; Annex G.3.3.2; Annex G.4.5; MIS0003-1v7;

Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation'. (Annex D.2.6; D.2.7; F.1.5)

A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (HLRk-2; Annex D.1; D.2.7; Annex E.3.1)

It is recommended that the EC supports a process to regularly update the meta-data registry.

The pre-study makes 13 recommendations for support measures -measures that do not lead to a Standard, but that are important to enable Urban Administrations to implement Urban-ITS. Some of these measures are considered essential i.e. without which it will be difficult for Urban Administrations to successfully introduce Urban-ITS.

A list of these recommendations can be found in Annex A 5

9.5 Vendor lock-in

The remit to PT1701 included a pointer to the Communication *"Against lock-in: building open ICT systems by making better use of standards in public procurement"* [41]. Annex C.7.6 analyses these issues and makes recommendations to avoid this situation.

There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications. (C.7.6)

9.6 Testing and Conformance

A mandatory test scheme is needed to verify conformance to communication/operational/performance requirements. This is often referred to as type approval or equipment certification. A strong industry consortium or government organization is needed to control and manage the process on a European level. It is suggested that Urban-ITS attaches to the overall C-ITS process aimed at the goal of conformance testing. It is recommended that a project team is formed to study conformance testing requirements specifically for Urban-ITS. See Annex J.1.2; J.3;

9.7 Standards procedures

When is a standard needed? and when is it an appropriate time to develop and publish a Standard? Recommendation RC_PL02- of this Technical Report advocates that all Urban-ITS standards deliverables are first published as "Technical Specifications". This enables much faster development and availability, but importantly enables specifications to be tested while the situation is still evolving, and if necessary enable revisions or improvements before a final standard is published. Of course it imposes migration responsibilities in the event of change, but it helps to provide a situation where standards deliverables are available at an earlier stage.

PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as "Technical Specifications" (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards. (Annex E.7).

This Technical Report also recommends that CEN considers adopting a process where once a work item is created, the first approved deliverable can be published as a TS, and the same approved work item can enable the subsequent development as a full Standard. (This is already the case in ISO, but after publication of a TS, CEN currently requires the creation and approval of a new work item to develop the TS into a full Standard, which incurs delays). . (Annex E.7).

See Annex A.5 for a list of recommendations relating to Standardisation policies

9.8 Other panoptic recommendations

Interchangeability, within this context, having a choice of the mode of transport means, is more a design, investment and management issue than a standards issue. But the process of deciding if and when to interchange between transport means (bus to metro to train to tram; long-haul hydrocarbon based truck to non-emission last mile delivery) –'multimodality'- is only possible with the availability of dynamic data. In order to enable physical interchangeability, standardised physical interfaces are therefore required. (Annex E.3.2)

In order for data passed through a standardised interchangeable physical interface to be comprehensible and useable, data format and presentation standards are also required in order to achieve interoperability. (Annex D.2.7; Annex E.3.2; E.3.3)

Similarly, intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability.)(Annex E.3.3)

This study recommends that in all situations where document-type data is to be transferred, and there is not a particular bandwidth restriction, XML should be used as the standard transfer syntax according to ISO 8825-4. Annex D.2.3.1) and that ITS data/Urban-ITS data defined in standards or data-registries should be defined in ASN.1. (Note: this does not preclude that the data may additionally also be defined in other formats if local practices require this). (Annex D.2.3.2)

It is recommended that there is now an onus on standards developers to understand that their standards, and particularly foundation standards, need to be 'abstract' with regard to any particular application they are envisaged to serve, and that application standards need to specify their application specific issues within the application standard. (Annex C.5)

Further recommendations are made for a technical report for ITS terminology and the conceptualisation of how stakeholders could benefit by cooperation and interaction and a Technical Specification: Common methodology for the assessment and quantitative evaluation of proposed or instantiated Urban-ITS solutions and services. (Annex C.6).

10. Summary of communications and security requirements

10.1 Communications and Security context

Within the areas of modal transport systems and traffic management, and to a lesser extent urban logistics, the pre-study shows how the evolution of systems in isolation from each other have created so called 'silo's of application specific data and application specific protocols. If, as we have established, Urban-ITS requires data interoperability in order to function, then we have to find a migration path acceptable to all, to migrate to common interoperable data concepts.

Urban-ITS users, be they personal travellers(passengers), drivers both of public transport and private vehicles, who are also frequently users of Cooperative ITS, need to pass data wirelessly to and from each other, and the infrastructure. This will be achieved by using several, and multiple, wireless media.

Further, the security issues that face participants in urban-ITS service provision and use are similar/common to those facing C-ITS. And the solutions to both the use of wireless media, and security issues need to be common between Urban-ITS and C-ITS.

It turns out that the C-ITS architecture, security and protocols are not only essential in order for Urban-ITS to operate in the upcoming world of Cooperative-ITS, but provide an efficient migration path from current silos with their own definitions to the interoperable Urban-ITS paradigm, and provide solutions to security issues that have largely yet to be addressed in the Urban-ITS paradigm. See also Annex J which assesses these issues and makes a number of recommendations.

Cooperative-ITS is one of the essential advances of ITS facilitated by the European Commission. C-ITS is both a toolkit and technical platform for Urban-ITS.

(With C-ITS in this context, we refer to the complete definition from ETSI EN 302 665 and ISO 21217, and not the reduced V2V/V2I often referred by the car makers.)

10.2 C-ITS Communications and Urban-ITS

C-ITS in our Urban-ITS context covers travellers with the personal ITS-station, vehicles of various modes and types, roadside/depot/*outstation* functions, and central/back-office/*instation* functions.

This means that all data storage/data processing will per definition happen inside one of the four classes of ITS-station. The data sharing cloud functions as a 'Virtual Private Network' over the internet, or more precisely over IPv6, which is the new internet protocol.

Enabling and, where appropriate, applying the C-ITS paradigm for Urban-ITS will allow:

- interoperable communication over different bearers without having to specify these for each of the applications/Use Cases we define in Urban-ITS;
- security features that support cross-domain trust between all actors, at the same time as providing privacy support according to national/EU regulations;
- remote management possibilities that allow unattended Stations that may be remotely loaded with new services, and automatic configuration and maintenance;

- stations may also run locally determined ITS services side-by-side with the standardized Urban-ITS set, giving a high degree of local freedom to Urban Administrations to set their own policies.

Most of the C-ITS standards needed to support Urban-ITS are already available, but two areas need urgent attention:

- Setting common policies for Urban-ITS regarding the use of C-ITS. This is suggested to be done by a project that create and support a handbook include the following elements:
    - Best practices for the various roles of Urban-ITS (authorities setting policies, operators, implementers/suppliers),
    - Guide(s) showing how the different C-ITS standards may be applied,
    - Guide showing how to become part of the overall security hierarchy;
- A mandatory test scheme is needed to verify conformance to communication/operational/performance requirements. This is often referred to as type approval or equipment certification. A strong industry consortium or government organization is needed to control and manage the process on a European level. It is suggested that Urban-ITS attaches to the overall C-ITS process aimed at the goal of conformance testing. It is recommended that a project team is formed to study conformance testing requirements specifically for Urban-ITS;
- Defining the missing security standards regarding interfaces between roadside/personal/central ITS-stations, patterned on well-established vehicle ITS-station security standards.

It turns out that the C-ITS architecture, security and protocols are not only essential in order for Urban-ITS to operate in the upcoming world of Cooperative-ITS, but provide an efficient migration path from current silos to the interoperable Urban-ITS paradigm, and provide solutions to security issues that have largely yet to be addressed in the Urban-ITS paradigm. The concrete recommendations are handled largely in 1.5 and 1.10 above.

Details of the work of the project team in the area of communications and security can be found in Annex J.

The recommendations regarding communications and security can be found in Annex A.

11. Summary of MIS requirements

11.1 The MIS context

In making a journey, a traveller may use one mode or a combination of transport modes. "Travellers" can comprise car drivers, freight drivers, passengers, cyclists, pedestrians, and potentially, in the future, the use of autonomous travel 'pods' or autonomously controlled taxis or similar. Multimodal Information Services (MIS) comprise the consideration of all modes in the urban area to give the traveller the choice of modes before and during their journey to enable an optimum travel experience.

Presently, the conventional urban public transport offering (buses, trams and metros) dominates the modes for which urban travel information is provided, but links have now to be made with trains, private cars, bicycles and walking and the so called 'New Modes' such as car sharing, car-pooling, bicycle sharing and flexible transport services.

There are a number of existing mature standards such as DATEX II for road data exchange, NeTEx and SIRI for public transport data exchange (based on the Transmodel reference data model), and ALERT C and TPEG for delivery of information. However, many of these standards overlap or are not harmonised and there are gaps, particularly in the coverage of the new modes.

The base of current standards for many multimodal information services, come from the 'Public Transport' sector (called 'transit' in many countries), and one of the core standardisation initiatives relevant to Urban-ITS in this area are the "Transmodel" series of Standards, including the associated NeTEx and IFOPT Standards. This work is undertaken by CEN TC278 WG3.

This is already recognised in the European Commission “***Rolling Plan for ICT Standardisation 2016***” (DG GROW)

“3.4.5. Intelligent Transport Systems (ITS)

D. Proposed new standardisation actions

D.1 Standards developments

In the domain of public transport, and particularly with respect to multimodal information and smart ticketing, such a need for coherence will concern a broad set of standards and technical specifications, namely:

- *Transmodel, the European Reference Data Model for Public Transport, CEN-TC278 ENV12896;*
- *IFOPT, (CEN/TS 00278207) a CEN Technical Standard defining a data model for the Identification of Fixed Objects in Public Transport (e.g. stop points, stop areas, stations, connection links, entrances, etc.);*
- *SIRI, (CEN/TS 00278181-1 to 5), a European CEN technical standard defining Service Interface for Real- Time Information relating to public transport operations;*
- *NeTEx, a prCEN/ Technical Standard currently in development. It is based on Transmodel, extended with additional concepts from IFOPT and SIRI. NeTEX is divided into three parts: Part 1 - Transport Network and Part 2 - Schedules Part 3 - Fares and data for AVL*
- *Standard supporting the emerging interoperable fare management (IFM) systems: Public Transport interoperability (IOPTA) standard EN 15320 defining the functional system architecture and the application scenarios; the EN 1545 standard describing the data elements and the ISO EN 24014-1 standard, defining functional system architecture and the application scenarios.”*

Initiatives to extend and improve Transmodel are already overdue, and the Transmodel standards may need revising to better fit into the new “Multimodal Information Services” paradigm. Further attention and standards are needed in the area of location referencing. This work is considered essential by public transport experts to enable Urban-ITS to function efficiently, and this pre-study encourages CEN TC278 WG3 to proceed with this work with as much urgency as possible, and recommends that EC funding is found to support project teams where this is deemed to be necessary.

PT1701 considered a value chain of the provision of a service from data collection (both scheduled and real-time), through collation and aggregation, to the provision of a service to the traveller. From the value chain, some 18 Use Cases were generated covering all aspects of MIS. These Use Cases each encompass the requirement, looked at the provision of covering standards, and hence identified the gaps, leading to recommendations for standardisation. The recommendations fell into 4 types: new standard development; standards update; standards harmonisation; and support actions. In total there are 32 recommendations generated from the MIS sector. (See Annex A)

As the urban area is presently predominately served by public transport, most of the recommendations fall into the area of public transport information modelling and service provision; hence the dominance of recommendations for updating and extending Transmodel, NeTEx and SIRI.

The development area for new MIS standards identified by PT1701 comprises 17 recommendations of which 8 are concerned with incorporating the new modes into the Transmodel standard reference data model, exchange formats and coherent with SIRI, NeTEx, DATEX II, and infrastructure model (GDF); a further 5 recommendations cover standards needed to cover gaps in current provision in data exchange and services for MIS; and the final 4 recommendations for new standards cover the assurance of data quality.

The requirements for standard updates area comprise 9 recommendations, 6 of which are to support updates and development in and support for Transmodel, 2 to develop links to geographic models linked to infrastructure and 1 to further develop quality procedures.

The requirements for standard harmonisation comprise 2 recommendations, both concerning the harmonisation across modes of existing location referencing standards. This is a major issue with almost all application standards having their own location referencing methodology which inevitably are not in line with each other or the INSPIRE standards. Although these recommendations originate from the MIS studies, they are considered generally applicable across the whole Urban-ITS domain.

Finally, the requirements for support actions comprise 7 recommendations, 2 of which are concern development of NeTEx profiles, 3 address verification of standards compliance of data (both in data repositories and in data exchange files), and 1 provides for an urban meta-data registry. Lastly, there is a recommendation to financially and institutionally support the creation and existence of an organisation (strongly connected to stakeholder) in support those seeking to implement and deploy systems compliant with NeTEx, SIRI and Transmodel.

11.2 MIS and Urban-ITS

'Multimodal Information Services' (MIS), for the purposes of this study, comprise:

- information to travellers on all modes of transport in the urban area; choices before and during a journey;
- information to travellers on interurban transport that has a direct impact on a traveller's urban journey;
- modes of transport cover the conventional urban offering such as buses, trains, trams, metros, private cars, bicycles and walking, but also 'New Modes' such as car sharing, car-pooling, bicycle sharing and flexible transport services; in the future, the use of autonomous travel 'pods' or autonomously controlled taxis or similar; and
- enabling the Urban Administration to provide a balanced effective transport offering within the constraints of cost and policy.

"Travellers" can comprise car drivers, freight drivers, passengers, cyclists and pedestrians.

MIS enable the urban traveller:

- to make the optimum choice of mode, cost, route and timing to reach an intended destination; and,
- to choose to switch between modes during the trip to reach an intended destination optimally.

The scenario envisaged is that a traveller arriving in the urban area or already present, will have all the information to hand to make an optimum journey. This might include, for instance, travel by metro to a certain point where the traveller is directed and guided to the nearest bicycle sharing facility to continue, or complete their journey. Giving locations, availability and timetables is only part of the story; the traveller will also need information on the cost structures in an integrated way – will my ticket cover the whole trip using all modes?

Many public transport services operate on the basis of scheduled transport offer, but this information can change over one operational day, due to diverse circumstances, such as public transport disruptions but also traffic or road conditions. It is therefore envisaged that a traveller might plan a journey by choosing and using more than one mode, but also change modes during the trip as a result of information received during the trip.

There are a number of existing mature standards such as DATEX II for road data exchange, NeTEx and SIRI for public transport data exchange and Transmodel providing a reference data model, ALERT C and TPEG for delivery of information, however these standards can *overlap*, or are not sufficiently *harmonised* in some aspects, or show gaps. For example, they do not completely cover the new modes, i.e. services such as car sharing, car-pooling, bicycle sharing and flexible transport that now are gaining importance in the urban area. These new services have to be taken into account for real-time multimodal information and in particular for trip planning algorithms. It is vital that these new services are standardised in coherence with already existing standards.

11.3 Approach taken

The approach used in MIS was to consider a conventional value chain from the acquisition of data through the collation and validation of that data, to the building of an information message and finally the delivery of the message to the urban traveller. Requests can be made before the journey has commenced or during the journey as a result of changing circumstances or an additional request.

The data available from the modes falls into two distinct areas: *scheduled data* for each mode which details the intended offer the data related to an operational day, possibly modified by events occurring during an operational day as *real-time* data; and *real-time* data outside of the public transport domain can comprise at least:

- flow, speed and occupancy (stationary vehicles) data from an 'Urban Traffic Control '(UTC) system;
- the status of traffic signals and signing systems;
- weather and road surface conditions;
- incidents; and,
- the occupancy levels of car parking.

For each element in the value chain and for 'New Modes' of transport a number of 'Use Cases' were constructed. As a result of the stakeholder consultation and the knowledge of experts, the gaps between the existing standards and the requirements were identified resulting in 31 recommendations for standards and supporting actions.

The recommendations for Multimodal Information Systems are detailed in Annex G and Annex P.

12. Summary of Traffic Management (TM) requirements

12.1 The TM context

Traffic management encompasses a wide range of technologies and solutions used to detect, inform and control road users. Road users can include private cars and motorbikes, public transport buses, pedal cyclists, pedestrians, taxis and may include special provisions for vulnerable road users.

In the urban environment, traffic signals are considered the ubiquitous form of traffic management, but it is now more far reaching and includes message signs, CCTV, access control, selective vehicle priority, intelligent detection of vehicles and road users, enforcement technologies and urban tunnel management systems.

Within the Traffic Management domain there are currently very few Standards available to be used on a pan-European level. There are some very mature open regional specifications (for example OCIT/OTS and UTMC) and a number of supplier specific proprietary specifications are in use, and while some of these have been adopted by Urban Administrators, there are pitfalls associated with them. While DATEX II supports the traffic management service, it is designed for the one function of data exchange (for instance between TM Centres). This has made procurement of traffic management systems challenging often resulting in Urban Administrators developing their own specifications or relying on "outcome" based contracts.

Outcome based, or non-specific procurements often result in vendor lock-in and the PT1701 team's experience highlighted various examples of this, from vendors simply filling a standards void to make their products work, through to purposeful lock-in to maximise future income streams.

Following a 'value chain' approach to traffic management services, the PT1701 project team were able to break down traffic management into a small number of fundamental functions. These functions were then examined as in a number of Use Cases to identify the standards (and gaps) appropriately, which resulted in the 11 recommendations being made.

Some of the recommendations overlapped with those in the other study areas, and these have been grouped together in this report, as 'panoptic recommendations, (for example location referencing), while others are very specific to the traffic management domain, (for example configuration of traffic controllers).

Many of the gaps from the Use Cases, and hence the recommendations, are focused on data exchange, and this covers a broad spectrum of functions, including the traditional synchronised control of traffic signals, but also integration of a growing range of traffic sensors and even simple functions, like how to put information on message signs and deliver automated fault reporting. This area also includes identifying gaps in DATEX II to ensure it can continue to provide the necessary high level data exchange for all Traffic Management functions.

Other recommendations are based on the need for coherent data models for traffic management, including a data model for traffic management plans, topological data models for the road network, and measures to avoid vendor lock-in.

12.2 TM and Urban-ITS

From its humble beginnings as simple, isolated, traffic signals, Traffic management in the urban environment has grown in both scale of operations and complexity in technology, and never more so than in the last decade.

Most Urban Administrations now operate some form of centralised control of traffic signals, with many using an adaptive control algorithm on those traffic signals. Selective vehicle detection is used more commonly to enable public transport and emergency services to have integrated priority. Urban message signs can now be seen providing both strategic and tactical information to travellers and cutting edge technologies, such as ANPR, are used to measure road network performance and provide this information to the travellers.

However, this growth has been organic - often over many decades - resulting in either:

- ➢ multiple traffic management solutions being both physically and logically isolated from each other, resulting in little interoperability or data exchange and providing a more complex operating environment; or,
- ➢ a supplier led fully integrated traffic management solution, resulting in vendor lock-in and causing service expansion issues.

And it has highlighted that there are very few pan-European standards relating to traffic management.

Although at a micro level, Urban Administrations across Europe may have differing policy objectives for their traffic management, at a macro level the over-arching goals will be very similar (e.g. reduce emissions, improve safety, manage congestion) resulting in similar technical solutions being used.

There are three core problem areas, identified in Annex H, for the traffic manager:

a) Continuity of traffic management services on the urban and on urban-interurban interfacing roads.
b) Exchange of data and information with third parties (other road operators as well as traveller information service providers)
c) Vendor lock-in affecting procurement and asset management of the Urban-ITS infrastructure, especially relating to the deployment of C-ITS.

Each of these areas is affected by standards, or gaps in standards, and are reviewed in the 'Use Cases'. Taking each one in turn:

12.3 Traffic management Standards issues.

During the drafting of this work (See Annex H), the following standards gap areas were identified in the traditional traffic management systems:

a) Sensor Data. With current generation sensors being able to provide richer data (e.g. pedestrian density, automatic number plate recognition, floating vehicle data and pollution monitoring) and more sensor data being consumed by central systems (as opposed to local traffic controllers), there is a significant lack of standards that enable an Urban Administrator to add multiple vendors' sensors onto their system.

b) Synchronised control of traffic systems. While there are several regional standards for central systems to control traffic signals, there are no Pan-European standards in this area. However, the team acknowledged that the regional specifications, where they are available, are doing a good job at preventing vendor lock-in.

c) Download of configuration data. A synchronised download and update of configuration data to all interworking traffic management subsystems is an indispensable prerequisite for a high operational consistency in a mixed vendor environment. There is a significant lack of standards that enable a centralised, synchronised and easy to apply distribution of configuration data to all subsystems of a traffic management system environment.

12.4 Exchange of data and information with third parties

DATEX II has enabled traffic managers to exchange key data about traffic data, incidents/events, roadworks, traffic conditions/travel times, Road surface and weather conditions, VMS settings and at last also parking information. However, although DATEX II provides a comprehensive and wide ranged set of data elements there is a significant lack of Pan-European accepted DATEX II profiles and there were more other third party exchanges identified, which are not currently included, or not supported on “standard” off the shelf systems.

12.5 Procurement and maintenance of the Urban-ITS solution for TM

One of the obstacles in adopting new ITS solutions in traffic management is in the actual procurement. If there are gaps in standards, what does an Urban Administrator ask for when procuring a new system? Without any standards to specify, a procurement would need to be based on one of:

a) A locally developed detailed specification. You will get what you ask for and can specify open interfaces or even own the ‘Intellectual Property Rights’ (IPR). However, the cost of such a bespoke solution may be prohibitive.

b) A “lot” based procurement approach delivering a modular solution, requiring the vendors to adapt their interfaces so that the products are interoperable, but without any open standards, resulting in delivery risk and vendor lock-in.

c) An output based specification. The Urban Administrator does not need to have the skills to specify the system, only what it should do. This would cost less but could result in vendor lock-in.

d) Traffic management as a ‘Service’. A few traditional suppliers are now offering cloud based TM solutions, where the Urban Administrator never owns the system. Would need to have long contracts as supplier change will be painful, but removes other pains such as upgrade paths and obsolete systems. Would still need open interfaces to any Urban Administrator or 3rd party systems.

The team also identified that Urban Administrators often desire to operate a single asset management system for all their assets, not just traffic management, resulting in an asset management system which sits outside of the traffic management system, however there are no standards for the exchange of asset and configuration data between these two systems.

The high level Use Cases identified in the traffic management domain follow a value chain process, recognising the inputs and outputs from a typical traffic management solution, which has highlighted the standards gaps and overlaps in this value chain.

ITS is a key part to the future of traffic management, and while some standards are reaching maturity in this area, such as SPAT/MAP, there are still recognised gaps (e.g. central system to traffic controller to enable SPAT/MAP) which need to be addressed.

The recommendations for Traffic Management are detailed in Annex H and Annex P.

13. Summary of Urban Logistics (UL) requirements

13.1 UL context

Detail of the work of the project team in the area of Urban Logistics can be found in Annex I.

Urban logistics, for the purposes of this study, comprises

- Urban freight;
- Urban parking;
- Alternative fuel refilling.

Urban parking has been around for a long time, but its integration into the Urban-ITS paradigm, and the level of sophistication of the parking offering (especially availability of and guidance to specific bays) remains in its infancy. This means that there are competing technical solutions and at this stage it is unclear if one offering will come to dominate or whether there will be a plurality of solutions.

In respect of alternative fuel refuelling, the sector is still very much in its infancy. Alternative fuel refuelling Use Cases at this stage largely centre on recharging electric vehicles. But other alternative fuel forms (such as hydrogen) will emerge and need to be accommodated.

In such nascent domains, the role of standards deliverables, usually developed alongside the first trials of the solutions, are to provide consistency of thought and to prevent the creation of silos, hopefully also to prevent the solutions being within the IPR of a single market player.

One may therefore expect a proliferation of Technical Specifications that will be trialled and evolve in the market place and trials. Some of these will be in contention with each other, but in time a few will become the accepted paradigm and be developed into full standards. This work is largely funded and driven by commercial interests (hopefully working together), so does not need ‘pump-priming’. But in some pre-competitive situations, pump-priming, in this case the sponsorship of the developments of standards deliverables to achieve political objectives, or to ensure an open market, is justified.

13.2 Urban Freight

Urban freight, by comparison is well developed. However, the Urban-ITS paradigm envisages the reduction of congestion and reduction of pollution by more intelligent freight delivery and collections within the urban zone, and by improvement to safety and to the environmental conditions for the urban citizen.

Many of these concepts include the concept of an “Urban Consolidation Centre” (UCC) that consolidates inbound and outbound freight, delivering and collecting by more efficient means due to the consolidation and by less polluting vehicles for the so called “last mile” (Though in the megacities of today this might actually be the last 20 miles).

Over the past 20 years nearly 200 such trials have taken place, nearly all of which have failed to become commercially viable services. The conclusion of PT1701 is that the UCC function is already being carried out in-house by large organisations, such as supermarkets, and by the National post offices and commercial courier and parcel delivery services in the case of other deliveries/collections. The only problem being that they all still tend to use diesel powered vehicles for deliveries. Deliveries using electric vehicles have generally not turned out to be practicable solutions. Solutions to these issues are therefore likely to be long term rather than short term. So in the short term the emphasis needs to be on control via “low emission zones” and other emissions, and other access control measures.
(See I.2.1).
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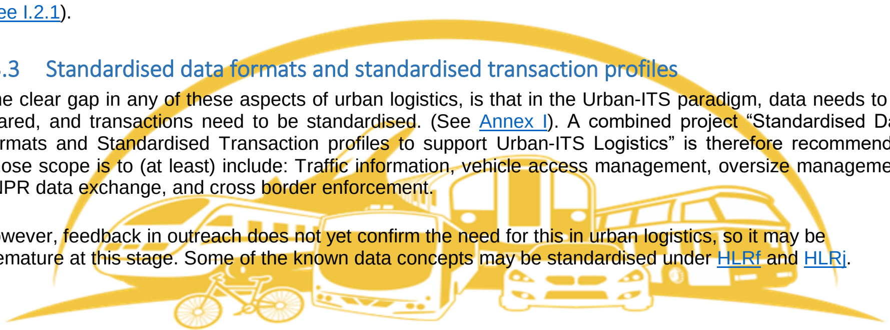
13.3 Standardised data formats and standardised transaction profiles

One clear gap in any of these aspects of urban logistics, is that in the Urban-ITS paradigm, data needs to be shared, and transactions need to be standardised. (See Annex I). A combined project “Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics” is therefore recommended whose scope is to (at least) include: Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement.

However, feedback in outreach does not yet confirm the need for this in urban logistics, so it may be premature at this stage. Some of the known data concepts may be standardised under HLRf and HLRj.



13.4 Emissions monitoring and geofencing

It is clear that in the short to medium term, the monitoring and control of emissions remains a key area for Urban-ITS. ‘Low emission zones’ and other monitoring and enforcement measures need to be based on common data concepts. Geofencing uses GNSS coordinates to create a virtual zone around a particular location which activates the electric mode of hybrid vehicle buses with extended zero emission capability and other hybrid vehicles when they enter the ultra-low emission zone or other zones. This can be configured to allow ‘hard zones’, where buses, certain vehicles/taxis must always run in electric mode and ‘soft zones’ where they run in electric mode if there is enough battery charge remaining. The technology could also be used in low emission neighbourhoods and other roads with high concentrations of NOx and high levels of pedestrian activity.

A Project Team for Emissions monitoring, management, and geofencing’ is therefore recommended. (See HLRi; UL-0301; UL-0112).

13.7 Recommendations for Urban Logistics

The recommendations for Urban Logistics are detailed in Annex I and Annex P.

It should be noted that there are a number of Use Cases (largely proposed by OPTCITES) that have been identified, but the PT does not yet have enough data to complete the Use Cases.

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14. Summary of architecture requirements

14.1 FRAME Architecture context

PT 1701 work in this area has focussed on the request from the European Commission to identify what can be done to promote and improve the deployment of Urban-ITS, and the coherence of proposals from the PT to the coherence of the FRAME architecture.

14.2 Coherence

The Use Cases for the Urban-ITS domains of ‘Traffic Management’ (TM), ‘Multimodal Information Services ‘(MIS) and ‘Urban Logistics’ (UL) have been analysed for coherence with the contents of the FRAME Architecture. In all three domains a good level of coherence was found between majority of the descriptions in the Use Cases and the functionality that the FRAME architecture contains.

Most of the lack of coherence that was found can be summarised in the following two ways:

a) The evolution of services and facilities since updates were last made to the FRAME Architecture.

Examples of this are: a lack of support for car and bicycle sharing; the ability to include access to facilities that provide alternative fuels for vehicles in traveller trip plans; and, the availability of some multimodal information only when requested by a traveller.

b) Some facilities and services are not shown explicitly within the functionality that the FRAME Architecture includes.

Examples of this are: the analysis of public transport performance data against "contractual reporting" and "providing data for QoS analyses and processes"; enabling a bias towards the use of public transport services within traveller trip planning; and the downloading of configuration data to functionality that can be expected to be located at the roadside.

14.3 Standards required in order to ensure homogeneity and support for Urban-ITS

In order to ensure homogeneity, and support for Urban-ITS requires consistency beyond just that of data formats and protocols. The study has identified that the use of some existing standards should be required throughout the sector in order to provide benefits in the creation and use of Urban-ITS architectures., and in the consistent enabling/support/implementation of applications for Urban-ITS

These standards are: ISO 14813-1 (ITS service descriptions), ISO 14813-5 (ITS architecture descriptions), ISO TS 17427-1 (roles and responsibilities in ITS), ISO TR 24529 (use of UML in ITS standards), ISO TR 26999 (use of process orientated methodology in ITS standards) and ISO/IEC/IEEE 42010 (general architecture descriptions). This is particularly true of ISO 14813-1, the use of which will have the benefit of providing a standardised description of the services that ITS is able to support.

14.4 Update and extension of the FRAME ITS architecture

Attention has been given to the identification of what should be done to improve the existing FRAME Architecture so that it becomes even more useful to its users. This includes the following:

a) The integration of the best parts from other ITS architecture initiatives in Europe such as the Norwegian ARKTRANS architecture, the French ACTIF architecture, the Italian ARTIST Architecture, the German OTS architecture and the UK's UTMC architecture;
b) The creation of a "standardised" physical views based on the Cooperative-ITS communications network diagram;
c) Modifications to provide enhanced capabilities within the FRAME architecture toolset for the creation of organisational views for ITS implementations and to make it more user friendly;
d) Extensions to accommodate new paradigms within Urban-ITS (since the last update of FRAME)

However, outreach feedback showed little awareness and use of the FRAME architecture at the Urban Administration level, and some negative feedback to the proposed recommendations. These have therefore been withdrawn for further consideration.

The recommendations for Architecture are detailed in Annex K and Annex P.

Technical Report: Intelligent Transport Systems
Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

Annex A Detailed Recommendations of CEN TC278 PT1701

A.1 Background and Structure of this Annex

A.1.1 Background

This Annex has been substantially restructured between the already circulated Interim Report and this version for the final report.

In the Interim version of the report, the PT1701 experts, with the assistance of their *phase one* outreach contacts, identified 103 recommendations for Standards deliverables development or other support actions relevant for Urban-ITS in the areas of multimodal information systems, traffic management and urban logistics. They were organised functionally as: Key and summarised recommendations; List of Use Cases assessed; Standards Policies - Urban-ITS (and general); Recommendations: Panoptic-Across the Board (Gen); Recommendations: Multimodal Information; Recommendations: Traffic Management; Recommendations: Urban Logistics; Recommendations: Architecture; Recommendations: for standards deliverables from other ESO's / recognised standards Issuers; and, Recommendations: for other associated support measures and policies.

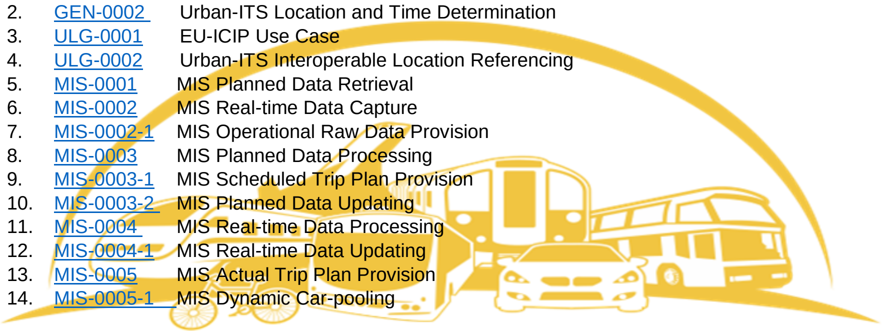
All of the recommendations are based on elaborated Use Cases. These Use Cases have been used as a basis to identify requirements, relevant available standards, and to undertake a gap analysis and therefore identify the recommendations, which were shown in Annex A of the Interim report, and form the basis of the recommendations made in this, the final, report. Although many are organised according to the four aspects that we were charged to study, the PT has been very conscious of the need to elevate the requirements to the Urban-ITS paradigm wherever possible, and have been very concerned not to simply create three new silos.

A.1.2 Use Cases

NOTE: The Use Cases are formally described, as investigated, and as they occur throughout the Annexes, but are presented collated in Annex M. and may b summarised as follows:

KEY: GEN & ULG+ General/Panoptic; Multimodal Information Systems; TM=Traffic Management; UL= Urban Logistics. <*> indicates still under development

1. GEN-0001 Urban-ITS Interoperable Location Referencing
2. GEN-0002 Urban-ITS Location and Time Determination
3. ULG-0001 EU-ICIP Use Case
4. ULG-0002 Urban-ITS Interoperable Location Referencing
5. MIS-0001 MIS Planned Data Retrieval
6. MIS-0002 MIS Real-time Data Capture
7. MIS-0002-1 MIS Operational Raw Data Provision
8. MIS-0003 MIS Planned Data Processing
9. MIS-0003-1 MIS Scheduled Trip Plan Provision
10. MIS-0003-2 MIS Planned Data Updating
11. MIS-0004 MIS Real-time Data Processing
12. MIS-0004-1 MIS Real-time Data Updating
13. MIS-0005 MIS Actual Trip Plan Provision
14. MIS-0005-1 MIS Dynamic Car-pooling



15.	MIS-0005-2	MIS Driver Guidance
16.	MIS-0005-3	MIS Car Sharing
17.	MIS-0005-4	MIS Bicycle Sharing
18.	MIS-0005-5	MIS Demand Responsive Systems
19.	MIS-0006	MIS Information Structuring
20.	MIS-0007	MIS Information Dissemination
21.	MIS-0008	MIS Query Structuring
22.	MIS-0000	User Support
23.	TM-0001	TM Planning and system configuration data retrieval
24.	TM-0002a	TM Real-time Field Data Capture
25.	TM-0002b	TM External System Real Time Data Capture
26.	TM-0003	TM Planned Data Processing & Subsystem Configuration
27.	TM-0004	TM Real-time Data Processing
28.	TM-0005	TM Traffic Condition calculation and Event/Incident detection
29.	TM-0006	TM Decision and Measure Selection & Structuring
30.	TM-0007	TM Measure realization
31.	TM-0008	TM Information dissemination
32.	TM-0009	TM Procurement and maintenance of Traffic Management infrastructure
33.	UL-0101	Optimising Modal Choice <*>
34.	UL-0102	Providing Delivery Service
35.	UL-0103	Exchange information with other authorities in area of security <*>
36.	UL-0104	Exchange information with other authorities in area of environmental risk <*>
37.	UL-0105	Pre-trip planning – Freight
38.	UL-0106	Dynamic navigation <*>
39.	UL-0107	Embedded digital maps <*>
40.	UL-0108	Last mile parcel tracking <*>
41.	UL-0109	Freight Manager and driver assistant <*>
42.	UL-0110	Access to Traffic information
43.	UL-0111	Customer/Receiver databases
44.	UL-0112	Delivery vehicle real-time mapping/route optimisation
45.	UL-0113	Comply with regulations
46.	UL-0201	Access Control and Management
47.	UL-0202	Remote Tachograph Monitoring
48.	UL-0203	Emergency messaging system/eCall
49.	UL-0204	ADR management
50.	UL-0205	Driver Work Records Monitoring
51.	UL-0206	Vehicle Mass Measurement
52.	UL-0207	Mass information for control and enforcement
53.	UL-0208	Vehicle Speed Monitoring
54.	UL-0209	Consignment and location monitoring
55.	UL-0210	Vehicle Parking Management/Facilities
56.	UL-0211	Vehicle weigh-in-motion
57.	UL-0212	Vehicle enforcement using roadside sensors
58.	UL-0213	Urban Consolidation Centre Management
59.	UL-0214	Oversize management
60.	UL-0215	Scheduling infrastructure (restrictions – day- time of day- length of stay- other limitations)
61.	UL-0216	Description of freight offer <*>
62.	UL-0217	Monitor Compliance <*>
63.	UL-0218	ICT framework handling RT heterogeneous mobility resources <*>
64.	UL-0219	Network management (<*>

65.	UL-0220	Freight Fares <*>
66.	UL-0221	Freight Delivery schedule timetables
67.	UL-0222	Optimise Resources <*>
68.	UL-0223	Improve E2E Freight efficiency <*>
69.	UL-0224	Vehicle Technology <*>
70.	UL-0225	Innovative load units <*>
71.	UL-0226	Restriction Zones Information Harmonisation
72.	UL-0227	Intelligent Truck Parking and Delivery Areas Management (ITP/DAM)
73.	UL-0228.1	Priority and Speed Advice Service
74.	UL-0228.2	Priority and Speed Advice Service (Macro Approach)
75.	UL-0301	Emissions monitoring –General
76.	UL-0302	Urban Low Emission Zone Management
77.	UL-0303	Monitor Emissions Compliance in Urban Zone <*>
78.	UL-0304	Cross Border
79.	UL-0305	Green balancing and controls <*>
80.	UL-0306	Eco-drive Support Service
81.	UL-0307	CO2 Footprint Monitoring and Estimation
82.	UL-0401	Loading unloading places
83.	UL-0501	Measurement place : weight no of axles etc./ covered area/freightlines/limitations- time of day-day-size/ADR rules) <*>
84.	UL-0601	Cargo Identification- Predetermined <*>
85.	UL-0602	Cargo Identification – Dynamic <*>
86.	UL-0701	Use of alternatively fuelled vehicles for urban logistics
87.	UL-0801	Charging alternatively fuelled vehicles
88.	UL-0901	Charging (e.g. during loading/unloading at the specific bays) <*>
89.	UL-1001	Parking Availability in multimodal areas
90.	UL-1002	Intelligent parking for light vehicles: Off-street Parking Access and Availability
91.	UL-1003	Intelligent parking for light vehicles: On-street Parking Availability
92.	UL-1004	Intelligent parking for light vehicles: Parking spot internal access management
93.	UL-1101	intelligent parking for light commercial vehicles <*>
94.	UL-1201	Intelligent parking for heavy goods vehicles <*>

A.1.3 Objectives for Phase 2 outreach

The Recommendations of the Interim Report were presented to the second phase of outreach approaching all 116 outreach contacts, and via the www.urbanits.eu website, a further 39 interested parties. with a request to identify:

a) Which recommendation was of most importance/significance to their organisation;
b) Name 4 other recommendations of importance to their organisation;
c) Name the 4 recommendations of least relevance to their organisation

And they were also asked to provide some statistics regarding their organisation's use of Transmodel, NetEx, IFOPT; SIRI; OCA; UTMC and FRAME.

Within the limited period available, some 41 responses were received, comprising 27 from respondents from Urban Administrations or Urban Administration type organisations (such as transport authorities), and 14 from other sources such as advisors, suppliers, universities, standards makers, etc.

It must be recognised that such a sample response cannot be taken to be statistically representative. It can be taken as significant, but it must be recognised that its feedback, while invaluable, cannot provide precise relative prioritisation, that the greatest number of responses will come from the most active areas, which may or may not be the areas of greatest need; and PT1701 has therefore been careful not to infer such precision from the outreach feedback received.

It must also be made clear that the responses were the responses of individuals and not the formal position of their urban-administration.

The objective of PT1701 is to identify standardisation requirements in the areas of traffic management, multimodal information systems, and urban logistics, from the perspective of assisting Urban Administrations to implement and support Urban-ITS within their domains. The PT has been instructed to place greater weight to the requirements expressed by Urban Administrations. In this we were fortunate in that the outreach responses received were approximately in a ratio of

2:1
Urban Administration:others,
(27 UA responses:14 responses from 'others)

thus naturally providing the weighting to provide emphasis to the requirements of Urban Administrations (and avoiding the need to create an artificial means to weight the responses from Urban Administrations).

We further influenced the responses by allocating double points to the "recommendation of most importance/significance to their organisation;" thus giving greater recognition to the recommendation identified as of greatest importance/significance above other requirements.

We then analysed the markings to categorise

a) Recommendations supported/prioritised by outreach response
b) Recommendations which did not receive supportive outreach response
c) Recommendations which received no support and received negative outreach response

Although not placing great significance to precise scoring, we identified the most frequently prioritised responses, and did this for 'all responses' received, but also analysed the responses from 'Urban Administrations' and 'Other' responses separately, in order to be able to identify if there were significantly different priorities for these two groups.

Annex P provides a full analysis of outreach response to the PT1701 recommendations. It is organised as follows:

P.1	Organisations and individuals consulted during the preparation of the interim and final reports
P.2	Organisations and individuals circulated with the Interim Report for comments and prioritisation
P.3	Feedback from outreach following circulation of interim report
P.4	Collated outreach responses to individual recommendations
P.5	Other Feedback received
P.6	Revised High Level Priority Recommendations for CID Support
P.7	Revised Recommendations for other ESOs/Committees
P.8	Revised priority Recommendations for other support measures
P.9	Other supported Recommendations for CID support
P.10	Other Recommendations for CID support (unsupported by outreach feedback)
P.11	Recommendations withdrawn as a result of outreach feedback

Section P.3 compares the interim results and priorities identified at the outreach open meeting in February 2016 (and confirms most of these as priorities). It provides itemised comments against each of the outreach meeting's "High Level Recommendations".

Section P.4 provides the full feedback comments received to every interim report recommendation, and provides some summary conclusions as a result (for each and every recommendation).

Section P.5 provides all other outreach feedback received that could not be directly aligned to a specific recommendation.

Sections P.6 - P.11 (reproduced below {as A.3 – A.8}) provide the revised list of recommendations that now form the final recommendations of PT 1701.

An important aspect of Section P.11 (recommendations withdrawn for further consideration) is that although PT1701 withdraws the following recommendations as the result of negative feedback, this does not, however, mean that these projects are not needed nor important, only that there are higher priorities for the CID, and these recommendations require further explanation, consideration and consultation before progressing.

Please note that relative prioritisation between recommendations cannot be taken either from the sequence within sections, nor the ranking within sections.

A.2 Key issues and summarised recommendations

A.2.1 Summarised recommendations

The PT1701 Interim Report (issued end December 2015) made 103 recommendations for standards development or support actions to support/enable Urban Administrations to enable/introduce/maintain Urban-ITS. Each recommendation addresses a ‘gap’, a requirement, for an identified ‘Use Case’ for Urban-ITS.

Some Use Cases are near-term, or can already be implemented, some are for the near future. Some are capability enhancing and desirable, others are considered essential prerequisites.

While each of these recommendations emanates from a ‘Use Case’, and is justified within this document, it cannot be ignored that 103 recommendations is a long list of requirements, and, especially as resources available to implement the CID are limited, some prioritisation is required.

Further, while the emphasis of this pre-study lies in recommendations for the development or revision of standardisation, some of the intermediate recommendations enabling Urban Administrations to support Urban-ITS are for support actions that do not result in Standards deliverables, and therefore cannot be assisted by the normal measures to support the CID (Project Teams funded from the Standardisation budget), (except Support Action Rc-SM13 referring to Public Transport series of standards that is related to production of deliverables according to the corresponding project plan).

In respect of these recommendations, the principal task facing proponents of Urban-ITS, and the European Commission in particular, is to find sources of funding to enable these related recommendations (that do not qualify for support under the CID support measures) to be carried out. Of these recommendations, some are identified as priority, or prerequisite, in order to enable Urban-ITS to be implemented, and so identifying the need to finding sources of funding for these projects is an important recommendation in itself.

Further, some of the recommendations concern areas where there is already well established standardisation activity and programmes, indeed, in some specific cases are already identified and prioritised by the EC’s ICT Rolling Plan, and it is the intention to support the continuation and furthering of such work within the existing committees, and to identify them as priority areas for action within existing committees (and not to claim dominion over these areas for Urban-ITS). This pre-study encourages these committees to use the recommendations of this pre-study in pursuance of seeking funding to continue this important work. Attention is drawn particularly to projects associated with the enhancement and extension of Transmodel and associated

Standards (NeTEx, IFOPT, SIRI), DATEX II and C-ITS security). Section A.4 provides recommendations for the attention of other Committees and ESOs.

A.2.2 Phase 2 outreach

While the recommendations of the interim report were made using the experience of the PT experts combined with informal outreach, the second phase of outreach approached all 116 outreach contacts, and via the www.urbanits.eu website, a further 39 interested parties.

The interim report identified prioritised 6 project Team proposals to address these areas as a matter of urgency. A further two areas of 'High Level Recommendations' for support actions (3 project teams), outside of CID support for standardisation deliverables, were also identified as priority areas. Each of these "High Level" recommendations emanate from a number of Use Cases, and embrace a larger number of specific recommendations. Annex P.3 provides outreach feedback for these interim recommendations, and largely affirms them.

The outreach response form asked for some simplified statistical information to identify the use of existing measure. Table A.1 shows the result.

NOTE: It is noted that some respondents, both in the response sheet and in discussion, stated that they used SIRI and/or NeTEx. However, maintainers of Transmodel have asked us to point out that NeTEx and SIRI are Transmodel implementations, and therefore are considered dependent on Transmodel, even if this is not obvious to all users.

Table A.1 - Use of key existing measures

Combined Statistics	Responses	YES as % of ALL	TOTAL YES of Resp	UA YES of Resp	OTHER YES of Resp	TOTAL DON'T KNOW	UA DON'T KNOW	OTHER DON'T KNOW
Does your organisation use Transmodel standards?	23	22%	39%	17%	22%	61%	52%	9%
Does your organisation use NeTEx standards?	17	29%	71%	35%	35%	41%	24%	18%
Does your organisation use IFOPT standards?	18	27%	61%	28%	33%	39%	22%	17%
Does your organisation use SIRI standards?	18	41%	94%	61%	33%	6%	0%	6%
Does your organisation use OCA: OTS/OCIT standards?	19	32%	68%	42%	26%	32%	21%	11%
Does your organisation use UTMC standards?	16	17%	44%	31%	13%	56%	50%	6%
Does your organisation use the FRAME architecture?	10	15%	60%	40%	20%	40%	40%	0%
Does your organisation use DATEX II?	29	54%	76%	41%	34%	24%	24%	0%

Table A.1 provides a summary of existing measures.

Column 2 shows the number of respondents to the question. Note, there were a total of 41 outreach respondents, so these questions were answered by between 70% down to just 24% of all respondents, so can only be taken as a rough indication of use and awareness.

Column 3 shows the number of YES responses as a % of the total number of outreach responses (41) and Column 4 as a % of those actually responding to the particular question (Column 2). The highest three %s are shown in red, and the lowest % responses in blue. Red therefore indicates the highest awareness of use, and blue the lowest. We can note that there is consistency between the most used and least used, whether measured against total responses, or respondents to the particular question, are similar.

Columns 5 and 6 show the breakdown between UA responses, and 'Others' responses. The red and blue again indicating highest and lowest awareness responses.

The "Don't Know" figures reflect how widespread knowledge of the measure is among respondents who completed these questions (i.e. the lower the % the higher the awareness of the measure).

It would be wrong to imply any precision to these results because of the elsewhere discussed lack of balance in statistical representation. But they can be taken to indicate where there is:

a) A general high/low level of awareness of the measure (Red=High/Blue=Low)
b) A general high/low level of awareness of use of the measure (Red=High/Blue=Low)

Turning to the Recommendations, Table A.2 summarises the top 10 responses. The reader is advised not to pay too much attention to the relative ranking as the sample is small and not statistically representative.

Table A.2 - most prioritised 10 recommendations

	COMBINED RESPONSES UNWEIGHTED
	TOP 10
Rc_Gn12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
Rc_TM05	An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)
Rc_TM07	A control interface standard to link roadside devices such as signal controllers to an instation system, to support multi-vendor integration. (H.4)
Rc_TM03	A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (E.4.3.2)
RcPl01	PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP
Rc_SM13	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisationin order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles verification). (F.4.14)
Rc_TM02	A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (E.4.3.2)
Rc_TM01	A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (E.4.3.2) May be linked with MI20)
Rc_TM08	System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (H.4)
Rc_TM06	Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)

Taking only the responses from UA's we get the prioritised 10 recommendations shown in Table A.3

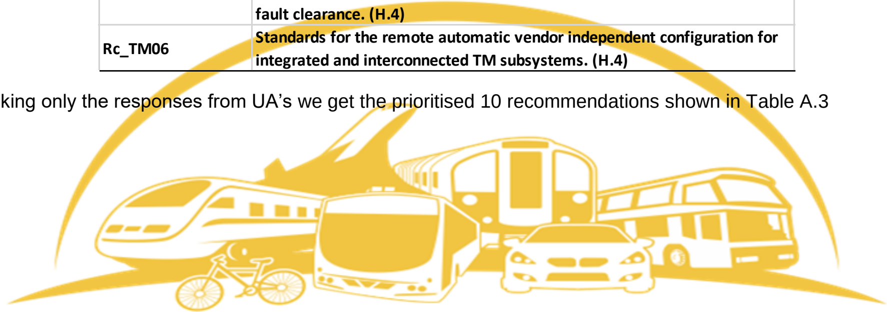


Table A.3 - 10 recommendations most prioritised by UAs

	URBAN ADMINISTRATION RESPONSES
	TOP 10
Rc_TM05	An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)
Rc_TM07	A control interface standard to link roadside devices such as signal controllers to an instation system, to support multi-vendor integration. (H.4)
Rc_Gn 12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
Rc_Tm02	A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (E.4.3.2)
Rc_Tm 03	A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (E.4.3.2)
Rc_TM06	Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)
Rc_TM04	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. (H.4)
Rc_TM08	System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (H.4)
Rc_Gn15	PT1701 recommends that CEN develop a guide (Technical Report) to provide advice and guidance to urban administrations to assist them to move from current organisations and practices into a multimodal business paradigm. The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm (D.7)
Rc_SM13	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisationin order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles verification). (F.4.14)

Taking only the responses from 'Others' we get the prioritised 10 recommendations shown in Table A.4

Table A.4 - 10 recommendations most prioritised by UAs

	OTHERS RESPONSES
	TOP 10
Rc_PI01	PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP
Rc_Gn12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
Rc_PI05	The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
Rc_PI10	Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
Rc_SM13	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisationin order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles verification). (F.4.14)
Rc_SO01	OESO/OEC :The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
Rc_PI11	A PT to study how C-ITS security shall be applied for Urban use. Specifically : practical advice to city authorities, and national/regional level needs to get going based on recommendations.
Rc_TM01	A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (E.4.3.2) May be linked with MI20)
Rc_Gn11	Develop standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate. (E.4.3.5)
Rc_MI24	Standard harmonisation: To specify a unique solution for the models as developed by GDF and INSPIRE in overlapping areas: road, rail, waterway network, walking paths, administrative areas, named areas, etc.). (G.4.1)

While it is always interesting to see the way that a spreadsheet prioritises its lists, and while this feedback is very important; because of the nature of the sample, PT1701 again urges caution in the marking and relative prioritisation. **What is important is that these are the recommendations that garnered positive response as priorities.**

We can see that some recommendations (for example Location Referencing) are prioritised by both UA's and 'Others', the responses from UA's tend to favour traffic management recommendations, while responses from advisors tend to prioritise 'Policy and Strategy' aspects. With the natural weighting achieved by the 2:1 ratio of

UA responses to ‘others’ responses, the overall table therefore tends to favour traffic management recommendations. Within UAs, more responses were received from traffic management than from information systems departments. With these considerations in mind, while giving the greatest priority to the outreach response, PT1701 has had to carefully interpret these results, and therefore, as stated above, urges caution in implying significance to the relative markings or rankings, except for the very general statements that can be inferred that one or two recommendations have attracted so many more marks than others that they can be identified as top level requirements. It is therefore more important that a recommendation is mentioned on a top or other 4 priorities list, than the number of instances in which this occurs.

PT has therefore categorised its recommendations simply as:

a) Recommendations supported/prioritised by outreach response
b) Recommendations which did not receive supportive outreach response
c) Recommendations which received no support and received negative outreach response

The PT did however compare the results from the outreach response to the prioritisation at the outreach meeting, and this can be found in Annex P.3.

As a result of outreach response, the outreach meeting, and the technical assessment of the experts, PT1701 makes the following summary and recommendations, as displayed in Sections A.3 – A.8.

For the detailed consideration of each priority, and list of all recommendations and outreach feedback that lead to the revised recommendation lists below, see Annex P.

A.3 Revised High Level Priority Recommendations for CID Support

(From Annex P.6)

Taking into account the outreach meeting, and the outreach feedback received, the revised High Level Priority Recommendations for CID support are now as follows:

(Please note that this list is identified as a-k (rather than 1 – 11) to avoid signifying a ranking of priorities.

These 8 high level recommendations incorporate 28 of the original recommendations in the Interim Report and reflect the proposals of the PT that have received positive affirmation/support from outreach feedback. But no attempt is made to rank prioritisation between these recommendations, nor should their sequence be taken to imply any ranking.

That said, recommendation 1701-HLRa, Location Referencing received significantly more support than any other proposal.

A	**1701- HLRa** **Location referencing Harmonisation**		
		Rc_GN01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
		Rc_GN02	To develop GDF 5.1 data model covering the connection between Transmodel and GDF and the corresponding data exchange format (G.4.11)
		Rc_GN12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
		Rc_SO03	ESO/OEC :It is recommended that Standards be developed for New elements to include in Local Dynamic Map related to a Car Park internal description including :Available spots locations; Evolution of MAP standard to describe different paths to reach a spot; Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. This work is probably best led by the DATEX standards community. (I.2.3.10.4)
		Rc_SM09	A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services. A new or existing project is proposed to handle this issue. (E.4.3.5)
		Rc_Gn11	Develop standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate. (E.4.3.5)
		Rc_Gn12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
		Rc_MI30	New standard development To define a standard for data accuracy criteria and publication referring to space and time data. (G.4.6)
B	**1701- HLRb** **Mixed Vendor Environments.(MVE)**		
	1701-HLRb-1 **Mixed vendor environments Methodologies & Translators**	From Outreach meeting Rc_TM10	Stage A: MVE (mixed vendor environment) Protocols. A project team to collect technical and implementations details per method; propose a translator (Rosetta Stone); write guideline of when and how to use which method. The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined. (H.4)
	1701-HLRb-2 **Mixed Vendor Environment Guide (CONOPS)**	Rc_GN15	PT1701 recommends that CEN develop a guide (Technical Report) to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm. The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm (D.2.3.18; E.5.1, P.3.2.3)
	1701-HLRb-3 **Mixed Vendor Environment Standards**		
		Rc_TM05	An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)
		Rc_TM06	Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)

		Rc_TM07	A control interface standard to link roadside devices such as signal controllers to an instation system, to support multi-vendor integration. (H.4)
		Rc_GN01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
C	**1701-HLRc** **Urban-ITS issues associated with the introduction of autonomous/automated vehicles.**		NOTE: This project may be joined with EU-ICIP
		Phase 1 outreach feedback	Funded European Project Team to study the Urban-ITS issues associated with the introduction of autonomous/automated vehicles. The work will study operational, technical and relevant legal issues related to introduction for AVs in the Urban environment. The PT will analyse the current status of AV standards, and propose new work that is needed for safe operation and seamless integration in the challenging urban environment
		Rc_PI04	Automated vehicles: Funded European project to study the Urban-ITS issues associated with the introduction of autonomous vehicles. See Rc_PI04 NOTE: Created as a result of phase 1 feedback (therefore no opportunity for outreach response)
		Rc_PI04	It is recommended that there is a funded European project to study the ITS/Urban-ITS and regulatory framework issues associated with the introduction of autonomous vehicles.
D	**1701-HLRd** **Traffic Management System status, fault and quality standards**	Rc_TM04	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. (H.4)
		Rc_TM08	System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (H.4)
E	**1701- HLRe** **EU-ICIP. European ITS communications and information protocols**		
	1701-HLRe-1 **EU-ICIP Protocols**	Rc_PI01	PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP
	1701-HLRe-2 **EU-ICIP Guide**		
F	**1701-HLRf** **Data models and definitions for new modes**	Rc_MI13	To develop a standard reference data model for network topology for New Modes (car/cycle sharing areas, car pooling areas, battery recharging places) in coherence with Transmodel V6 and Part 7: Driver Management.. (F.4.1)
I	**1701-HLRi** **Emissions management in urban areas**		

		Rc_UL03	Emissions monitoring - Project Team to determine standard for Air Quality outstations and Traffic Management Systems Priority: Medium (in relation to other Urban Logistics recommendations). (I.7)
		Rc_UL04	Geofencing: A project team is probably required in respect of standardising geofencing protocols.
		Rc_UL01	A combined project “Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics” is therefore recommended whose scope is to (at least) include: Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement. (I.5.)
J	**1701-HLRj** **Traffic Management Data Models and interfaces**		
	1701-HLRj-1 **TM Data Models**	Rc_TM02	A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (E.4.3.2)
		Rc_TM03	A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (E.4.3.2)
	1701-HLRj-2 **TM interfaces and information**	Rc_TM01	A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (E.4.3.2) May be linked with MI20)
		Rc_UL08	Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats.(Possibly part of Rc_UL01)

A.4 Revised Recommendations for other ESOs/Committees

(From Annex P.7)

The following two priority actions are for auctioning by other European Standards organisations/existing committees and incorporate 19 of the interim report recommendations. A further 12 recommendations are provided for other ESOCs to consider.

			PRIORITY RECOMMENDATIONS
	1701-HLRg	CEN TC278 WG3	**Update/Develop Transmodel/ IFOPT and NeTEx/SIRI.** These subjects are already prioritised in the EC/ICT Rolling Plan.PT1701 encourages and supports CEN TC278 WG3 in pursuing the following projects which are essential if these standards are to remain relevant
		Rc_SM13	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisation in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles, verification). (G.4.14)
		Rc_MI08	OESO/OEC To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4) – see recommendation MI02. (G.4.11)
		Rc_MI01	OESO/OEC This report recommends that the EC, as a matter of urgency, makes call for experts and offers funding for the Transmodel update project so that it can align Transmodel with the Urban-ITS paradigm and accommodate new modes. (G.1.4.2)
		Rc_MI15	To develop a standard data model for cycling network in coherence with Transmodel V6 and GDF. (G.4.1)
		Rc_MI16	To develop a standard exchange format for New Modes planned data (topology, service description and fares). (G.4.1)
		Rc_MI17	New standard development : To develop a standard data model for New Modes operational aspects (in coherence with Transmodel). (G.4.2)
		Rc_MI02	OESO/OEC :Standard update To develop Transmodel v6 – Part 4: Operations Monitoring and Control, i.e. the update of Transmodel Operations Monitoring and Control with the requirements of SIRI standard, EBSF project & align with DATEX II part 3 (Situation Publication). (G.4.3)
		MI13; MI14; MI15; MI16: MI03; MI04; MI05; MI24; SM12	To develop a standard reference data model and data exchange format for network and service description (incl. booking, fares, etc.) for New Modes (incl cycling) in coherence with Transmodel V6 Part 1 to 7 (G.4.1)
	ISO TC204/IEEE/ IETF/ETSI		
H	**1701-HLRh**	Rc_PI11	**Application of C-ITS security in Urban-ITS paradigm (TR)** A PT to study how C-ITS security shall be applied for Urban use. Specifically : practical advice to city authorities, and national/regional level needs to get going based on recommendations.
	1701-HLRh-2		**Security in the Urban-ITS Paradigm**
		Rc_PI10	Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_PI05	The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_SO01	OESO/OEC :The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.

		Rc_PI13	One specific task is identifying the missing security standards regarding interfaces between Roadside/Personal/Central ITS Stations, patterned on well-established Vehicle ITS Station security standards.
			Other PT1701Recommendations that ESOs/OSCs should consider progressing
	CEN TC278 WG3		
		Rc_MI03	OESO/OEC :Standard update: To develop Transmodel V6 – Part 5: Fare Management (incl. validation and control part). (G.4.1)
		Rc_MI04	OESO/OEC :Standard update: To develop Transmodel v6- Part 6: Passenger Information to take into account complex queries and filters as requested by NeTEx -informative annex. (G.4.13)
		Rc_MI05	OESO/OEC To develop Transmodel v6-Part 7: Driver Management. (G.4.3)
		Rc_MI06	OESO/OEC Standard update : To develop Transmodel v6- Part 8: Management Information & part 7: Driver Management). (G.4.3)
		Rc_MI07	OESO/OEC Standard update: To develop the update of the TR "Transmodel informative documentation". (G.1.4.2)
		Rc_MI11	OESO/OEC To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files). (G.4.2)
		Rc_MI21	New standard development: To develop a standard stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner or information service. (G.4.4)
		Rc_MI22	New standard development: To develop standard APIs and/or query/ data exchange format for interconnection of Journey Planning Systems in coherence with Transmodel v6 (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). (G.4.5)
		Rc_MI26	New standard development: To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence. (G.4.1)
		Rc_UL02	Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas Car Park Operators deliver information about parking space availability using DATEX. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged. To be included in work proposed in Rc_MI10. (I.2.3.10.2.1)
		Rc_MI09	OESO/OEC Standard update : To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw operational data needed for the Study and Control stage. (F.4.3) May be linked to TM01
	DATEX Community/ISO TC204/TISA	Rc_SO02	OESO/OEC Further development of DATEX II. a) An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. b) Development of standards based on ITS-station broadcasted services, to describe equivalent Local Dynamic Map elements related to: Available places; Cost of parking lot €/hr; etc… And transmit it towards vehicles. This work is probably best led by the DATEX standards community. (I.2.3.10.2)

A.5 Revised priority Recommendations for other support measures

(From Annex P.8)

Two priority actions, incorporating 14 of the Resolutions of the Interim Report, and one strategic recommendation, are proposed

	Priority: EC Requirement to meet CID timetable	Rc_PI02	PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as “Technical Specifications” (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards.
	1701-HLRk		**Data exchange/data management**
	1701-HLRk-1 Establish data registry (Support Action)		A project team to review existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry. This requires ‘Support Measures’ (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures.
		Rc_SM01	This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary.
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for ‘ITS Data Harmonisation’ .
		Rc_SM03	Other action: To develop a unique access point for urban data repositories, in particular an urban meta-data registry. (G.2.4.3.1)
		Rc_SM04	b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (D.1; D.2.4; D.2.7; E.3.1)
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_SM07	At the ‘city’ or ‘Urban Administration’ level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
		Rc_PI06	Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.
		Rc_SM07	At the ‘city’ or ‘Urban Administration’ level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
	1701-HLRk-2		**Harmonise Data concepts**
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for ‘ITS Data Harmonisation’ .
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_Gn09	Intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).

A.6 Other supported Recommendations for CID support

(From Annex P.9)

These 8 recommendations also received support from outreach feedback and should be considered for support under the CID, although not at the same level of priority as those listed in A.5/ P.7.

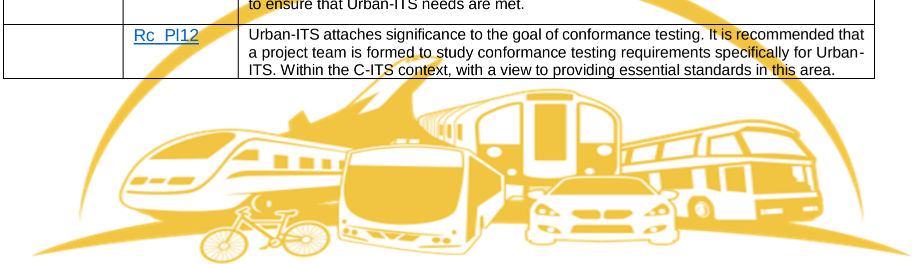
Rc_MI24	Standard harmonisation: To specify a unique solution for the models as developed by GDF and INSPIRE in overlapping areas: road, rail, waterway network, walking paths, administrative areas, named areas, etc.). (G.4.1)
Rc_SM08	In addition to the technical standards defined by the ESOs, the EC should sponsor the creation, management and support of an open repository of practical profiles of those standards, which are suitable for both system developers and urban authorities during procurement. (H.4)
Rc_Gn05	It is recommended that for all ITS data definition and data exchange standards, that a model driven approach is followed. (E.4.5.2, E.4.2)
Rc_TM10	The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined. (H.4)
Rc_UL08	Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats.(Possibly part of Rc_UL01)
Rc_Gn03	It is recommended that ITS-station communications is a preferred mechanism for data exchange and provides a migration path to move from 'silos' to an urban-ITS paradigms.
Rc_Ar03	a guidance document (Technical Report/Guide) is created to help Urban Administrations with factors, issues and best practices associated with the life cycle, relationships, "value" chains, and administration of ITS services. (K.4.1)
Rc_MI23	New standard development: To develop a standard a standard specification of the characteristics of trip options and modal choices to be provided by trip planners. (G.4.12)

A.7 Other Recommendations for CID support (unsupported by outreach feedback)

(From Annex P.10)

Although these Recommendations did not attract support from outreach (we limited the response to the most important four recommendations), the list below attracted no adverse feedback and are worthy of consideration for support under the CID., although at a lower priority than those recommendations in A.3 – A.6 : P.6 - P.9.

	Rc_Gn04	It is recommended that there is generic independence of a data concept. i.e. autonomous; free from control in action, judgement, etc. and not dependent on anything else for function, validity, etc; separate. It is recommended that there is now an onus on standards developers to understand that the data concepts of their standards, and particularly foundation standards, need to be 'abstract' with regard to any particular application they are envisaged to serve, and that application standards need to specify their application specific issues within the application standard.
	Rc_Gn08	This study recommends that in all situations where document-type data is to be transferred, and there is not a particular bandwidth restriction, XML should be used as the standard transfer syntax according to ISO 8825-4.
	Rc_Gn10	In order for data passed through a standardised interchangeable physical interface to be comprehensible and useable, data format and presentation standards are also required in order to achieve interoperability. (D.2.7; E.3.2)
	Rc_MI20	New standard development: To develop a standard service interface between mobile devices and car-pooling back office system (neutral to the car-pooling algorithm itself). (G.4.10)
	Rc_MI25	Standard update To develop standard data update procedures (for planned data for the usage of MIS) to be adopted in accordance to the existing standard (and adapted to the MIS context). (G.4.6)
	Rc_MI31	New standard development: To develop standard validation procedures and routines for real–time data (for the usage of MIS) verification (completeness, coherence and compliance to standard formats where they exist). (G.4.7)
	Rc_MI32	New standard development: To develop standards for frequency of update and provision of real-time data for MIS use. (G.4.8)
	Rc_PI08	the following standards should be used where appropriate in the creation and publication of all ITS architectures in Europe: ISO 14813-5 (Describing Architecture); ISO 14813-6 (Data presentation using ASN.1); ISO TS 17427-1 (C-ITS Roles and responsibilities) ; ISO TR 24529;(Using UML (ISO 19501) in ITS Standards) ISO TR 26999 (Using POM in ITS Standards);ISO 24097 (using web services); ISO 24531 (Using XML in ITS Standards) ISO/IEC/IEEE 42010 (Architecture description)
	Rc_PI09	The use of ISO 14813-1 (ITS domains; service groups and services) is promoted across Europe to ensure commonality in the content and scope of ITS services.
	Rc_SM12	To develop a standard method (and possibly tool) for the development of data exchange profiles based on NeTEx (e.g. stop place profile based on NeTEx) useful in the context of travel information and associated reference generic description for local agreements referring to the profiles. (G.4.1)
	Rc_UL07	Adaptations of existing standards and new standards have to be engaged for future Valet Parking applications (Autonomous Vehicles). (I.2.3.10.4)
	Rc_Gn07	The overall recommendation for Urban-ITS security is to follow the C-ITS security process to ensure that Urban-ITS needs are met.
	Rc_PI12	Urban-ITS attaches significance to the goal of conformance testing. It is recommended that a project team is formed to study conformance testing requirements specifically for Urban-ITS. Within the C-ITS context, with a view to providing essential standards in this area.



A.8 Recommendations withdrawn as a result of outreach feedback

(From Annex P.11)

PT1701 withdraws the following recommendation as the result of negative feedback. This does not, however mean that these projects are not needed nor important, only that there are higher priorities for the CID, and these recommendations require further consideration and consultation before progressing.

While currently unsupported by outreach feedback, and while we do not claim complete unanimity among the members of the PT, we may reasonably say that in the opinion of the experts of the PT, while withdrawn from the current list of recommendations, most of these proposals will need to be addressed within the Urban-ITS context in the coming years.

Withdrawn for further consideration	Rc_Gn06	When determining standard data exchange profiles, It is recommended to specify the purpose of the profile and how it refers to a reference standard data exchange format. And shall provide an open (publicly available) specification, including: to data versioning; to precise cardinalities; to restrictions to certain data values.
Withdrawn for further consideration	Rc_Gn13	Development of a: Technical Report: ITS terminology and the conceptualisation of how stakeholders could benefit by cooperation and interaction.
Withdrawn for further consideration	Rc_Gn14	Development of a: Technical Specification: Common methodology for the assessment and quantitative evaluation of proposed or instantiated Urban-ITS solutions and services.
Withdrawn for further consideration	Rc_MI27	a CEN Project Team is set up to create the standards for the form(s) in which data is to be made available from the urban access data portal, and for the minimum criteria for data that is collected/ provided use by the portal (E.4.4.2) - See MI 11/30/31/33/34.
Withdrawn for further consideration	Rc_Ar01	OESO/OEC: the FRAME Architecture is modified to incorporate the best parts of other ITS architecture initiatives from across Europe to provide a high-level ITS architecture that is freely available for use throughout Europe. (K.3.3)
Withdrawn for further consideration	Rc_Ar02	OESO/OEC: the FRAME Architecture is updated to ensure that it properly reflects the evolution of ITS and services travellers expect to be available, is made more user friendly and includes aspects related to business issues. (E.4.1; K.3.3; K.4.1.1)
Withdrawn for further consideration	Rc_MI10	OESO/OEC Other action : To develop several of the most useful profiles based on NeTEx. (G.4.1) (May be incorporated into SM13)
Withdrawn for further consideration	Rc_MI18	New standard development : To develop a standard data exchange format for each of the New Modes real-time data (availability, booking etc.), coherent with SIRI, in combination with DATEX II.). (G.4.9) (May be incorporated into MI14)
Withdrawn for further consideration	Rc_MI19	New standard development: To develop a standard interface between on-board equipment and mobile devices for dynamic car-pooling. (G.4.10)
Withdrawn for further consideration	Rc_PI03	PT1701 recommends that CEN considers adopting a process where once a work item is created, the first approved deliverable can be published as a TS, and the same approved work item can enable the subsequent development as a full Standard. (This is already the case in ISO, but after publication of a TS, CEN currently requires the creation and approval of a new work item to develop the TS into a full Standard, which incurs delays).
Withdrawn for further consideration	Rc_UL05	Delivery vehicle realtime mapping/route optimisation A project team is probably required in order to develop a delivery vehicle realtime mapping/route optimisation matrix in order that it could apply across EUPriority: Medium (in relation to other Urban Logistics recommendations). (I.5.2)
Withdrawn for further consideration	Rc_UL06	There are already adequate standards available to enable a fully interoperable UCC operation (and one that could co-exist interoperability with the international postal sector). However, guidelines on the operation of such UCCs (probably in the form of a Technical Specification, could be beneficial in finding and interpreting such available standards. (I.2.1.10; I.2.3.2.13)
Withdrawn for further consideration	Rc_SM11	an EC funded Project is proposed to define the way in which multimodal travel data can be made freely available from an urban data access portal to European MIS service providers.

Withdrawn for further consideration	Rc_TM09	Common agreed certification standards to support EC-type examination in the TM domain. (H.4)
Withdrawn for further consideration	Rc_UL08	(this item has been combined into UL01. But have not transferred negative vote because UL01 combines several issues
Withdrawn for further consideration.	Rc_PI07	ITS meta-data/Urban-ITS meta-data concepts defined in standards or metadata registries should be defined in ASN.1. (Note: this does not preclude that the data itself may additionally also be defined in other formats if local practices require this). (D.2.3.2) NOTE: This is in any event an existing requirement for TC204/TC278 Standards

Technical Report: Intelligent Transport Systems
Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

Annex B Objectives, strategy, philosophy and process of the study

B.1 Foreword

This document has been prepared by CEN/TC 278 "Road transport and traffic telematics" Project Team PT1701, with support from the European Commission,

under contract reference. SA/CEN/ENTR/EFTA/000/2015-05

The secretariat of TC278 is held by NEN.

B.2 Overview

This Annex provides summary of the objectives, strategy, philosophy and process of the work of PT1701. It describes the background to the "Commission Implementing Decision" (Mandate/Standardisation Request) for Urban-ITS, the creation of and remit to the Project Team (PT), and summarises what is expected from the team.

These requirements shape the format of this report, which attempts to address each of the issues identified in the remit to the PT and the background CID.

B.3 Commission Implementing Decision

B.3.1 Overview

The COMMISSION IMPLEMENTING DECISION *on a standardisation request to the European standardisation organisations as regards Intelligent Transport Systems (ITS) in urban areas in support of Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport* [1] focuses on three areas of Urban-ITS, namely:

- multimodal information services;
- traffic management, including access regulation;
- and urban logistics including parking management.

The requested European standards and European standardisation deliverables shall be developed to be compliant with:

- the principles mentioned in Annex 2 of Directive 2010/40/EU [2],;
- the principles of the personal data protection regulation (Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data [3] and COM/2012/011 proposal

- for a Regulation of the European Parliament and Council on the protection of individuals with regard to the processing of personal data and on the free movement of such data[4][5];
- ➢ the principles of e-accessibility and web accessibility (Communication "Towards an accessible information society"[6]).

The requested European standards and European standardisation deliverables are instructed to reuse, harmonise or interface as far as possible with the following existing standards, specifications and projects: the CIVITAS projects [7], CAPITAL CIVITAS ITS Advisory Group[8], Promoting Open Specifications and Standards in Europe (POSSE) project [9]], OPTICITIES project [10], FREILOT project [11], Smart Cities and Communities Coordination Group[12], standardisation request M/453 on Cooperative Systems[13], the C-ITS platform, DATEX II Strategic and Technical Groups [14], the Urban Traffic Management Control programme (UTMC) [15], the Open Traffic Systems City Association (OCA) [16] and the Open Communication Interface for Road Traffic Control Systems (OCIT) [17], the FRAME project [18], Co-Cities project [19], The project European Digital Traffic Infrastructure Network for Intelligent Transport Systems (EDITS) project [20], the European Bus System of the Future (EBSF) project [21], Data Catalog Vocabulary (DCAT) [22], spatial 'standardised' data and geo standardisation.

Against this background the requested European standards and European standardisation deliverables should also provide consideration to the reuse, harmonisation or interface with existing reference data models, common data dictionaries and metadata structure requirements with a view to foster interoperability, consistency and continuity of services.

The requested European standards and European standardisation deliverables should fit the needs of the various users, the diversity of cities, and be easily implementable. This should include the following aspects as far as possible:

- ➢ legacy systems and existing protocols, cost-effective migration paths, business models and guidelines for procurers;
- ➢ special needs of consumers, businesses and operators, including small and medium- sized enterprises;
- ➢ executable and freely available guidance, code lists, datasets, tools and processes to facilitate operational implementation and conformance tests;
- ➢ data availability, access, quality, reliability and accuracy.

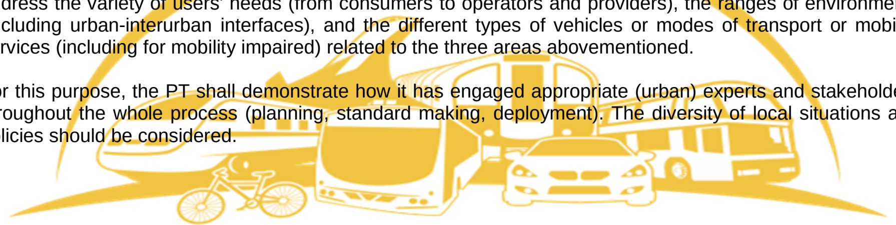
The CID focuses priority on three areas of Urban-ITS, namely:

- ➢ multimodal information services;
- ➢ traffic management including access regulation;
- ➢ urban logistics including parking management.

In order to enable ITS connectivity (avoiding silos or lock-in effects) the ESOs shall demonstrate how the three areas above mentioned are linked together within a broader Urban-ITS architecture, and accommodate their relationships and interfaces with other related ITS applications (not directly in the scope of this request).

The work shall recommend the necessary organisational arrangements supporting an effective cooperation and good coordination across ITS standardisation initiatives and working groups, keeping in mind the need to address the variety of users' needs (from consumers to operators and providers), the ranges of environments (including urban-interurban interfaces), and the different types of vehicles or modes of transport or mobility services (including for mobility impaired) related to the three areas abovementioned.

For this purpose, the PT shall demonstrate how it has engaged appropriate (urban) experts and stakeholders throughout the whole process (planning, standard making, deployment). The diversity of local situations and policies should be considered.



B.3.2 General requirements for the requested deliverables

The requested European standards and European standardisation deliverables should also provide consideration to the reuse, harmonisation or interface with existing reference data models, common data dictionaries and metadata structure requirements with a view to foster interoperability, consistency and continuity of services.

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This should include the following aspects as far as possible:

- legacy systems and existing protocols, cost-effective migration paths, business models and guidelines for procurers;
- special needs of consumers, businesses and operators, including small and medium- sized enterprises;
- executable and freely available guidance, code lists, datasets, tools and processes to facilitate operational implementation and conformance tests;
- data availability, access, quality, reliability and accuracy.

B.3.3 Requirements to strengthen compatibility and coherence with existing standards and technical specifications

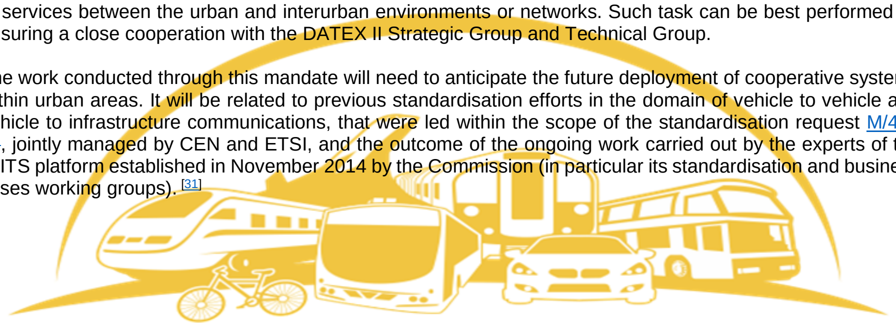
The coherence of existing European, international or other globally used standards shall be checked (i.e. taking into account the work not only of CEN, CENELEC and ETSI, but also DATEX II, UTMC, OTS, ISO, IEC, ITU, etc.), potential gaps shall be assessed and compatible or open solutions proposed, either with the intention of providing for harmonisation and enhancement of existing standards or development of new interoperable standards and other specifications where appropriate. The development of new standards and specifications needs to build on the existing ones and to identify architectural or connectivity requirements.

In the domain of public transport, and particularly with respect to multimodal information and smart ticketing, such a need for coherence will concern a broad set of standards and technical specifications, in particular: Transmodel [23], IFOPT [24], SIRI [25], NETEX [26], IOPTA [27], ISO [98].

In the domain of alternative fuel vehicles and infrastructure, any new standards and specifications should be made compatible and complementary to ETSI TS 101 556-3 [29].

The adaptability of general standards to the urban environment also needs to be considered, and potentially further developed. It is notably the case of DATEX II [30] providing for the exchange of traffic related data, described through specific profiles. It appears as a pre-requisite for establishing interoperability and continuity of services between the urban and interurban environments or networks. Such task can be best performed by ensuring a close cooperation with the DATEX II Strategic Group and Technical Group.

The work conducted through this mandate will need to anticipate the future deployment of cooperative systems within urban areas. It will be related to previous standardisation efforts in the domain of vehicle to vehicle and vehicle to infrastructure communications, that were led within the scope of the standardisation request M/453 [13], jointly managed by CEN and ETSI, and the outcome of the ongoing work carried out by the experts of the C-ITS platform established in November 2014 by the Commission (in particular its standardisation and business cases working groups). [31]



B.3.4 Specific requirements for the requested deliverables

With the aim to develop a pragmatic approach, the activities under this request shall be based on high level Use Cases, addressing multimodal information services, traffic management including access regulation and urban logistics including parking management. The definition or selection of these Use Cases will have to balance user needs, urban mobility trends, technological developments, financial sustainability and policy priorities (e.g. road safety). The prioritisation of these Use Cases and their possible interdependencies shall also be explained together with the work programme.

The Use Cases will be embedded within an Urban-ITS architecture (logical structure and connectors between standards and specifications and their stakeholders) covering the whole information chain for each of the three areas abovementioned and fitting within the overall European ITS architecture. Therefore, such an architecture for Urban-ITS shall be coherent with the e-FRAME model [32].

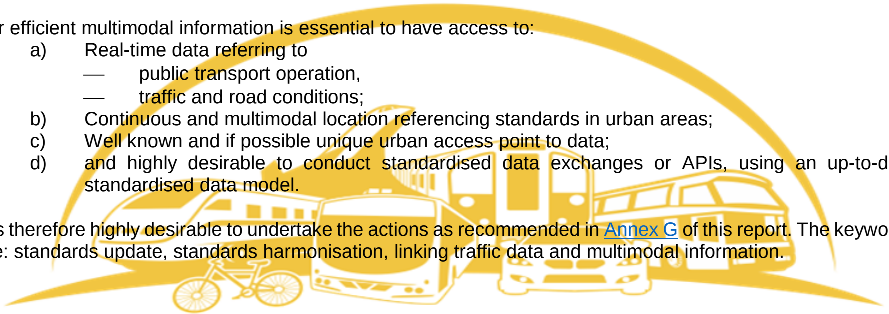
This holistic and systemic overview will support stakeholder collaboration as well as the development or enhancement of standards and other specifications compatible and complementary with each other, therefore enabling ITS connectivity.

The deployment strategy deliverable shall express how to foster easy deployment of such standards and other specifications, through the deployment of multimodal information services, traffic management measures and urban logistics operations. For this purpose, the lessons learnt from the Use Cases, the involvement of the right stakeholders, and the provision of realistic implementation guidance will be essential.

B.3.5 Multimodal information systems

Among the main issues today are the fragmentation of traffic and travel information services, and lack of interoperable multimodal information and planning services of broad pan-European coverage that would incorporate first and last miles of the journey in conjunction with the A to B long-distance leg of the journey. The range of available data about mobility services must be extended and needs to be available in standardised format, in order to enable its introduction into innovative traffic and travel information services. Only comprehensive multimodal information services would enable the user to have a complete range of travel choices, routing options, contributing to making optimal mobility choices, fostering more sustainable travel behaviours and making the whole transport system more efficient and accessible to all users.

Compatible data formats, open and documented interfaces and protocols for transmission of relevant data and their integration in multimodal datasets and (existing) multimodal information and planning services (including integrated ticketing) shall be ensured (i.e. worked out where necessary). It is essential that the existing and new standards and other specifications enable, with supplementary interfaces and protocols where necessary, the effective integration or connection of the different aspects or blocks of multimodal information and planning services.



For efficient multimodal information is essential to have access to:

a) Real-time data referring to
  - public transport operation,
  - traffic and road conditions;
b) Continuous and multimodal location referencing standards in urban areas;
c) Well known and if possible unique urban access point to data;
d) and highly desirable to conduct standardised data exchanges or APIs, using an up-to-date standardised data model.

It is therefore highly desirable to undertake the actions as recommended in Annex G of this report. The keywords are: standards update, standards harmonisation, linking traffic data and multimodal information.

B.3.6 Traffic management, including access regulation

Traffic management systems are constantly developing, while in the past they were mostly control centre to control centre oriented, they tend to become more cooperative amongst systems (including field devices), networks and operators. For this reason, the right standards, interfaces and/or protocols shall be developed to support cooperating traffic control and management solutions at the different geographical scales or across different administrative boundaries of the city (e.g. from small neighbourhood traffic calming solutions and peri-urban traffic spill-over management to efficient integration of urban nodes within interurban corridors).

There are a variety of means to manage the road network and address traffic congestion and traffic disruption (e.g. planned/unplanned events, accidents, floods, fires, etc.) through traffic management in an efficient and innovative manner. For instance, a number of cities put in place different types of traffic re-routing, traffic prioritisation and access regulation measures, including intersections management, targeting all or a subset of vehicles (e.g. deviations, priority lanes, green waves, road user charging or tolling, low emission zones, low speed zones, pedestrian zones, etc.). Unfortunately, these measures are not necessarily managed in a holistic and coordinated manner and often not correctly taken into account in traffic information system towards users (e.g. navigation devices). Therefore, establishing on one side coherent specifications, compatible standards and practical interfaces supporting the interoperability of data necessary for up-to-date traffic information, and optimising on another side a variety of traffic management and prioritisation measures, rightly supplemented by standardised technological solutions for vehicle identification (i.e. as regards vehicle categorisation, emission class, character of emergency, load factor), would both contribute to the overall efficiency of traffic information and management in urban areas, including access regulation management and enforcement.

Compatible data formats, open and documented interfaces and protocols for transmission of relevant data, independently of their source (e.g. sensors, floating car data, traffic control centres), and their integration in current and future traffic information systems and traffic management operations, for various road networks including urban-interurban links, shall be ensured (i.e. worked out where necessary).

Detailed consideration of these issues are to be found in Annex H.

B.3.7 Urban logistics, including parking management

In the urban environment, the search for parking spaces and the distribution of freight is estimated to exacerbate traffic congestion. Therefore, providing real-time information on the availability of parking possibilities, and easy reservation options, would contribute to alleviate this problem. Differentiated approaches should be provided to cater for specific logistics sectors and freight vehicles or loads needs (e.g. alternative fuels, refrigerated goods, reverse logistics or waste, dangerous goods).

Compatible data formats, open and documented interfaces and protocols for transmission of relevant data, independently of their source and their integration in current and future traffic information systems and traffic management operations, for various road networks including urban-interurban links, shall be ensured (i.e. worked out where necessary).

Detailed consideration of these issues are to be found in Annex I.

B.4· Remit to PT1701

Within the contexts described in Annex B, the remit to CEN TC278 PT1701 is to undertake a PRE-STUDY - *"Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS*", the pre-study to identify standards requirements, and identify resources required to develop them.

Bearing in mind the 'Action Plan for the Deployment of Intelligent Transport Systems (ITS) in Europe '(Dec 2008) and Directive 2010/40/EU: Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport (Aug 2010) [2];
and bearing in mind the EC Priority Objectives for Urban-ITS, based on the work proposed by Urban-ITS Expert Group: *address gaps in standardisation in the domains of: multimodal travel information (e.g. data formats for new mobility services), urban logistics (info & reservation of loading bays, intelligent parking), traffic management, etc. [. .. ..] Gap analysis and Use Cases analysis in the initial part of the Standardization Request will allow to fine-tune the final Working Programme*".

This renewed focus on the urban dimension in EU transport policy is a strategic objective behind the Standardization Request "*Standardisation request as regards Intelligent Transport Systems in urban areas",* and the Pre-study will identify standardisation work items that will need to be the focus of attention during the tenure of the Standardization Request.

Considering the Transport White Paper 2001 "*European transport policy for 2010*"[34] underscored the importance of urban dimension of the development of truly European transport system;

The Green Paper "*Towards a new culture for urban mobility*"[35] has put urban mobility high on the EU's political agenda;

The White Paper on Transport 2011 "*Towards a single European transport area*"[36] suggested a number of initiatives which relate to urban mobility and anticipate ITS applications, e.g.: ~ Sustainable Urban Mobility Plans {Initiative 31) ~ An EU framework for urban road user charging and access restriction schemes (Initiative 32) ~ A strategy for near 'zero-emission urban logistics' 2030 (Initiative 33) ~ Urban Mobility Package "Together towards competitive and resource-efficient urban mobility"[37] adopted in 2013 provided the framework for adoption of 'Sustainable Urban Mobility Plans', and underscored the key importance of Urban-ITS, urban logistics, access regulations, road safety in 4 respective EC Staff Working Documents.

And bearing in mind that in the 2009 "*Action Plan on urban mobility*"[38] the Urban-ITS Experts recommended addressing standardisation gaps in 3 domains ~ multimodal travel information (data formats for new mobility services, logical structure for multimodal dataset) ~ urban logistics (info/reservation of loading bays, intelligent parking) ~ traffic management (urban-interurban interfaces, multi-application solutions, access restriction).

Consequently, Urban-ITS experts recommended a pre-study and active involvement of Urban Administrations/experts/stakeholders in the ITS standardisation process and we paraphrase several lengthy statements:

the means to use Standards to move from old fashioned 'silo' solutions to provide integrated, multimodal, .and interoperable support for Urban-ITS "
(Quotation 2015-05-2015-05-18 Page 2 of 33 Annex 2 Terms of Reference)

These objectives are also and more recently encapsulated in the "Rolling Plan for ICT Standardisation (2015)" [39] which states
"Urban-ITS (with the perspective of smart cities) .... To ensure that the existing standards are properly adapted for urban environment, notably to ensure a better impact on market solutions, via public procurement, ... The objective is to better connect existing networks, foster strong cooperation and creation of interoperable urban-inter-urban interfaces and foster more extensive use of all transport modes". " .... The Commission is considering issuing a specific Standardization Request in Urban-ITS, which would enable the development of new standards, where appropriate"

The upcoming Standardization Request *"COMMISSION IMPLEMENTING DECISION " on a standardisation request to the European standardisation organisations as regards Intelligent Transport Systems (ITS) In urban areas in support of Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport"* [1], requests the ESOs (European Standardisation Organisations), to draft new European standards and European standardisation deliverables in support of the implementation of Article 8 of Directive 2010/40/EU for multimodal information, traffic management and urban logistics in the Urban-ITS domain.

…….

Such an architecture for Urban-ITS also needs to be coherent with the e-FRAME model. …..

...... the coherence of existing European and international standards must be checked (i.e. taking into account the work not only of CEN, CENELEC and ETSI, but also DATEX II, UTMC, OTS/OCA, ISO, IEC, ITU, etc.), potential gaps must be assessed and compatible solutions proposed, either with the intention of providing for harmonisation and enhancement of existing standards or development of new interoperable standards and specifications where appropriate.

In discussion with the European Commission, the need to identify standardisation deliverables required is inclusive of both ENs and Technical Specifications. It is explained that is a Standardization Request which needs to cope with a variety of situations and stakeholders - hence a use-case approach, the architecture driven paradigm, and the stakeholder mapping.

The standardisation request mentions "European Standards" and this leaves the option of choice between ENs and TS (see definition of European standard in regulation 1025/2012[40]). The pre--study envisioned by the EC requires the identification, not just of work items that will lead to an EN, but, it is recognised that in this evolving environment, the role of TS is very important. The EC envisages that the start of the Standardization Request as the development of the work programme building upon the achievements/results of the pre-study (incl. stakeholder engagement) directly followed by the standardisation activities. The results of the pre-study are required to be available from the start of the tenure of the new Standardization Request (i.e. End 2015). It is required therefore that at least a stable draft report is available by December 2015, although it is recognised that the final document and its processing through the CEN approvals system will postdate 2015.

Annex C Situational Factors affecting the study

C.1 Overview

The following figures (C.1 – C.5) provide some visual characterisations of the Urban-ITS paradigm today.

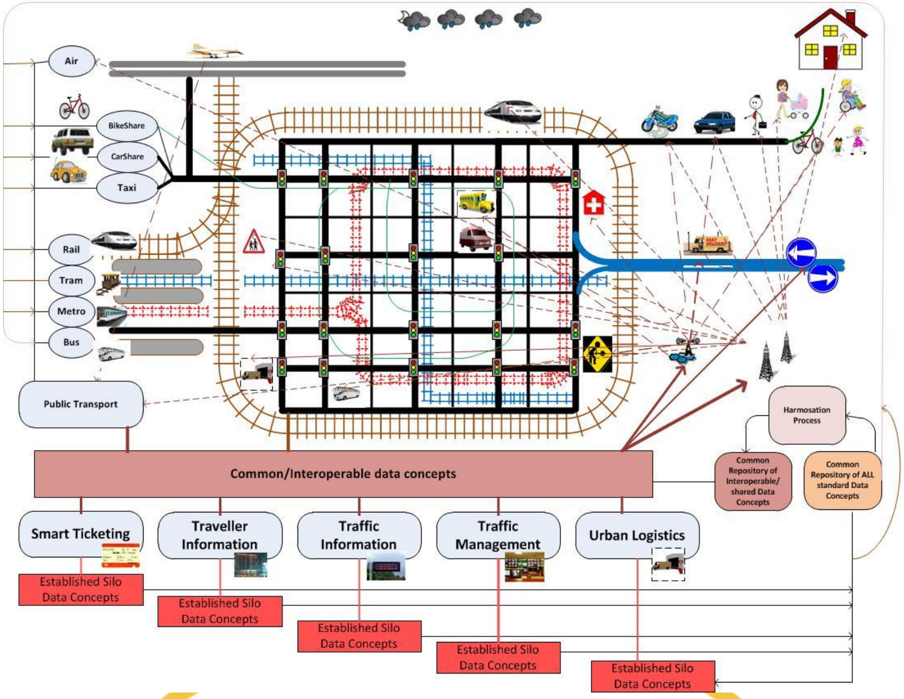

Air
BikeShare
CarShare
Taxi
Rail
Tram
Metro
Bus
Public Transport
Harmosation Process
Common/Interoperable data concepts
Common Repository of Interoperable/ shared Data Concepts
Common Repository of ALL standard Data Concepts
Smart Ticketing
Traveller Information
Traffic Information
Traffic Management
Urban Logistics
Established Silo Data Concepts
Established Silo Data Concepts
Established Silo Data Concepts
Established Silo Data Concepts
Established Silo Data Concepts

Figure C–1: A characterised view of Urban-ITS (Example)

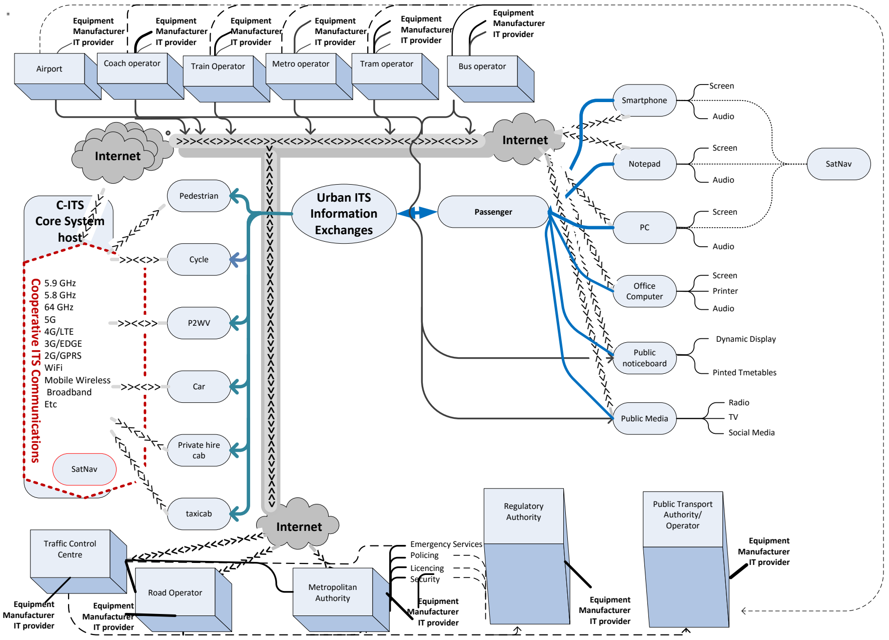

Equipment
Manufacturer
IT provider
Airport
Coach operator
Train Operator
Metro operator
Tram operator
Bus operator
Internet
Internet
Urban ITS
Information
Exchanges
Passenger
C-ITS
Core System
host
Pedestrian
Cycle
P2WV
Car
Private hire
cab
taxicab
Cooperative ITS Communications
5.9 GHz
5.8 GHz
64 GHz
5G
4G/LTE
3G/EDGE
2G/GPRS
WiFi
Mobile Wireless
Broadband
Etc
SatNav
Smartphone
Screen
Audio
Notepad
Screen
Audio
SatNav
PC
Screen
Audio
Office
Computer
Screen
Printer
Audio
Public
noticeboard
Dynamic Display
Pinted Tmetables
Public Media
Radio
TV
Social Media
Internet
Traffic Control
Centre
Road Operator
Metropolitan
Authority
Emergency Services
Policing
Licencing
Security
Regulatory
Authority
Public Transport
Authority/
Operator
Equipment
Manufacturer
IT provider

Figure C–2: Urban-ITS information exchanges (example)

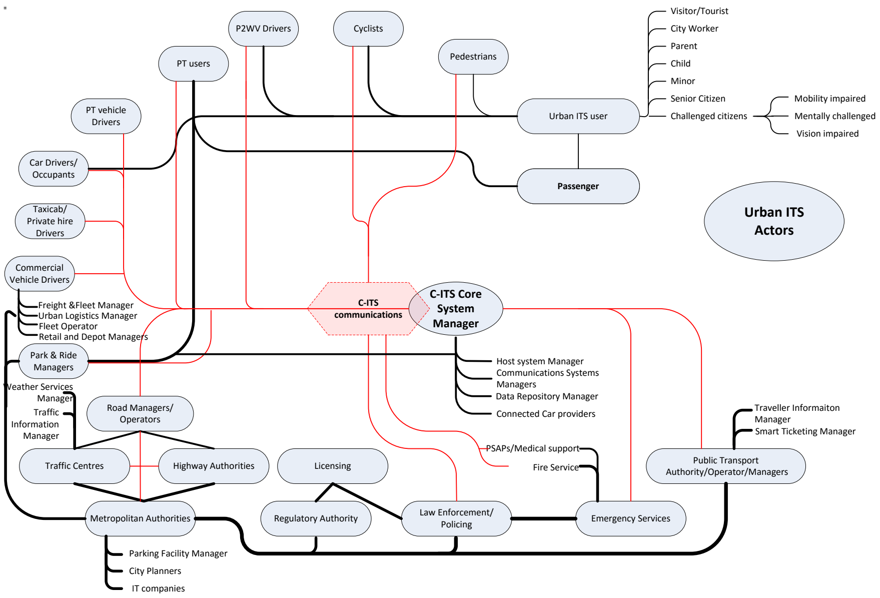

P2WV Drivers
Cyclists
Pedestrians
PT users
PT vehicle Drivers
Car Drivers/ Occupants
Taxicab/ Private hire Drivers
Commercial Vehicle Drivers
Freight &Fleet Manager
Urban Logistics Manager
Fleet Operator
Retail and Depot Managers
Park & Ride Managers
Weather Services Manager
Traffic Information Manager
Road Managers/ Operators
Traffic Centres
Highway Authorities
Licensing
Metropolitan Authorities
Regulatory Authority
Law Enforcement/ Policing
Emergency Services
Parking Facility Manager
City Planners
IT companies
Visitor/Tourist
City Worker
Parent
Child
Minor
Senior Citizen
Challenged citizens
Mobility impaired
Mentally challenged
Vision impaired
Urban ITS user
Passenger
Urban ITS Actors
C-ITS communications
C-ITS Core System Manager
Host system Manager
Communications Systems Managers
Data Repository Manager
Connected Car providers
PSAPs/Medical support
Fire Service
Traveller Informaiton Manager
Smart Ticketing Manager
Public Transport Authority/Operator/Managers

Figure C–3: Urban-ITS Principal Actors

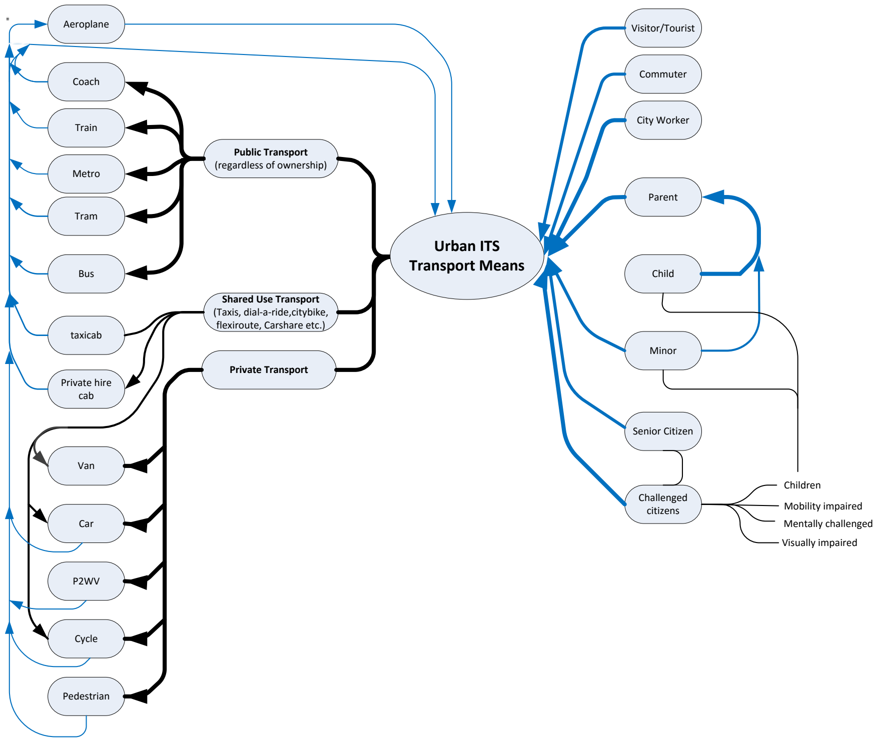

Aeroplane
Coach
Train
Metro
Tram
Bus
taxicab
Private hire cab
Van
Car
P2WV
Cycle
Pedestrian
Public Transport (regardless of ownership)
Shared Use Transport (Taxis, dial-a-ride,citybike, flexiroute, Carshare etc.)
Private Transport
Urban ITS Transport Means
Visitor/Tourist
Commuter
City Worker
Parent
Child
Minor
Senior Citizen
Challenged citizens
Children
Mobility impaired
Mentally challenged
Visually impaired

Figure C–4: Urban-ITS Transport means

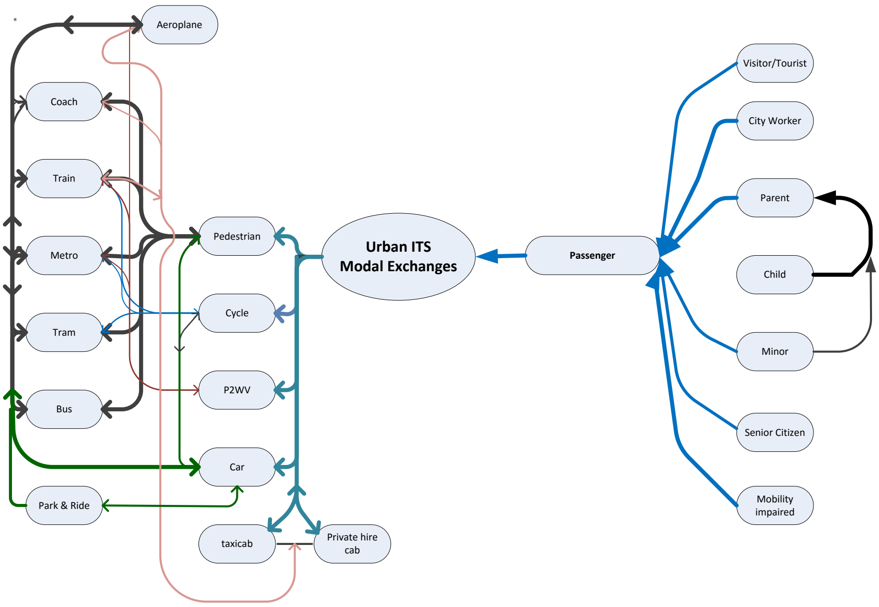

Aeroplane
Coach
Train
Metro
Tram
Bus
Park & Ride
Pedestrian
Cycle
P2WV
Car
taxicab
Private hire cab
Urban ITS Modal Exchanges
Passenger
Visitor/Tourist
City Worker
Parent
Child
Minor
Senior Citizen
Mobility impaired

Figure C–5: Urban-ITS Modal Exchanges

But Urban-ITS stands at a point of disruptive change. Recent technology development, most particularly in the capabilities and availabilities of wireless communications (from smart-phones to car<>car communications) enable better and more dynamic planning, management and movement within the urban space. New technology concepts, such as autonomous vehicles, and practical alternative fuel vehicles, enable the Urban-ITS paradigm to change. Figure C.6 shows 8 examples using autonomous driving and/or electric vehicle technology that is likely to change the paradigm of transportation within urban zones.

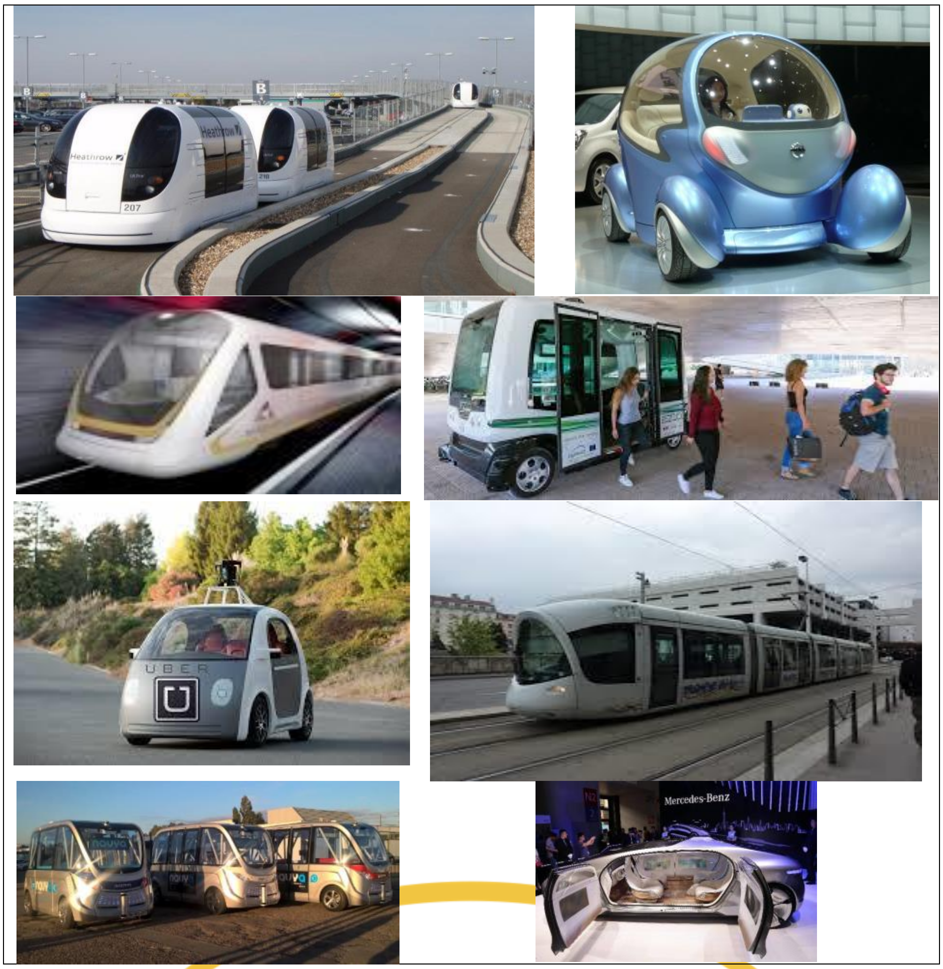


Figure C–6: Urban-ITS Innovative transport means

But significantly as important to the change of the technical paradigm, is the change in perception of planners and Urban Administrations concerning a different attitude and a different paradigm for travellers within the urban zone. A key feature envisaged for the future is perceived to be a shift from pre-selecting one transport means in order to make a journey, to using a multimodal combination of transport means, available more or less on demand, in order to provide the most efficient and comfortable journey, and, within urban zones at least, one that is far less dependent on the ownership and driving of a car. With cities growing ever larger, this becomes a necessity if the city traffic is to operate effectively and pollution is to be managed and reduced.

In order to achieve all of these objectives, the most significant change that is required, even more significant than the technology changes, is a change of attitude of how we collect and share information, in order for these paradigm shifts to be possible.

C.2 Characterising Urban-ITS

Information, communication and control systems in the field of urban and rural surface transportation, including intermodal and multimodal aspects, traveller information, traffic management, public transport, commercial transport, emergency services and commercial services, are generally referred to as "Intelligent Transport Systems (ITS)."

Intelligent Transport Systems (ITS) technologies can significantly contribute to a safer, more efficient and pleasurable journey, particularly in urban areas.

The most significant contribution of ITS has so far been in the area of safety. Reducing the death rates associated with transportation has been a key goal for most governments around the world and ITS has been, and continues to be, at the forefront of the significant progress being made to make the transportation process safer, and has contributed significantly to the fall in deaths and injuries caused in the transportation process. Even greater achievement in this area is becoming realised as communications between vehicles and the infrastructure, and between vehicles, becomes possible.

But, while safety remains the highest priority for ITS, innovative transport solutions can also meet ever-growing citizens' needs in terms of new mobility services that increase the travellers' options regarding transport modes available, modal choice and the efficiency in which the transport means are provided and managed. ITS can be used for different purposes under different conditions, applicable to all transport modes and mobility services, both for passengers and freight.

ITS is often considered from two viewpoints – information, communication and control in the perspective of interurban transportation (inter-Urban-ITS), and information, communication and control within urban areas and conurbations (urban-ITS). ITS provides tools which not only enhance road safety measures, but also enable the smoother operation of traffic management, especially in cities, can enable information to assist the traveller to make choices of transport mode and combinations of mode to best achieve their journey, can assist to improve traffic management - especially in the urban context, and can assist to improve the efficiency of urban logistics for freight, and urban logistics in respect of parking and delivery management.

The urban environment will increasingly provide employment opportunity, healthcare, education and leisure options for citizens, and this will continue to drive populations towards further urbanisation. As the global trend towards urbanisation means ever larger cities, (many now with populations above 10 million, some already exceeding 20 million, and projections of "megatropolis" of 50, possibly 250 million people in the future), the problems of the urban environment are exacerbated. For while urbanisation may be attractive or necessary for its citizens, larger cities create problems of traffic management, pollution and movement of people.

So it should not be surprising that Urban Administrations seek tools to manage these issues, and ITS have come to be seen as key tools to assist urban management. ITS can provide very concrete solutions, for example for traffic and travel operations and management, thus reducing congestion and its consequent adverse effects on traveller, thereby also reducing pollution. It turns out that, in the urban context, Intelligent Transport Systems (ITS) in particular can significantly contribute to a cleaner, safer and more efficient transport system.

ITS are also becoming key enablers to achieve public policy objectives. Innovative transport solutions can also meet ever-growing citizens' needs in terms of new mobility services such as car sharing and bike sharing schemes or smart ticketing solutions.

Urban-ITS provides an environment of "connected transportation"- transportation where vehicles, travellers, and the infrastructure communicate with each other through various data streams. Urban-ITS also envisages the transition from considering a journey to be based on a preselected transport means, to a journey focussed on efficient arrival having experienced a comfortable journey by whatever means.

Within the urban context, ITS are therefore now becoming key enablers to achieve public policy objectives, support the design of urban mobility and offer tailor-made measures, adapted to the wide variety of urban mobility scenarios and support the design of urban mobility packages that provide a more sustainable urban environment. The White Paper *"Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system"*[56][57] reasserted the positive contribution that ITS can make to smart and efficient (eco) mobility through a number of measures such as optimised traffic management and city logistics, seamless travel information and integrated /intermodal ticketing, charging and payment systems in the context of access restriction or parking management, and (on-board) road safety devices.

Additionally, the full potential of ITS can only be realised if their deployment in Europe evolves from the limited and fragmented deployment, as it is still today, to an EU-wide, interoperable and contiguous environment. Urban areas are critical to achieving these objectives, and they also constitute important start point and end point nodes on the trans-European road network, ensuring the smooth link to interurban transport networks, and are frequently the locations of nodal points for intermodal changes of transport means.

While some fast emerging countries have the opportunity to design their new cities from previously rural space, in European urban areas, the density of the road network is already very high, and building new infrastructures in older, well established cities ceases to be a viable option, especially, in many cities which feature limited space availability in general, and often also contain preserved historical centres.

Additionally, in a current environment of austerity, financial resources are scarce, and any new investment constitutes a burden upon tight public budgets. For that reason, local authorities, while devising their urban transport and mobility policies, look for achieving the best return on investment, and ensuring consistency and continuity with other local and regional solutions. They also need to optimise the use of the existing infrastructures, in terms of space and time, in order to better accommodate and manage the ever increasing demand for mobility.

Enabling/ensuring interoperability - allowing connected travellers and vehicles to send and receive data, is critical to realize benefits from integration. And properly structured, organised and managed data exchanges are necessary to mitigate the potential systemic risks which may arise with increasingly interconnected data systems, and to minimise new possibilities for cascading failures.

With effective Urban-ITS, the concept of mobility - where the emphasis is shifting to efficiently reaching destinations rather than committing to a particular transportation mode - becomes an achievable objective.

Increasingly, mobility will be experienced as a just-in-time service rather than owned as an asset, mirroring the embrace of software-as-a-service by many companies over the last decade, where they effectively rent data and software services via the cloud rather than purchase on demand and manage the capability in-house. In the mobility space, this shift is toward what is often now called "*mobility on demand*" and "*mobility as a service*". "An integrated system that uses real-time data to optimize personal mobility on a massive scale, without hassle or compromises for travellers."

In the urban environment, deploying ITS solutions grounded in open standards and common specifications contributes to foster inter-urban, inter-regional, national, and ultimately international, interoperability. In the modern, connected and international free-trading context, both travellers and cargos travel across national borders with increasing frequency, and so such interoperability is essential (and therefore the standards that underpin such interoperability are also essential). Within the European context, such interoperability is essential to enable the single market, and to enable trade between the EU member states and those neighbouring countries with whom it trades.

Such interoperability also safeguards the sustainability of the investment made and helps to avoid vendor lock-in solutions that are more expensive for upgrade and maintenance.

ITS are an area of constantly and rapidly evolving technology, and are often at the forefront of technological innovation. As more solutions and tools are developed, the variety and amount of data (static, dynamic, floating, etc.) is constantly increasing. A trend towards open data, and in some circumstances, open access, is enhancing the scope and quality of the accessible data, as well as enabling the development of new mobility services, and travel or traffic applications. The standardisation of data formats and interfaces for new mobility services (such as bike sharing schemes, car sharing, and car-pooling) and their introduction into multimodal information systems, including applications for booking, payment and ticketing, could considerably contribute to promoting more sustainable (multimodal) mobility. The creation of comprehensive multimodal datasets in urban areas, including data from all transport modes and mobility services, can foster the development of high quality information services for end-users and ensure a fair competition among private information service providers, while respecting and protecting the interests of transport and infrastructure operators. Public authorities have a role in order to ensure the consistency of the services provided to achieve public policies.

Within the urban context, and the responsibilities of Urban Administrations, ITS can only be deployed to their optimal effect, when they are applied within a strategic framework, aligned with transparent policy goals and with clear roles distributed among all relevant stakeholders. For that reason, an integrated approach including different transport modes and mobility services, and bringing together both technical and policy considerations is needed, and these considerations need to be based on standards to ensure interoperability.

Urban-ITS can be viewed from two aspects:

a) **urban functions and infrastructure / data aspects:** To consider architectures, stakeholders, and support guideline measures and guideline standards deliverables required to enable cities/administrations to enable/support/implement interoperable Urban-ITS, especially with relation to the provision of multimodal travel information, traffic management, and urban logistics, and as a tool to manage urban congestion, pollution, and other sustainability issues.

b) **user perspective aspects:** To consider related measures and standards required to enable the support of citizens to optimise use of the features offered by Urban-ITS to achieve a successful, efficient and enjoyable journey, particularly using wireless communications and Cooperative-ITS communications

While both are important and key aspects to be addressed, indeed are in many respects can be seen as "two sides of the same coin". But (a) can be considered to be a prerequisite to enable cities/administrations to implement interoperable Urban-ITS and exploit the support opportunities offered by the Standardization Request. Indeed, without (a) there can be no effective coordinated Urban-ITS. Addressing aspect (a) is also therefore a prerequisite for the swift implementation of the Standardization Request, to identify the key stakeholders and architecture and standardisation support deliverables for urban functions and infrastructure/data aspects that will have to be delivered within the first 36 months of the tenure of the Standardization Request.

While considerations of aspect (b) is accepted as part of a holistic approach, it is not the focus for the aspirations for the pre-study, which needs to focus on support for the provision of the prerequisite infrastructure aspects.

The pre-study is to provide stakeholder mapping, framework identification, gap analysis and identification of Standards and related actions required to address the urban infrastructure aspects, notably: the provision of multimodal travel information, traffic management and urban logistics, required to support the provision of Urban-ITS.

The pre-study to produce a project report that will for each area, specifically address the standardisation requirements to meet the following technical challenges:

- Stakeholder engagement;
- Common/interoperable data;
- Multimodality;
- Creation of (multimodal) transport datasets;
- Multiple means of communication;
- Urban logistics management;
- Creation of urban-interurban interfaces;
- Use of open standards, architectures and specifications;
- Enable rather than prescribe or proscribe.

It is the intention that while the formal deliverable of this pre-study will be a project report, that the project team will also provide draft New Work Item Proposals (and justifications) for work items to fill the identified gaps, where those gaps can be filled by Standards deliverables, and that the pre-study will also consider and make recommendations for any other support measures that are considered important or essential in order for the successful implementation, management and support of Urban-ITS in an environment where this is an administration controlled and led activity, and not a community-wide managed or controlled activity.

It is recognised that in this evolving and rapidly developing situation, the first generation ‘New Work Item Proposals’ (NWIP) deliverables may be for TS or EN depending on the stability of the subject area, and that an early delivery TS may in many circumstances be a preferable deliverable (with an EN often, but not always, following some time later once the subject area is stable and working implementation experience gathered, but not part of the initial work item). (In CEN a TS and an EN are separate work items {unlike ISO where a TS may be a stepping stage to an IS of the same approved work item}. Therefore, the deliverable type (TS or EN) must be determined at the start of the project). A TS process also provides a referenceable and published deliverable to the market place much more quickly.

In order to undertake stakeholder mapping, we have first to recognise that 'Urban-ITS' is not a virgin concept, created in a new sphere of ambition, and all of the actors and participants in Urban-ITS already exist, although largely within their own (silo oriented) means. A key objective for Urban-ITS is to achieve the cooperation and intermodality/multimodality between these actors and use new technologies to assist this process. Determining the most appropriate architecture framework can help with governance, and stakeholder mapping, can help with experts’ engagement and collaboration, including through new working methods.

Within the infrastructure focus of this pre-study, it is also an objective to better enable/support the single European marketplace by addressing issues of product or modal dependency that has built up in the 'silo' approach to date.

Of course, the objectives within the field of standardisation are only one aspect of achieving success in realising a sustainable, efficient and effective Urban-ITS environment that achieves the objectives of the actors involved, but are a vital and enabling means to enable and underpin the achievement of successful Urban-ITS environment for its stakeholders.

C.3· Stakeholders and actors

C.3.1 Stakeholders

Urban-ITS “Stakeholders” can be viewed as four categories of stakeholder, comprising those who:

- Want Urban-ITS
- Use Urban-ITS
- Govern Urban-ITS
- Make Urban-ITS

Service providers fall into any combination of the categories “Want”, “Make” and “Use”, depending on what they do. All stakeholders will have different expectations for what the services that ITS can provide will mean to them and their organisations.

C.3.1.1 Stakeholders who want Urban-ITS

Most users of Urban-ITS do not per se, *“want”* Urban-ITS. They probably often do not even have a concept of what Urban-ITS comprises. They are usually simply travellers who want to move around their city more efficiently, and, hopefully more pleasurably and without detriment to their health.

But the Urban Administration is in a different position. It has a vested interest to *want* urban-ITS. Similarly, central government of the Nation State will also *want* Urban-ITS. The European Union, (or in a global context any federal government or parties to an international agreement) may also *want* Urban-ITS
.

The Urban Administration is, in the vast majority of cases, an organisation that delivers the political will of politicians who have been elected by the citizens of the territory of the Urban Administration.

But unlike central government, despite political differences, the majority of the functions of the Urban Administration continue, regardless of the dominant political philosophy at the time, in order to keep the city functioning efficiently. Various political leanings may tend the service provision to a more lean and citizen responsible environment, while others will lean to a more comprehensive and supportable environment, but the bulk of the role of the Urban Administration remains, within the constraints of the will of their political masters, to provide an efficient city and to provide essential services to its citizens, and other services that its elected officials deem appropriate.

The Urban Administration also has another master, and that is the central government of the Nation State, who will impose the result of various political decisions that it has made, primarily regarding the quality and extent of services provided by Urban Administrations. The Urban Administration therefore has also to protect its politicians by ensuring that the will of the central government – national legislation and regulation- is also maintained.

The National government of a Nation State, therefore is also a stakeholder, who also has a vested interest to greater or lesser extent, to *want* Urban-ITS, because it provides a means for the government of the Nation state to achieve its political ambition, or its international obligations.

Supra-national bodies (The federal state government in the case of a Federation; the European Union in the case of the EU; and bodies such as the UN, in the case of international agreements) are also stakeholders who have vested interests to a greater or lesser extent to *want* Urban-ITS.

However, while all these parties may *want* Urban-ITS it falls largely on the Urban Administration to enable the physical delivery of, or to deliver, Urban-ITS.

And while the user of Urban-ITS primarily sees its role (if the user is aware of Urban-ITS), to move around their city more efficiently, and, hopefully more pleasurably and without detriment to their health, governments, at whatever level, have political objectives that are not focussed on the short term wants of users, but the long term strategy to achieve political goals. Regardless of whether you agree or disagree with the objectives relating to climate change, these are requirements that may be decided locally, but increasingly are required to achieve National and international commitments to reduce various emissions.

Further, as the global population increases and people are increasingly living in urban environments, cities become increasingly larger. London grew from 1.1 million inhabitants in 1800, to a population of 3.4 million by 1900, 7.9 million by 1950 and is scheduled to exceed 8.6 million by 2020. New York, has seen its population grow from 3.4 million in 1900 to 7.9 million in 1950 and a forecast 8.6 million in 2020. Jakarta has seen its population grow from 1.5 million in 1950 to 30 million by 2015. Beijing has grown from 2.5 million in 1950 to a forecast 23 million by 2020, and Chinese planners believe that several major city complexes in the region will by 2050 merge to form a megatropolis approaching 250 million persons.

The management of pollution, and the ability to physically be able to move at all without gridlock of vehicles and overload of the public service vehicle network requires mot only significant investment, but measures, such as Urban-ITS to enable these cities and mega-cities to function.

Environmentally aware citizens may also have loftier goals and aspirations for their cities role in the greater scheme of things and sensitivity to so called green' issues, but for the purposes of this study, we assume that such goals of citizens are effected through the politicians that they elect.

In some circumstances, and according to the organisation of the Nation, other state service providers, such as 'Road Operators', 'River Crossing Operators' may also be considered as stakeholders, but within the scope determined for this study, are primarily considered as "actors" within this pre-study.

However, the dominant stakeholders, for the reasons given above are therefore considered to be the Urban Administration, central government and international governance. International governance will look to National Administrations to conform to international agreements, and National governments will look to Urban Administrations to impose their political will and international commitments. So the prime stakeholder role is focussed on the Urban Administration.

This pre-study does not focus on the political facets of Urban-ITS, nor the funding and financial aspects of Urban-ITS, but simply on the standards required for an urban authority to enable Urban-ITS to function efficiently, or indeed be possible at all, and specifically on the 'gaps' – i.e. the standards that do not currently exist, to enable Urban –ITS to become a reality.

C.3.1.2 Stakeholders who use Urban-ITS

As stated above, most users of Urban-ITS do not per se, *"want"* Urban-ITS. They probably often do not even have a concept of what Urban-ITS comprises. They are largely travellers who simply want to move around their city more efficiently, and, hopefully more pleasurably and without detriment to their health.

They are however stakeholders in the provision of Urban-ITS as they are the beneficiaries of the services, or they are affected by the changes in travel means that may impact them as the administration seeks to achieve its goals.

Freight shippers, transport schedulers and in-city businesses are also both stakeholders and actors in the context of Urban-ITS. As with travellers, as they both the beneficiaries of the services, or they are affected by the changes in travel means that may impact them as the administration seeks to achieve its goals. This is particularly significant where travel corridors, shared delivery, and access restrictions are involved.

Transport schedulers are affected, but more as actors than stakeholders.

C.3.1.3 Stakeholders who govern Urban-ITS

The stakeholders who govern Urban-ITS but is more often the case, within the context and scope of this pre-study, are the regulators who set the requirements for Urban Administrations.

This can at the local level, be by-laws put in place by local politicians, but is more usually legislation of National Governments, or of Federal Governments or bodies such as the EU.

It could be argued that, as regulation is increasingly effected by reference to Standards, that standards developers become a stakeholder in this process. Others may argue that standards developers are more appropriately classified as actors who cater for the needs of stakeholders.

Regardless of which of these two views that you prefer, the historical context that standards are voluntarily developed between participating actors who have vested interest in the presence of a standard for their marketplace (and therefore fund its development), is challenged in the context where the stakeholders are dominantly local, central or international governance.

The principal stakeholders will increasingly need to fund the development of the standards that they require for Urban-ITS,
and it is recommended that vehicles such as the CID be used to provide funding for such standards development and
Rc_SM01- the support of consequential requirements (e.g. common data registries, data repositories and data access systems.)

C.3.1.4 Stakeholders who Make ITS

Urban-ITS in functional terms, largely concerns the use of technology and communications to enable ITS service provision. The manufacturers and vendors of Urban-ITSs, equipment and component suppliers, communications, and infrastructure providers are therefore stakeholders, because the prospect for their businesses rest, in this context, on the implementation decisions of the Urban Administration.

In the implementation of Urban-ITS, they may also be actors.

C.3.2 Actors

An actor is someone, or something that actively contributes to the provision and operation of a service and in so doing may be a beneficiary of the service. The actual benefit will be different for each actor, and for some the benefit may be indirect, or something that is done for others. The following are examples of the benefits:

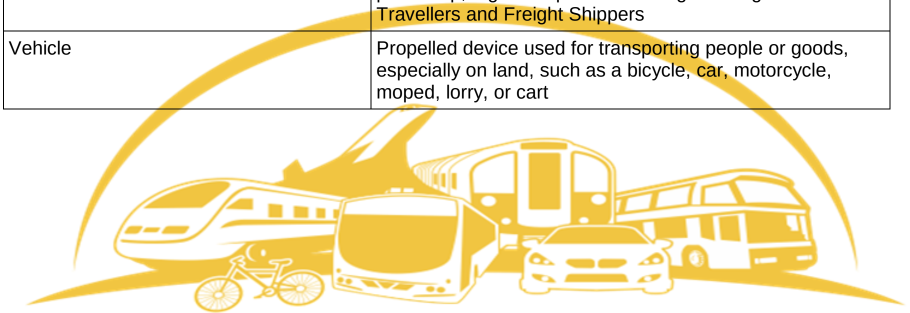
- The *road network operator* – is able to reduce congestion, which may be one of their KPI's, or it may help them to fulfil a policy objective of national, regional or local government.
- The *traveller* – benefits from being able to complete their journey in the most efficient and satisfactory manner
- The *freight shipper* – is able to make money out of moving goods either because that is their business or as part of a manufacturing or distribution process

Each of these Urban-ITS Use Cases will include one or more of the following actors:

Table C–1: Urban-ITS actors

Actor Name	Actor Description
Car Park Operators	Entity that provides and/or manages parking, be it on-street or actual car parks, but usually where a payment for use is involved, or a space can be managed and/or booked in advance, or car parks can be closed/access restricted
Connected Vehicle	Specific type of Vehicle that communicates wirelessly with other vehicles and/or the infrastructure
Driver	Person who controls the physical operation of any vehicle using the road network, including light rail vehicles.
Emergency Service Operators	Entity that responds to incidents that take place in the road network and will care for those that are injured and/or remove any debris that may be restricting the flow of traffic
Emergency Vehicle Driver	Specific type of Driver who physically controls and operates emergency vehicles
Financial Service Providers	Entity that is responsible for collecting payments from Travellers and others
Freight Shipper	Entity that generates trip plans (pre-trip planning) and monitors their use (on-trip planning) for the movement of freight through the infrastructure network
Freight Vehicle Driver	Specific type of driver who physically controls and operates freight vehicles
Geographic Information Provider	Entity that provides digital maps and associated data
Inter-urban Travel Management System	Instance of an inter-urban travel management system with which data needs to be exchanged.
Law Enforcement Agency	Entity to which evidence of a rule violation is sent to enable prosecution to take place
Location Reference Service	Entity that provides data from which the location of a person, a vehicle, or an object (e.g. bus stop or traffic signal controller) can be determined.
Mobility Service Provider	Entity that advises, manages and/or operates services that assist the use of multimodal trip, such as car sharing clubs, bike sharing trip planning, etc.
Other Urban Travel Management System	Instance of another urban travel management system with which data needs to be exchanged.
Other Travel Mode Provider	Entity that provides travel, for people and/or goods using non-road based transport modes, e.g. heavy rail, maritime and air, and which will provide other actors with details of its service schedules and costs, plus current and predicted operational status
Probe Vehicle	Specific type of vehicle that provides data either directly via a communication or indirectly (through some kind of detection) to indicate its presence and location in the road network and which is updated either in real time, or from time to time, depending on how the data is create/collected.

Actor Name	Actor Description
Public Transport Driver	Specific type of driver who manages and operates a ‘Public Transport’ vehicle
Public Transport Operator	Entity that provides data (such as operating schedules, fares, changes to schedules, requests to drivers, vehicle maintenance, etc.) that is used in the operation of public transport services
Public Transport Vehicle	Specific type of vehicle such as a bus, coach, tram, taxi or, in the case of Urban-ITS, train, that is driven or operates automatically, and which can be used by a traveller on a trip for which payment may be required before, during or after the trip.
Road Maintenance Operator	Entity that maintains the road network, i.e. makes road repairs or changes road layouts, and also deals with hazards such as snow, ice, spills, etc.
Road Network Operator	Entity that manages the operations of the road network and provides data such as any type of traffic management strategy, other traffic management instructions, rules, etc.
Toll Operator	Entity that manages charging for road use including bridges and tunnels and provides data such as toll charges
‘Travel Information Provider’	Entity that takes data from the infrastructure network and Public Transport management services, plus actors providing non-road based transport (Other Travel Mode Providers) and processes it to provide information to end users such as pre-trip and on-trip Travellers and freight shippers, using a variety of mechanisms, e.g. broadcast radio, SMS, Apps and the Internet
Traveller	Person who uses any part of the transport infrastructure to make journeys and/or move freight, using any combination of the available transport modes
Traveller Assistance Provider	Entity that provides trip planning services (pre-trip and on-trip) plus any additional information needed to plan or re-plan a trip, e.g. hotel prices
Trip Planning Provider	Entity that provides trip planning services (pre-trip and on-trip) plus any additional information needed to plan or re-plan a trip, e.g. hotel prices and freight storage costs to Travellers and Freight Shippers
Vehicle	Propelled device used for transporting people or goods, especially on land, such as a bicycle, car, motorcycle, moped, lorry, or cart



C.4· Mixed vendor environment

C.4.1 Introduction

In an effective Urban-ITS environment, far-going user expectations and the political aspirations of jurisdictions at international, national and local levels, can no longer be met by a single solution, but only by the establishment of networked solutions. Within the context of this study, the creation of added value in terms of the goals of the European ITS-directive, as demonstrated elsewhere in the text of this report, requires cross-organizational interworking in order to achieve its objectives.

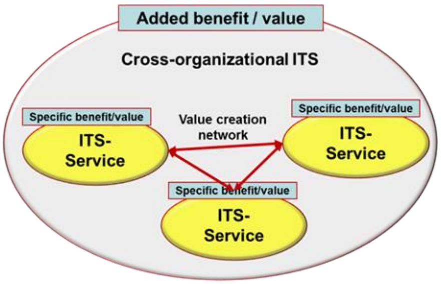


Figure C–7: Added value creating ITS-networks

The development of new “Intelligent Transport Systems”, or the revision/extension of existing *ITS* and their networking on a city-wide, regional, national or international scale, are tasks that may vary to a great extent in each individual case. Nevertheless, in each case, a solution concept has to be developed which considers not only all direct requirements, but also specifies the interface functionalities and system borders of those parts of the system separately, and within the context within they have to operate. Although they may be delivered locally by separate vendors, they need to be interoperable, and to share and exchange data, in such a way that all parts interoperate correctly, not only among themselves, but - in most cases - also with other (and existing) systems and the systems of other vendors.

Therefore, in addition to the specification of feature, which aim to fulfil multimodal information systems, traffic management, and urban logistics requirements, the issue of a creating a “*mixed vendor environment”* by the specification of appropriate interoperability features gains an increasing importance.

A “*mixed vendor environment*” is a need which has evolved over several years. It is a need which the ongoing trend of networking, as well as the increasing number of manufacturers involved in the composition of ITS landscapes (and which lead to different life cycle of subsystems), makes inevitable. But it is a trend which has been resisted by many manufacturers, who have historically been used to dominating traffic management and information systems within an administration, region or country, and who have, accidentally or deliberately, created walls around proprietary systems, which make interoperability more difficult.

However, the mix of systems and the competition of different manufacturers is also a result from technological change. Established companies are suddenly in competition with new companies that exploit technological changes for their market access to offer exclusively or at a reasonable price new or improved functionalities for sub systems in the context of renewal cycles.

As ITS technology evolves, much is evolution of existing systems, however many new ITS services are/will be ‘disruptive’ and change the very nature of the services provided or required (past examples: mass production of the automobile at an affordable price disrupted horse and cart centric businesses; availability of automobiles enabled the development of out of town shopping centres and malls which have disrupted city-centre shopping;

now on-line shopping to some extent disrupts both city centre and out-of-town shopping. Future examples: connected vehicles, autonomous vehicles; environmental restriction etc.)

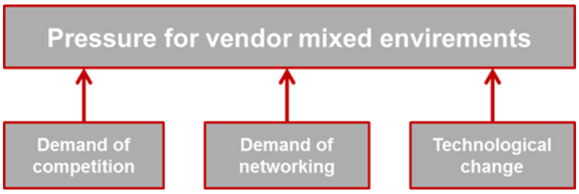


Figure C–8: Typical demands leading to mixed vendor environments

But a mixed vendor environment should not only be considered as a necessary evil. The mixed vendor environment, with its data interoperability, also makes a significant step creating new options for the future, both in terms of more capable and extended systems, and in the use of so called 'big data'. Systems and subsystems be need to be designed in a way that the various sub-systems can be supplied by different manufacturers and can be exchanged without any problems through sub-systems from other manufacturers at a later date. The mixed environment, and the Standards that underpin it, therefore always implies options for the future with the goal to have these systems working efficiently.

On the other hand, it cannot be denied that by the extension of an existing system with systems or components from different vendors usually increases the complexity of the system environment. Furthermore, it is important to state, that the opportunity for having a mixed vendor environment does not necessarily lead to mixed implementation, however, the possibility should always be given.

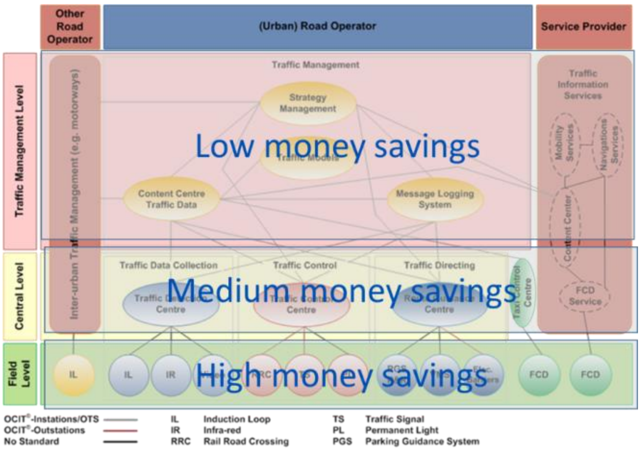
Further consideration of this issue is provided in C.7.6.

C.4.2 Obligations and expectations of urban public bodies

Urban public bodies, which finance their systems or system parts by public money, in the end must ensure that they tender and procure those parts according to the regulations of public procurement law. Hence, for public systems operators, a mixed vendor environment results primarily out of the demand for and the introduction of competition. This requirement leads to a split of the tender into various lots, to achieve the best price/performance ratio. The separate lots must be specified in a way that potential suppliers are enabled to offer a solution independently, even if the lot has a functional dependence on other lots or to existing systems.

Hence, the procurement and use of components that have the best value for money throughout the system is the main motivation and goal of public bodies to establish a mixed vendor environment. For instance, with the availability of the '*OCIT®-Outstations'* standard at the end of the 1990's, German cities began to tender for mixed vendor traffic control systems with central systems and field controllers independently. As a result, prices for traffic controllers and their maintenance fell dramatically, falling, in many cases by as much as 50%. Today more than a hundred cities benefit of OCIT®-standards, with many European countries gaining comparable benefits.

However, it must be stated that the impact of the use of standards in the frame of a public procurement is different according to the level of the system architecture, where the standard is applied, depending of the amount of money, which is invested in the infrastructure of the level. The situation is depicted in the following figure by example of the German OTS system model:


Other Road Operator
(Urban) Road Operator
Service Provider
Traffic Management Level
Central Level
Field Level
Inter-urban Traffic Management (e.g. motorways)
Traffic Management
Strategy Management
Low money savings
Traffic Models
Content Centre Traffic Data
Message Logging System
Traffic Information Services
Mobility Services
Navigations Services
Content Center
Traffic Data Collection
Traffic Control
Traffic Directing
Medium money savings
Traffic Detection Centre
Traffic Control Centre
Route Guidance Centre
Taxi Control Centre
FCD Service
IL
IL
IR
RRC
TS
PL
PGS
Elec. Signs
FCD
FCD
High money savings
OCIT®-Instations/OTS
OCIT®-Outstations
No Standard
IL Induction Loop
IR Infra-red
RRC Rail Road Crossing
TS Traffic Signal
PL Permanent Light
PGS Parking Guidance System

OTS-Systemmodell, © OCA e.V. 03/2014

Figure C–9: level of "monetary savings" (Traffic Management context)

After this, the biggest impact can be reached in the field level, where on the long run local authorities make the biggest investments. For instance, a city operates only one traffic computer but hundreds of signals controllers. Nevertheless, standards are also needed on the other levels of system architecture and might lead also to considerable savings if competition is guaranteed on a long term perspective.

Further, and of significance to the effective implementation of Urban-ITS, interoperability enables anonymised data to be used for purposes, other than that from which it was obtained/generated.

Indeed, in the context of the Urban-ITS environment, the achievement of political or social objectives for the urban area can only be achieved by interchange and use of data for purposes often never imagined or intended by the system designers who generated the data concept. Indeed, many of the objectives for Urban-ITS and exchange are only achievable with such data interoperability.

In addition to save money public system operators combine further expectations with a mixed vendor environment, namely:

- implementation of open, future-proof systems;
- reduction of expenses (personnel costs and invest) for the system operation;
- achieve a greater independence from specific vendors, so that a replacement of components or a change of supplier is possible at any time;
- integration of existing traffic control and management systems into future primarily information based solutions;
- application of new technologies for legacy systems with the possibility of migration;
- reduction of complexity for the operator;
- availability of data to enhance and enable other Urban-ITSs.

The diagram shows that the biggest impact can be reached in the field level, where over the long run Urban Administrations make the biggest investments. A typical city may operate only one traffic computer but hundreds of signal controllers. As roadside infrastructure will become more complex in an era of C-ITS, the potential costs and therefore, the potential savings from field-level standardisation - can only grow.

Standards are also needed on the other levels of system architecture, however. While the greatest direct savings come from the field level, the greatest benefits may come from system level integration at the centre. Partly this is because of the opportunity for improved centre-to-centre exchange (as demonstrated by DATEX II for interurban context), but also partly because this offers the urban authority many more opportunities to integrate its own systems, and to publish "joined-up" information of value to travellers; and at a technical level, it also offers a much greater opportunity to connect to a mixed-vendor set of roadside and vehicle equipment.

This has been the philosophy behind the UK's UTMC initiative. Originating as a government research programme, the initiative is now managed by a community forum, the ‘UTMC Development Group’, which represents both local transport authorities and the systems industry. UTMC is designed to allow the different applications used within traffic management systems to communicate and share information with each other. Previously disparate data from multiple sources such as ‘Automatic Number Plate Recognition’ (ANPR) cameras, ‘Variable Message Signs’ (VMS), car parks, traffic signals, air quality monitoring stations and meteorological data, can be amalgamated into a central console or database.

Where OCIT has driven down costs of operation, UTMC has enabled more intelligent management. For example, by collating car park data with traffic flow data, and providing an integrated response through variable message signs and altered signal timings, cities have found a dramatic reduction in congestion caused by vehicles trying to find a parking space - with consequential benefit on journey times, emissions and road safety. Similar operational benefits are being achieved in other areas, and the trend is towards integration of city and highway systems, tunnels and bridges, and other strategic developments. As with the German OCIT example, over a hundred authorities are now using UTMC to their advantage. The table below shows the range of areas covered by UTMC:

Table C–2: UTMC functional areas

Access Control	Detector	Roadworks
Accident	Event	Traffic Signal
Air Quality	Incident	Transport Link
ANPR	Meteorological	Transport Route
Car Park	Prediction	VMS
CCTV	Profile	

These cover both roadside-to-centre communications (e.g. between a roadside VMS and the VMS management system at the traffic control centre) and centre-to-centre communications (e.g. between the VMS management system and the traffic signal control system). They are also usable as format for data which is exported to other systems, (e.g. traveller information systems). The interfaces where UTMC is applicable are shown in the generic architecture of the following figure:

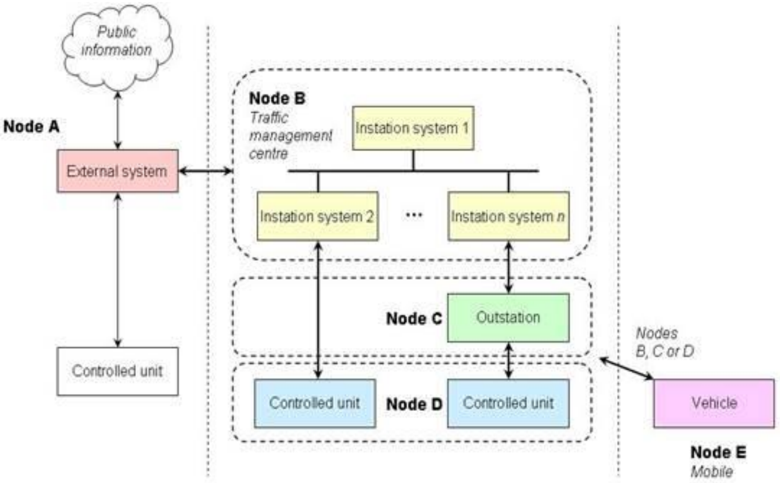

Public information
Node A
External system
Controlled unit
Node B
Traffic management centre
Instation system 1
Instation system 2
...
Instation system n
Node C
Outstation
Nodes B, C or D
Controlled unit
Node D
Controlled unit
Vehicle
Node E
Mobile

Figure C–10: UTMC systems architecture

C.5 Standards combinations

Occasionally a standard is developed for a purpose, and a single standard is adequate to underpin interoperability to obtain its objectives. However, as a general rule, and particularly in a complex domain like ITS/Urban-ITS, a suite of standards is required in order to achieve the objectives, particularly at the "application" level.

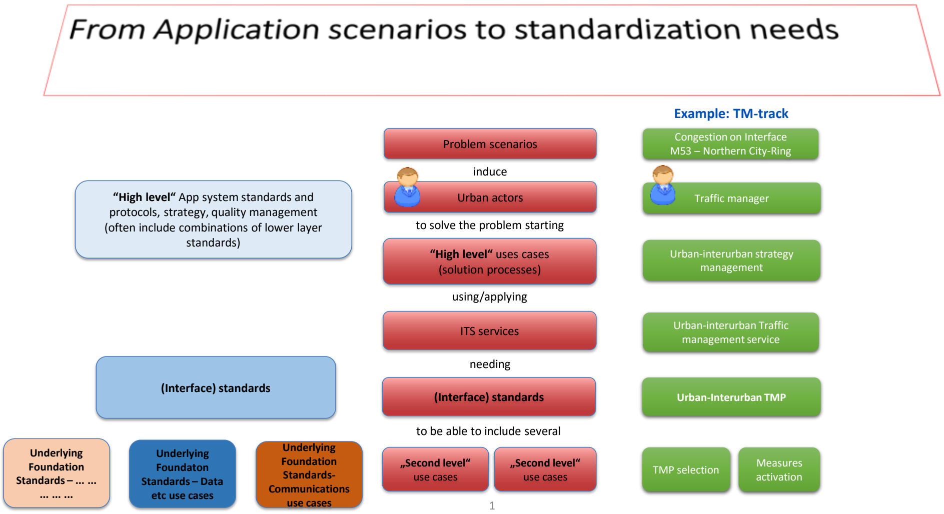

From Application scenarios to standardization needs
Example: TM-track
Problem scenarios
induce
Urban actors
to solve the problem starting
"High level" uses cases (solution processes)
using/applying
ITS services
needing
(Interface) standards
to be able to include several
„Second level" use cases
„Second level" use cases
Congestion on Interface M53 – Northern City-Ring
Traffic manager
Urban-interurban strategy management
Urban-interurban Traffic management service
Urban-Interurban TMP
TMP selection
Measures activation
"High level" App system standards and protocols, strategy, quality management (often include combinations of lower layer standards)
(Interface) standards
Underlying Foundation Standards – … … … … …
Underlying Foundaton Standards – Data etc use cases
Underlying Foundation Standards- Communications use cases
1

Figure C–11: Applications scenarios to standards requirements

In Figure C–11 the right hand column shows a practical physical example of the traffic management track. The middle column shows the underlying system needs, and the left column shows the standards requirements to underpin those system needs.

If we imagine a simple communications system between the TMC and a field device, this might simply require a single communications standard to achieve the objective.

However, if we are trying to standardise an update sequence, in an interface standard, the protocols for the sequence of operations will be included in the interface standard, but this standard will also have to specify the communication standard (or standards) upon which it relies, and may have to specify options within that/those standards.

When we move up to the user application level (business processes and strategic levels), while the scope and specification of the 'app' will be defined, it will in all probability rely on both interface standards and 'foundation' level standards. For example, if the 'app' is to update a VMS, then the 'app' standard will rely on an interface standard, which will itself rely on a foundation communications standard; but will also rely on a metadata standard for the data content, and will also probably also depend on another interface standard to a database where the data values are stored.

This means that in the Urban-ITS sector, most 'apps', be they 'apps' for user services, business processes, strategy or quality and management 'apps', exist in a complex environment that involve a complex combination of standards.

The implications of this are quite significant in terms of providing support to Urban Administrations to enable or instantiate Urban-ITS. Clearly:

Rc_Gn04- It is recommended that there is now an onus on standards developers to understand that their standards, and particularly foundation standards, need to be 'abstract' with regard to any particular application they are envisaged to serve, and that application standards need to specify their application specific issues within the application standard.

While this may appear to be obvious, it has not been true in the past, and these issues can compound the problems of interoperability.

In developing application level standard, how does the standards developer both determine the best combination of standards, and, in a multi-modal and multi-application situation, maintain interoperability? Even more problematic, how does the urban-authority who is planning an implementation, know what standards, and combinations of standards, are available, and preferred?

Annex F.1.12; F.1.13; F.1.14 below recommends (Rc_Pl01-) that a "European Transportation Communications for ITS Protocol." (EU-ICIP) is developed as a matter of some urgency in order to provide guidance in address this and other issues. It is envisioned that such a guide would provide detail of foundation standards, and standards combinations, and (unlike the US NTCIP), would address all forms of communication, (wired and wireless, `I2I, I2F, F2V, I2V, V2I, V2V,)` and associated foundation standards (e.g. including data standards, etc.)

As such it would provide a focus point for both standards developers and Urban Administration implementers of support for Urban-ITS.

C.6 Cooperation

The provision of user-oriented seamless and continuous ITS-solutions/services across Europe requires cross-organisational cooperation of all bodies involved. This cooperation often proves difficult to achieve not due to technical challenges but because of:

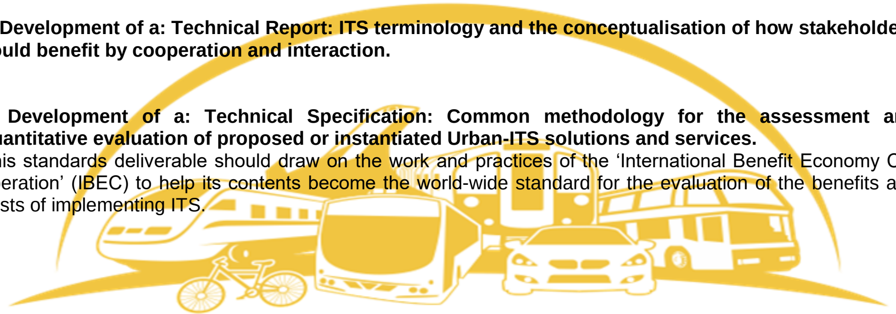
- a lack of political will because the benefits are either not visible or are not sufficient;
- a lack of understanding of the improvements to the travel experience that the application of some new technologies can bring;
- a lack of guidance about how the cooperation and collaboration of relevant stakeholders can be achieved.

Partnerships between different stakeholder types need a common understanding of their (possibly different) goals and the potential for added value creation that collaboration and cooperating can bring. There also needs to be a shared understanding of the obligations, risks and (any other as yet) undefined aspects, that are relevant for cooperation in the context of cross-organisational ITS.

In the light of this it would be highly beneficial to create at least the following two new standards:

Rc_Gn13-- Development of a: Technical Report: ITS terminology and the conceptualisation of how stakeholders could benefit by cooperation and interaction.

Rc_Gn14-- Development of a: Technical Specification: Common methodology for the assessment and quantitative evaluation of proposed or instantiated Urban-ITS solutions and services.
This standards deliverable should draw on the work and practices of the 'International Benefit Economy Co-operation' (IBEC) to help its contents become the world-wide standard for the evaluation of the benefits and costs of implementing ITS.



C.7· Barriers and constraints to the operation of the open single European market (OSEM)

C.7.1 Common issues

The aim of economic integration is to provide citizens and companies with access to markets that were previously closed due to national barriers. The ‘’Open Single European Market’ (OSEM) is intended to abolish non-tariff barriers to the free movement of goods and services. They include barriers that are physical (borders), fiscal (taxes), legal (access restrictions, import quotas) and technical (product standards) in nature.

The cornerstones of the ‘Open Single European Market ‘are the four freedoms:

- Free movement of goods: no restrictions on the trade in goods, which also implies a fundamental ban on state subsidies, discriminatory taxes on imported goods and preferential tax treatment for exports. The principle of mutual recognition established by the ‘Single Market Act.’ This ensures that a product which is already approved in one country can also be sold in the other member states;
- Free movement of people: includes the freedom of movement of workers and the freedom of establishment;
- Free movement of services: providers of services may conduct their business in all member states without having to be settled there;
- Free movement of capital and payments.

Many obstacles remain, however, in areas where integration is not yet achieved [55]. Fragmented national tax systems impede market integration and undermine efficiency. Separate national markets still exist for financial services, energy and transport. E-commerce between EU countries has been slower to take off than at national level, and rules, standards and practices vary considerably. The services sector is lagging behind the goods markets.

Perhaps the largest and most difficult to resolve issue in respect of a single market for products and services is that of language. While auto-translation has improved significantly, at the technical level it is far from perfect. The widespread use of English as a second language, and widespread ‘standardisation’ of computer languages and protocols (such as XML and ASN.1) assists at the background system level, but at the ‘street’ level, users, whether travellers or administrations, reasonably expect to understand and work in their domestic language. Behind language differences are societal differences that mean that the interactions that are expected differ according to location. This makes the common use of services, equipment and systems across the EU difficult in many cases. While large companies are able to adapt better and more rapidly to trading in a multi-lingual environment and develop their products and services accordingly, this is more difficult for smaller companies. Large companies are also able to use these abilities to trade-off to accept vendor lock-in. And, as many innovative companies in the ITS sector are relatively small, this can be unhelpful.

Specifically, with regard to Urban-ITS support and service provision, vendor lock-in (see 9.5; Annex C.7.2; C.7.3; particularly Annex C.7.6; H.1.2; H.3.1; H.4.3.1; K.4.1) remains the largest problem in respect of the single market. Urban administrations are also under pressure from local politicians to give preference to and use local solutions wherever possible, and this may in some cases produce effect that is not consistent with similar implementations in other locations. The biggest protection against either of these problems are the use of standard interfaces, protocols and data based on standards, See the sections referenced above in this paragraph) regarding vendor lock-in and mixed vendor aspects **(see also recommendations Rec RC_PL02-, a02, a03)**

The European Commission White Paper on Transport, 2011 [56] opined that:

- A lot needs to be done to complete the *internal market for transport*, where considerable bottlenecks and other barriers remain. We need to readdress these issues – how to better respond to the desire of our citizens to travel, and the needs of our economy to transport goods while anticipating resource and environmental constraints. The transport systems of the eastern and

- western parts of Europe must be united to fully reflect the transport needs of almost the whole continent and our 500 million citizens.

However, the White Paper fails to identify what exactly the “considerable bottlenecks and other barriers” are.

In relation to the operation of the single market (as it might affect Urban-ITS, the related impact assessment concluded that:

- The lack of EU action or the individual actions by Member States alone may hinder the development of the single market; give a competitive advantage to some players against the others and therefore negatively impact the free circulation of both goods and people, especially for transnational services;
- Most of the external costs of transport are still not internalised. Where existent, internalisation schemes are not co-ordinated between modes and Member States. Moreover, many taxes and subsidies which have been designed without the internalisation goal in view have a distorting effect on behaviour;
- The achievement of a single, integrated and efficient transport system is delayed today by a number of remaining regulatory and market failures such as regulatory barriers to market entrance or burdensome administrative procedures which hamper the efficiency and the competitiveness of multimodal and cross-border transport;
- Additionally, investments to modernise the rail network and the transhipment facilities have been insufficient to address the bottlenecks in multimodal transport.

NOTE: Multimodal in this context also implies intermodal

- Modal networks continue to be poorly integrated.

Relating to the functioning of the single market, a *Commission Working Document* accompanying the white paper [57] stated the following issues relating to the single market:

- Investments to modernise the rail network and transhipment facilities have been insufficient to address the bottlenecks in multimodal transport. Modal networks are badly connected. TEN-T policy has lacked financial resources and a true continental multimodal perspective;
- At the beginning of the 21st century, the railways were the only transport mode in the EU that had not been opened up to competition. Legislation prescribing market opening in rail freight transport as of 2007 and in international rail passenger transport as of 2010 has been implemented slowly and incompletely in the large majority of Member States. Enforcement has been inadequate. National passenger markets, that represent the largest share of the business, are still largely closed. The lack of competition held back service quality and efficiency;
- Short sea shipping faces higher administrative burdens compared to the land-based modes. National borders continue to cause inefficiencies and additional costs in rail.
- Charges and taxes do not fully reflect the societal costs of transport. Attempts to internalise transport externalities and to remove tax distortions have so far been unsuccessful.

C.7.2 Political obstacles to OSEM

It has to be recognised that, regardless of commitments made to the European single market, politicians are subject to pressures from their electorate, and especially when local employment is effected in times of austerity, are pressured by the democratic process to protect the local employment of their citizens. Some of these short term decisions have only short term consequence, but some can have unintended long term effects. The management of this process is of course political, and regulatory, and completely outside of the scope of this pre-study regarding standards.

However, it is appropriate to consider what role Standards can play in assisting the greater political goal of the OSEM.

The biggest single threat that local protectionist measures can cause is that caused by vendor lock-in. A short term political decision to counter a time related local issue, can result in a long term problem if the measure taken to deal with the short term causes long term vendor lock-in. Designing standards to avoid vendor lock-in is therefore the biggest contribution that standards can make to countering these issues. See C.7.6

C.7.3 Commercial obstacles to OSEM

The commercial obstacles to the OSEM are:

a) areas of failure of the delegated aspects of the OSEM regulations (out of scope of this study), and
b) vendor lock-in.

If Member States do not adapt their Regulations to the OSEM, the functionality of the OSEM will be impeded, and it can be stated that, a quarter of a century after the OSEM was agreed, it still has many local imperfections and some of these affect procurement of ITS service provision. Again, this is a political issue, and out of the scope of this pre-study.

However, within the scope of this study, commercially driven vendor lock-in is a particular problem in the traffic management aspects of the Urban-ITS areas considered by this study, and can also be a problem in areas such as fare payment, and outsourced service provision.

Historically, starting from the local contractor painting white lines on the road or the local electrician erecting coloured lights to control traffic at a single junction, traffic management has been a geographically bound local situation met by local suppliers. Latterly, the emphasis has changed to strong coordinated offerings from multinational companies providing complex but proven solutions to modern traffic management. These options are attractive to Urban administrations because they offer proven, and often the most cost-efficient solution in the short term. However, whether an unintended consequence, or a deliberate commercial strategy by the vendor, the consequence has, in many cases been vendor lock-in.

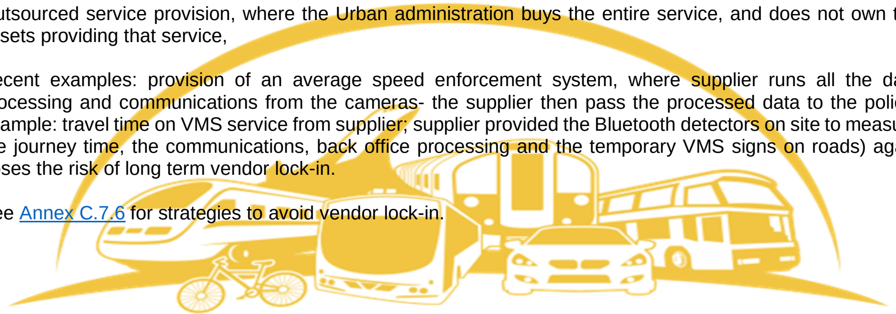
Current offerings from major multinational vendors have the attraction that they can appear to offer ‘complete’ solutions across many aspects of MIS/UL/TM. And of course, when they only have to deal with in-house developed software and its eccentricities, security, and design, can produce faster, and commercially competitive results - but often at the cost of vendor lock in.

In the future, as financial pressures remain prevalent on Urban administrations, entirely outsourced solutions offer an attractive solution for /Urban Administrations.

Outsourced service provision, where the Urban administration buys the entire service, and does not own the assets providing that service,

(recent examples: provision of an average speed enforcement system, where supplier runs all the data processing and communications from the cameras- the supplier then pass the processed data to the police; example: travel time on VMS service from supplier; supplier provided the Bluetooth detectors on site to measure the journey time, the communications, back office processing and the temporary VMS signs on roads) again poses the risk of long term vendor lock-in.

See Annex C.7.6 for strategies to avoid vendor lock-in.



C.7.4 Technical obstacles to OSEM

Technical issues also affect the single market. The greatest of these is language. It is natural to want to develop solutions using the local language, and this has direct and significant benefits to the local deployment and use. But in OSEM of 28 countries with almost as many languages, this makes competitive bidding from vendors across the market difficult, especially in smaller countries with less widely used languages. There are political measures to try to deal with this situation, but in respect of Urban-ITS, technically, the availability of a Europe-wide 'Registry of ITS meta-data concepts'; the specification of the use of these data concepts to achieve standardised solutions and the use of standardised protocol sequences, offer the best opportunities for successful operation of the OSEM. Other sections of this report produce specific Recommendations to enable/achieve these objectives, so are not repeated here, but this section emphasises the need and urgency for such measures. So long as a common, at least Europe-wide, meta-data registry does not exist, this problem will get worse. Had it been accommodated when it was first proposed, two decades ago, many of the measures described in 9.4; D.1; D.2.4; D.2.6; D.2.7 , together with their associated costs, could have been avoided.

C.7.5 Contending aspirations of Urban administrations and commercial freight operators

While Urban Administrations have targets and ideals to make the urban environment sustainable, and clean and seek control measures, such as low emission zones, and access hours limitations, and many would like to see urban consolidation centres and last mile deliveries and collections by vehicles with zero-tail-pipe-emissions, this in many ways is seen to contend with efficient delivery systems, whose objectives are to minimise supply chain steps and delays.

As the pollution levels are well above recommended levels in most major cities, actions to make cities more sustainable are likely to tend to the side of increased regulatory control. Annex I.2.1 examines these issues in depth, and makes recommendations.

C.7.6 Vendor lock-in

Vendor lock-in – where an Urban Administration, or public transport authority, is constrained to continue to buy from one vendor because the system operates only within the interfaces and protocols of that vendor, is a technique that has been used by vendors extensively in the traffic management sector. See C.4 above.

Vendor lock-in is extensive in Europe. In Germany, the German OTS system model/OCIT standards provide a way to overcome this in respect of centre<>centre and centre<>field systems, and whilst it is too early to say if the OCT/OCIT standards are suitable across Europe, it is clear that such an approach is needed on a Europe-wide basis and the experience of OTS/OCIT should serve as input to that process.

In USA, the NTCIP addresses these issues directly with a similarly purposed set of standards of the Joint Committee on the NTCIP, an official Steering Committee of the FHWA-funded project. These US National 'Standards' are a joint product of the National Electronics Manufacturers Association (NEMA), the American Association of State Highway and Transportation Officials (AASHTO), and the Institute of Transportation Engineers (ITE). These bodies form the Joint Committee on the NTCIP

NTCIP provides/supports a family of standards directly targeted at centre<>centre and centre<>field communications that provide both the rules for communicating (called protocols) and the vocabulary (called objects) necessary to allow electronic traffic control equipment from different manufacturers to operate with each other as a system. As with the OTS/OCIT, the NTCIP provide standards that allows traffic control systems to be built using a "mix and match" approach with equipment from different manufacturers. As with OTS/OCIT, NTCIP standards reduce the need for reliance on specific equipment vendors and customized one-of-a-kind software.).

However, it should be noted that, whereas in Europe, DATEX II forms the basis of current data exchange standards, in USA the original DATEX is used, and there are other differences. So while the objectives of NTCIP are the same in this area (and the scope of NTCIP is limited to this area), most NTCIP standards are not suitable for Europe.

In UK, The Urban Traffic Management Control or UTMC programme is the main initiative for the development of a more open approach to ITS traffic management in urban areas. Originating as a Government research programme, the initiative is now managed by a community forum, the UTMC Development Group, which represents both local transport authorities and the systems industry. See C.4.2 above.

UTMC systems are designed to allow the different applications used within traffic management systems to communicate and share information with each other. This allows previously disparate data from multiple sources such as ‘Automatic Number Plate Recognition’ (ANPR) cameras, ‘Variable Message Signs’ (VMS), car parks, traffic signals, air quality monitoring stations and meteorological data, to be amalgamated into a central console or database. The idea behind UTMC is to maximise road network potential to create a more robust and intelligent system that can be used to meet current and future management requirements.

UTMC and OTS/OCIT are not compatible with each other; neither is compatible with NTCIP. Both have links to DATEX II but these are substantially underdeveloped.

Between OTS/OCIT NTCIP and UTMC there are probably adequate standards and practices to migrate from vendor-lock in, but what is lacking in Europe is a project to provide the best combination and practices in the same way that NTCIP does for USA.

Rc_Gn01- There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.

In respect of public transport, Transmodel (see D.2.3.25) may be applied to any framework for information systems within the public transport industry, but there are three circumstances to which it is particularly suited:

- specification of an organisation’s ‘information architecture’;
- specification of a database;
- specification of a data exchange interface.

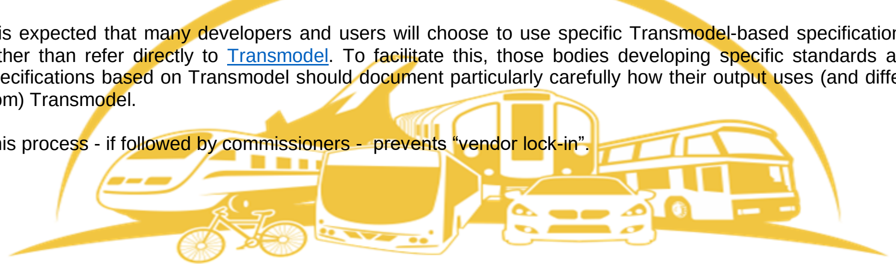
The status of Transmodel as a reference standard means that it is not necessary for individual systems or specifications to implement all of Transmodel. However, it must be possible to describe (for those elements of systems, interfaces and specifications which fall within the scope of Transmodel):

- -the aspects of Transmodel that they have adopted;
- -the aspects of Transmodel that they have chosen not to adopt.

Thus, the status of Transmodel as a ratified standard is not a constraint on those developing, acquiring or operating systems. They are free to use Transmodel to the extent appropriate to their particular circumstance.

It is expected that many developers and users will choose to use specific Transmodel-based specifications, rather than refer directly to Transmodel. To facilitate this, those bodies developing specific standards and specifications based on Transmodel should document particularly carefully how their output uses (and differs from) Transmodel.

This process - if followed by commissioners - prevents “vendor lock-in”.



C.8· Autonomous /automated vehicles

C.8.1 Context

Although not specifically mentioned in the remit to the Project Team, it would be wrong not to address the topical subject of autonomous vehicles. It is now clear that highly liquid companies (such as Google, Apple, Tesla etc.) and the considerable investments of many budding technology companies around the world (often encouraged and assisted by their governments) have forced the major car companies to invest heavily in this area, and the result is many workable forms of autonomous vehicles are now being tested in many places around the globe. It is already clear that most of the technical hurdles have been overcome, or are likely to be overcome within the next couple of years, and a paradigm of so called 'autonomous vehicles' is now a potential reality. PT1701 must then consider, how does this affect the pre-study on Urban-ITS?

C.8.2 Autonomous driving and mobility

The role of the autonomous vehicle will be mixed, and will change over time. But many of the concepts being studied by PT1701 could be effected, at least in part, by autonomous vehicles. In metro systems and guided pathway systems, largely at airports, autonomous vehicles have been in use for many years, and their span of use has moved from just moving passengers between terminals, to moving passengers from cars to terminals, and from moving passengers from other transport modes to the airport. In recent years, metro systems around the world have been introducing driverless trains However, the current emphasis is on driverless road vehicles, and here the paradigm is quite different from that for guided pathway systems.

Autonomous driving will in time become a feature of future mobility solutions. It is significant that the silicon valley giants Google, Apple and Tesla are making investments to become significant actors in this field, and are either already offering a form of automated driving, or developing them.

This is not being done for charity or the eccentricity of their founders or CEO's. Apple and Google are successful because they how to attract and retain customers and they see a paradigm where the vehicle becomes an extension of mobile communications (their core business) and see significant business opportunity. Together with the communications power-houses such as Qualcomm, they also see themselves as potential partners for carmakers eager to use their services as part of their infotainment offerings, or in providing ADAS functionality and providing income generating service provision.

To the car manufacturer, they are also threats to the integrity of car data and as inevitable competitors for the hearts and minds of the car-buying consumer.

The auto-manufacturers are responding by investing heavily to push autonomous vehicle development, but in a paradigm where they, not Google or Apple, have the new core business. Who-ever wins, it accelerates rapidly the pace of the introduction of the autonomous vehicle.

C.8.3 Autonomous driving and connectivity

The approach taken until recently by the leading researchers/developers has been one of truly independent vehicles. i.e. those that (allegedly) need no assistance from the outside. However, that claim is at best tenuous, because these systems rely on internet connections, private mapping, and proprietary methods of support, including cellular communications. This paradigm clearly has limitations when applied to a multi-vendor situation, and with vehicles of multiple manufacturers and designs coexisting. Having one driverless vehicle proving it can drive on the roads, without crashing, is a different paradigm from millions of such vehicles co-existing on the same roads at the same time. The experiences in our own lifetime with operating systems of computers not being able to coexist with their peers of other manufacturers, leave no room for doubt as to the scale of this problem. The recommendations, particularly those (above) gained from the experience of the traffic management sector, to establish measures to institutionally prevent vendor lock-in need to be heeded in the evolution and use of autonomous vehicles, right from the start of their introduction.

The major car manufacturers approach this issue from a different angle. The ITS industry, and car manufacturers, have been developing (for more than fifteen years) the concept of ‘connected vehicles’ that talk to each other and the infrastructure, It has been a slow but steady path, only now yielding significant dividends and opportunities. The ‘Cooperative ITS’ paradigm is one discussed and considered elsewhere and throughout this pre-study, because such wireless communications are a significant component of many aspects of Urban-ITS, and most aspects of Urban-ITS and wireless connectivity/cooperative ITS are inextricably interconnected. However, just how independently autonomous, or connected, an autonomous vehicle needs to be, is still under debate, and may well vary from manufacturer to manufacturer.

The result, however, has been a general realisation by most actors in this domain that the paradigms of the “connected car” and the “autonomous vehicle” have to be merged. This benefits all parties, but particularly addresses the problems driving in adverse weather conditions that research autonomous vehicles continue to suffer, and more importantly addresses the co-existence of multiple designs/manufacturers of autonomous vehicles (because connected vehicles have to rely on standards for interoperability in order for their systems to operate and coexist, and now have proven protocols to achieve this). But it should be noted that this is not for the benefit of the driver, Companies, whether car manufacturers or silicon valley giants, see it essential to their business model to support *and own* the maps which will their businesses. Such ownership may be very detrimental to the Urban-ITS paradigm. **Communications, mapping and security Standards need to be in place and compliance to them required for any autonomous vehicles that are allowed to be commercially available.**

Continuous communications will form an integral part of autonomous driving. At the moment Apple and Google are relying on WiFi, but the automotive manufacturers, supported by US DoT are combining this with 5.9 GHz communications, and, because of the need to support multiple media and switch from one to another, the ISO 21217 communications air-interface for land mobile architecture, or something similar, will become the accepted norm to manage media selection and operation.

C.8.4 Autonomous driving and maps

Autonomous driving is only successful with highly developed and continuously updated maps. The maps required for an autonomous vehicle will be far more precise and accurate than maps used today because it is presenting -continuously updated- detailed information about the world to the car. At a recent TU-Auto conference on Automotive telematics, autonomy and mobility, Stefan Butz, vice-president of location based Services at BMW, stated “*It’s really providing a picture of the real world,” …“it is worthless if it’s not up-to-date. And the only chance to do it is to have connected vehicles, which deliver sensor information to the location platform. And within this location platform, you enrich, enhance and correct the highly precise map and then you send it to the car.”*

At the same conference Philipp Kandal, vice-president of Engineering at Telenav, stated that *“maps are becoming an operating system for cars, not only used for navigation… .The map is now at the core of the car experience………..The map gets connected to safety systems. So we see safety systems like ADS, UHorizons and Adverse Weather Conditions are starting to be powered by the map”.*
.“The map is changing from a static asset to a dynamic asset,” Kandal said. “*The map is fundamentally transforming itself from something you buy once and have in a dedicated system to something that becomes part of every single function in the car, and that’s becoming a defining function of how your car works. We believe the map will be a [purchase] decision factor for your future car.”*

Many others, of course, believe that, at least in cities, the availability of Urban-ITS will change the paradigm away from purchasing/owning, a car at all.

Bryan Mistele, CEO of INRIX, noted at the same conference that real-time updates of maps are especially vital for autonomous driving,…. “*If I’m creating an autonomous vehicle, I want to know that the road ahead is closed due to construction, or that the ramp has been redesigned and moved. It’s not enough just to have map data; I need to have a real-time view of what’s happening on the roadway.”*

Mistele ,also said this data was comprised of several elements. Firstly, there is car data, *“which needs to be shared with the cloud infrastructure to enable intelligence-building”. GPS data, camera data for lanes, speed limits and signs, as well as LIDAR for localization, complete what Kandal called the “base data layer”.* To this he added personalisation such as the user’s calendar, messages and emails, or “*where this individual driver wants to go on the map you have built”.* This is combined with environmental data from the base layer map and transient information such as traffic and parking information.
“This will power the user experience of the future,” he declared

According to Kandal at the same TU-Auto conference in Stuttgart “*We need minute-by-minute updates to make sure, if you want to be in a highly autonomous driving mode, the road up ahead is safe and you can take your hands off the steering wheel.”*
With the availability of such, constantly updated, maps, autonomous driving can advance rapidly.

In addition to providing critical data to the driver and the carmaker, these connected mapping services also provide essential data to public authorities, helping them better manage urban traffic. “*What we’re seeing today is a variety of cities now doing dynamic traffic-signal timing, based on real-time road congestion,”* Mistele said. “*As the traffic congestion changes, the traffic signals, the lane directions even tolling changes based on the congestion on the roadways.”*

The ’Local Dynamic Map’ concept is a key component to represent the structured environment of the autonomous vehicle. The different layers of this LDM are currently envisaged as in Figure C–12.

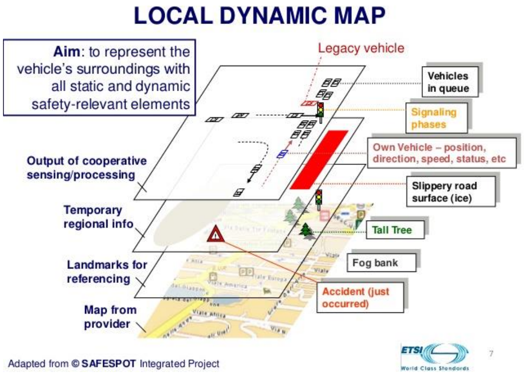

LOCAL DYNAMIC MAP
Aim: to represent the vehicle’s surroundings with all static and dynamic safety-relevant elements
Legacy vehicle
Vehicles in queue
Signaling phases
Own Vehicle – position, direction, speed, status, etc
Slippery road surface (ice)
Tall Tree
Fog bank
Accident (just occurred)
Output of cooperative sensing/processing
Temporary regional info
Landmarks for referencing
Map from provider
Adapted from © SAFESPOT Integrated Project
ETSI World Class Standards
7

Figure C–12: Local dynamic map concept (Safespot)

In this cooperative context, these different layers contain different types of elements:

- Layer 1: Geographic representation of roads (positions, sizes, slopes…) from map providers
- Layer 2: Landmarks (road signs, horizontal signs, barriers..)
- Layer 3: General and temporary information (hazard events)
- Layer 4: Dynamic positions of vehicles, status of lights…

Autonomous vehicles will need regularly updated embedded maps in order to build safely its e-horizon.

C.8.5 Autonomous vehicles and safety issues

Redundant sensor systems will be in place to provide a high level of environmental sensing. In addition, the control path from the control unit to the power distribution in the actuators needs to be redundant as well, to perform the safe manoeuvre in case of a failure.

Peter Hardå, 'Drive Me' function developer at Volvo Cars, notes that the autonomous driving function currently has to be deactivated in case inclement weather or other conditions make autonomous driving too difficult.

A safe manoeuvre can vary, depending on what has gone wrong. *"It could be to stop in the current lane, in the extreme case," he explained. "Or it could mean that it actually goes to roadside parking."* The safe state is always the same, however. *"It means that the vehicle is stationary and permanently braked.*
At this point we feel we are able to return control forcefully to the driver and say, 'Now you need to drive away'."

C.8.6 Autonomous vehicles and security

Security will be a key factor for autonomous vehicles. Currently the research vehicles can be effectively secured and operated in a closed environment. In an open road situation with many autonomous vehicles, this will not be possible. In the Urban-ITS paradigm, where dial-up services may call a driverless pod or taxi, the threat of hacking - making the pod not arrive or the taxi take the passenger to a different destination (even kidnap the occupant), or even deliberately crash the vehicle, - is a major issue of concern.

On the connected vehicle side, the easy-fix quick to implement solutions employed by major car makers to use cellular communications and other low cost wireless solutions, to provide apparently clever services, led to the exposure to hacking of BMW and Volkswagen vehicle locking/security/emergency systems, and the now famous incident where a hacker took control of a Jeep while it was being driven and over-rode the control of the driver; ibid:
http://www.wired.com/2015/07/hackers-remotely-kill-jeep-highway/ [92]

http://www.independent.co.uk/news/uk/crime/car-hacking-scandal-how-a-security-loophole-left-thousands-of-vehicles-vulnerable-to-thieves-10459765.html [93]

http://it.slashdot.org/story/15/02/07/0432254/how-to-hack-a-bmw-details-on-the-security-flaw-that-affected-22-million-cars [94]

http://www.figiefa.eu/security-loopholes-in-bmws-connected-drive/ [95]

Annex J of this pre-study addresses these issues for Urban-ITS, and its exposition is equally apposite for the autonomous vehicle paradigm.

C.8.9 Take up of autonomous vehicles

The introduction and take-up of this enhanced connected/autonomous paradigm will be dependent on a number of factors:

- Technical capability;
- Legal and regulatory framework;
- User acceptance.

It is now reasonably clear that the remaining technical issues relating to autonomous vehicles will quickly be solved. However, legislation and regulations are currently focussed around control of the vehicle and 'the driver'.

At the moment, specific exceptions have to be made for autonomous research vehicles in every country in the world because the legislation and regulations in one way or another currently forbid driverless vehicles.

In order for autonomous vehicles to be allowed on the roads, the legislative and regulatory regimes will have to be revised, and just what revision is needed will not be clear until some of the remaining technical issues are solved. That will happen soon, but changing regulations and getting legislative change is not a rapid process, and is likely to take many years. In the meantime, autonomous vehicles will require to be under the control of a supervising driver who is able to overrule and take control at any time. (For example autonomous ‘platooning’ is already available as ‘adaptive cruise control’ with the vehicle automatically maintaining position behind the preceding vehicle, but with the ability of the driver to override at any time), and will automatically switch off in adverse conditions.

This clearly limits the near term use of any autonomous features that would be in the Urban-ITS paradigm, such as autonomous driverless ‘pods’ or taxis providing on-demand mobility services in the urban context.

The third factor to consider, especially in Europe, will be that of user acceptability. While much of the world has adapted to, even eagerly taken up, vehicles with automatic gear changing, or continuously variable transmission, European drivers have retained preference for manual gearshift, not even allowing the handover of driver control to the “automation” of any modest aspect of driving, such as gear changing. The take-up of automated parking systems, now available on many models, is lower in Europe than in most other parts of the world.

According to the independent consultant Holger Meinel, speaking from the floor at the recent TU-Auto conference, a recent study he cited showed that, while 90% of Brazilians want to have a self-driving car, only about a third of all Germans and just a bit more than a quarter of Japanese feel the same way. Many consumers in markets where self-driving cars will no doubt first be launched still need to be convinced that they should buy them.

The speed at which European vehicle users will adapt to autonomous vehicles, and the proportion of the population that will ever want to hand over this control of the vehicle, remains an unanswered question, and will certainly be one that will require some time both for the user community to adapt, and may, in democratic regimes, also affect the speed at which legislative change progresses, because of resistance from the electorate.

At the previously quoted TU-Auto conference in Stuttgart, Dominique Bonte, consultant at ABI Research, predicted that 2030 the mobility revolution should be well established. “*I like to think about 2030 as a moment in time, 15 years from now, where we will see some significant uptake of these technologies for shared, electrical, cooperative, driverless multimodal mobility.”*

At the same conference, Martin Rosell, CEO of WirelessCar, reminded the audience that connected cars make up only 2.5% of the global auto market and warned that the rosy figures projected for connected-car penetration –150M connected cars on the road by 2020, in some estimations– will not be fulfilled unless carmakers alter their strategies.

“The business models today are wrong, to have a market to go after, you need 70% of the market. Less than that is a start-up. Because all the visionary things we talk about require major investments. It’s not technology investments. It’s investing in new processes, investing in organisational changes, it’s investing in doing things.”

This is not going to happen quickly. It will probably happen more quickly than the pundits expect, but it will not happen within the span of the CID.

But, of relevance to Urban-ITS, Robert Henrich, CEO of moovel Group, noted that *“Urbanisation leads to a massive increase of our mobility. Today, 64% of all kilometres travelled by humans are inner-city kilometres. This number is going to double or even triple by 2050.”*

C.8.10 Autonomous vehicles and associated standardizations

The International Organization of motor vehicle manufacturers (OICA) classifies automated driving vehicles in 5 different levels:

- Level 1: Assistance, driver can be assisted in some basic scenarios by the system.
- Level 2: Partial automation, driver monitors always the automated driving.
- Level 3: Conditional automation, system monitors its performance limits and transfers to the driver within a transition time when reaching the performance limits
- Level 4: High automation, system copes with all tasks within a specific use-case
- Level 5: Full automation where system copes with all tasks in all situations. No driver required.

Existing ADAS functions like ‘Adaptive Cruise Control’ (ACC) use generally one frontal sensor (radar, camera) which is sufficient to cover automatically different basic scenarios of this function (deceleration behind slow vehicles, distance control behind vehicles, speed control in case of free lane), but which can fail in some complex road situations (stopped vehicles, obstacles, pedestrians…). This level 1 function has to be constantly monitored by the driver, in case of such fails. In the same category we can consider the ‘Lane Keeping Assistant ‘(LKA) which maintains the vehicle in the lane. Level 2 functions make the integration of longitudinal and lateral controls:

- Automated parking where parking manoeuver is controlled automatically by the system
- ‘Traffic Jam Assist ‘which combines longitudinal control (ACC) and lateral control (LKA) in low speed conditions (dense traffic).

Such ADAS functions, completed by active safety functions like ‘Automatic Emergency Brake Assist’ have been standardized (or standard already under development) by ISO TC204 WG14 or ISO TC22. They have proven their efficiency for road safety and are taken in account by organisms like EuroNcap to award (or not) automotive brands in this domain.

The following Standards are used to support these functionalities:

ISO 15622	Adaptive Cruise Control
ISO/CD 16787	Assisted Parking Systems (APS)
ISO 22179	Full speed range adaptive cruise control (FSRA) systems
ISO/NP 11067	Curve Speed Warning Systems (CSWS)
ISO 15623	Front Collision Warning
ISO 11270	Lane Keeping Assist System (LKAS)
ISO/AWI 19638	Road Boundary Departure Prevention Systems (RBDPS)
ISO/CD19237	Pedestrian Collision Mitigation Systems (PCMS)
NWIP (TC22)	Cross function lateral/longitudinal
NWIP (TC22)	HMI for Autonomous Vehicle
NWIP (TC204)	Automated Lane Change
NWIP (TC204)	Traffic Jam Assist
NWIP (TC204)	Highway Assist

Car manufacturers are now developing or prototyping Level 3 / 4 functions dedicated to structured environments like motorways, main roads or parking areas. In these environments driving action is known to be monotonous and/or tiring (traffic jam conditions, motorway driving..), and sensing constraints are known and limited (motorcycles, cars, trucks, standardized horizontal and vertical signalisations).

The current autonomous vehicle roadmap seen by car manufacturers is shown in Figure C.13:

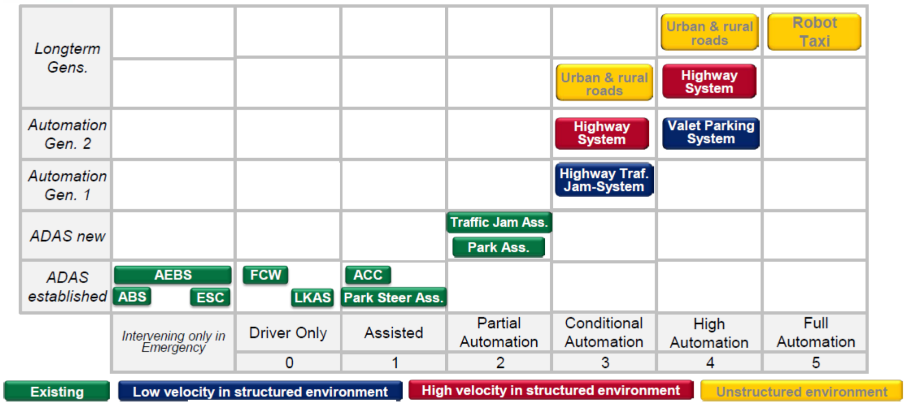

Longterm Gens.
Automation Gen. 2
Automation Gen. 1
ADAS new
ADAS established
Urban & rural roads
Robot Taxi
Urban & rural roads
Highway System
Highway System
Valet Parking System
Highway Traf. Jam-System
Traffic Jam Ass.
Park Ass.
AEBS
ABS
ESC
FCW
LKAS
ACC
Park Steer Ass.
Intervening only in Emergency
Driver Only
Assisted
Partial Automation
Conditional Automation
High Automation
Full Automation
0
1
2
3
4
5
Existing
Low velocity in structured environment
High velocity in structured environment
Unstructured environment

Figure C–13: autonomous vehicle roadmap as seen by car manufacturers

In order to sense the environment, level 3-4 automated vehicles use a combination of sensors, including Lidar (light detection and ranging), radar, cameras and ultrasonic. To anticipate road parts where the sensing and control system could have more difficulties, it is necessary to equip these vehicles with an e-horizon extracted from an embedded map. For localization, these vehicles have to use a combination of GNSS and inertial navigation systems to access correctly this embedded map. The extracted e-horizon will describe for the autonomous driving decision unit, the oncoming difficulties like intersections, bifurcations, ramps, toll gates, zebra areas, on-street parking areas, and of course the road surface limits.

ISO TC204 WG3 is developing the following work items, to be applied in Automated Driving:

- PWI 20524: Extension/revision of ISO 14825 (Geographic Data Files (GDF) - 5.0 for the exchange of map data between providers and ITS system integrators) to meet the requirements of emerging Cooperative-ITS applications, Multimodal transportation applications, and automated driving systems applications.
- ISO/PWI 17572-4 : Lane-level location referencing for automated driving systems applications

Current sensing architectures can ensure nominally an ultra-reliable automated driving (10-9 false alarm rate), designed in respect with ISO 26262 system safety methodologies. But the cost of this complex equipment cannot permit a quick massive deployment of level 3-4 automated vehicles on all types of roads. This deployment will be limited primarily to structured environments and for some specific scenarios. At the limits of these scenarios, drivers will need to quickly reengage (in a matter of seconds or less) at the vehicle's request. Cognitive science research on distracted driving suggests this may be a significant safety challenge. Similarly, developing the appropriate mental models for human-machine collaboration may be a challenge for a technology widely available to the public.

Challenges remain also in unstructured environments like urban areas, where sensors based on line of sight detections (GPS, radars) can become inaccurate and not enough reactive to manage complex road situations where vulnerable users could be also involved.

Automated driving in urban areas needs still a long term research activity on embedded sensing architectures and symmetrically on infrastructures adaptations. For example, current horizontal road signalisations (lane limits, arrows…) have been designed for a human perception and are depending on different national rules. It would be profitable, in order to accelerate a future penetration of automatic driving in cities, to harmonize and redefine such signalisations to be more safely compatible with current embedded image processing capacities.

Nevertheless, some urban structures like parking places, could be the first sites where 'High Automation '(level 4) would be achievable in a mean term. Valet parking functions are currently prototyped and tested by some carmakers or suppliers. A first level of function is primarily designed to record and replay automatically a short trip (a few tenths of meters) between two locations under the supervision of the driver. The driver can exit his car, and will use his smartphone to stop/validate the automatic manoeuver. For this limited Use Case, the function is also called "Remote Parking".

A second step towards a real "Valet Parking" function will require the implication of parking management system itself. This dedicated parking will have to define and to send a reference trajectory to each vehicle and will assume the supervision of autonomous vehicle's trip in the parking until they reach their affected lots.

Development of such cooperative system will require the use of dedicated standards to define:

- the necessary sensing architectures (indoor camera networks, embedded sensors)
- indoor positioning systems
- indoor I2V and V2I communication architectures,
- system safety related design methods

The following existing standards, and standards under development are appropriate for the autonomous driving paradigm.

EN 302 637-2	CAM
EN 302 637-3	DENM
EN 302 895	Local Dynamic Map (LDM)
ISO/CD TS 17426	Contextual speeds
ISO/TS 17427-1	C-ITS -- Part 1: Roles and responsibilities….
ISO TR 17427-5	C-ITS -- Part 5: Effective approaches to security
ISO/TR 17427-8	C-ITS -- Part 8: Liability aspects
ISO/TR 17427-9	C-ITS -- Part 9: Compliance and enforcement aspects
ISO/TR 17427-10	C-ITS -- Part 10: Driver distraction and information display
ISO/AWI TS 19091	C-ITS -- V2I and I2V communications for …signalized intersections
ISO/DIS 17438-1	Intelligent transport systems -- Indoor navigation for personal and vehicle
ISO/NP 17438-2	Indoor navigation for personal and vehicle ITS stations
ISO/PWI 19297	Shareable geospatial database for ITS applications
ISO/PWI 19404	Architecture of signal control systems utilizing V2I information
ISO/AWI 20035	Cooperative adaptive cruise control (CACC)
ISO 26684	Cooperative intersection signal information and violation warning systems
ETSI TR 103 298	Platooning; Pre-standardization study
ETSI TR 103 299	Cooperative Adaptive Cruise Control (C-ACC); Pre-standardization study
ETSI TR 103 300	Cooperative Vulnerable Road Users (VRU); Study of Use Cases..
ETSI TS 101 539-1	Road Hazard Signalling (RHS)
ETSI TS 101 539-2	Intersection Collision Risk Warning (ICRW)
ETSI TS 101 539-3	Longitudinal Collision Risk Warning (LCRW)

C.9·Issues associated with the introduction of Urban-ITS

Turning back to this pre-study, the remit to PT1701 has been directed to focus its work on standards deliverables that can be finalised within the three-year span of the CID mandate, and to focus on early measures to assist Urban Administrations to implement Urban-ITS. Within such restricted scope, there is a clear timescale difference with that required for the introduction of autonomous vehicles. Solving the technical issues are only the first step, and PT1701 recognises that the integration of autonomous vehicles into the ITS and Urban-ITS environment is a major issue, well beyond the scale and remit of this PT, but one that needs a project team to study at an early stage, and makes a recommendation to create a project team to address this issue.

Rc_PI04- It is recommended that there is a funded European project to study the ITS/Urban-ITS and regulatory framework issues associated with the introduction of autonomous vehicles

Within the PT1701 pre-study, the emphasis has been on creating, obtaining and using data to enhance multimodal information services, traffic management and urban logistics. As such Urban-ITS information exchanges will form a major contribution to the operation of autonomous vehicles in urban domains. But the emphasis of ITS/Urban-ITS or for that matter Cooperative ITS is the availability of relevant information on which to base decision making. The issue of whether that decision is made by a system or a human operator is important, but it is secondary to the provision of data in order to make such decisions. Thus the pre-study encompasses the use of autonomous vehicles (autonomous decision making) to potentially provide the services described in the Use Cases, but do not take into any account additional information requirements (if any) for autonomous vehicles, as any such additional requirements are not yet identified/characterised.

Annex D Standards Framework

D.1 Extant Standards

The very ethos and core of this pre-study, and the CID that it is supporting, espouses the development and use of standards. In respect of ITS, more than 250 standards deliverables have been developed by ISO TC204 (ITS); nearly 150 by CEN, nearly 100 by ETSI; and some aspects of ITS have seen standards from CEN TC301 and ISO TC22 (Road Vehicles), SAE and IEEE.

Many, if not most, of these Standards involve the use of “standardised” data concepts, data elements and protocols, which, except for some more recent standards, are likely to be specified within the standard itself.

The consequence being that the same or similar data concepts are:

a) defined differently in different standards;
b) users of one standard are probably unaware of the other definitions;
c) The data definitions are therefore scattered among some 700 or more documents produced by SDO’s around the world;
d) Even within standards organisations, there is no easy way find out what or where the definitions exist.

With multiple definitions, interoperability is significantly more difficult to achieve, in some cases, impossible. Data re-use is a major challenge that at best requires ‘interpreter’ conversion routines, in some cases is not possible because different attributes are defined in the data concept.

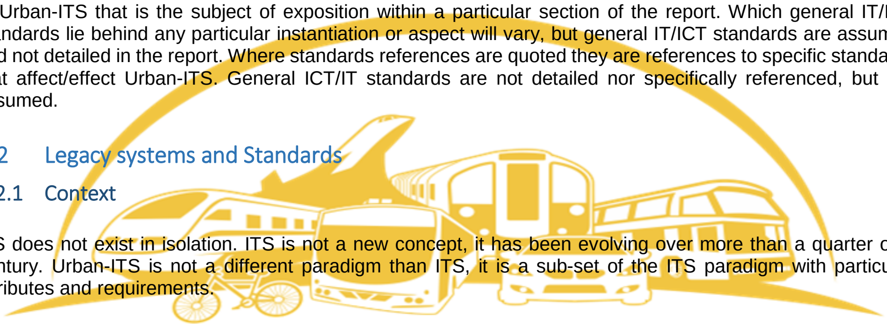
In order to address these issues it is imperative that Rc_SM01 and Rc_SM03- are progressed with the highest priority

Issues concerning legacy systems are addressed in Annex D.2 below

Urban-ITS, indeed all ITS, are specialised instantiations of so called “ICT” (Information and communication technology) systems, and as such use the common Standards for information technology/ information and communication technology, systems, developed by the major standardisation development organisations over many years, and lying behind every computer and communication. This pre-study is focussed on the specialised requirements for Urban-ITS and general ITS that may affect Urban-ITS. General IT/ICT standards are assumed and are not detailed nor discussed in this report except where such mention is specifically relevant for an aspect of Urban-ITS that is the subject of exposition within a particular section of the report. Which general IT/ICT standards lie behind any particular instantiation or aspect will vary, but general IT/ICT standards are assumed and not detailed in the report. Where standards references are quoted they are references to specific standards that affect/effect Urban-ITS. General ICT/IT standards are not detailed nor specifically referenced, but are assumed.

D.2 Legacy systems and Standards

D.2.1 Context



ITS does not exist in isolation. ITS is not a new concept, it has been evolving over more than a quarter of a century. Urban-ITS is not a different paradigm than ITS, it is a sub-set of the ITS paradigm with particular attributes and requirements.

These statements may be obvious, but the consequence is that there have been mechanised and electronic transport systems in use in urban environments, indeed principally in urban environments, since the middle of the 20th Century. These systems have evolved, been updated, and replaced, by Urban Administrations, largely in a 'silo' environment, for over half a century.

Traditionally transport systems change relatively slowly, with improvements in infrastructure design and build-out, and similar improvements in vehicle concept. The basic operation of a road today is much the same as it was in 1800, and that of a car much the same as it was in 1950. The coexistence of "old" and "new" systems coexisting has, therefore, historically not been problematic.

With information and communication technology, this is no longer the case. The pace of technology change – as well as the degree of interaction between ICTs – means that several "generations" of system do operate simultaneously. And where they do, either the newest must respect the oldest, or the oldest must be removed (or shielded).

The term "legacy system" is widely used to denote those systems which already exist. The term is sometimes used as if it were synonymous with "obsolete system", or "integration problem" but this is not true: as has been pointed out, in general a legacy is generally a valuable thing., but it has to be recognised that in some cases it can cause problems, particularly moving from an insular problem solving environment to a connected world of solutions.

Thus, with respect specifically to new Urban-ITS standards, all existing systems – no matter how effective – are by definition "legacy systems". Worse, those systems currently being procured will be "legacy" once implemented; and even systems at the design stage within leading industries will be legacy, unless the design is changed to meet the new standards.

Many of these systems will represent major investments for Urban Administrations, will be technically state-of-the-art, and (with luck) will work well. They will not be discarded just in order to meet a new standard, unless it is mandated by legislation or regulation.

As a consequence, a good new Urban-ITS design standard will be one that has positive benefits even where is it not in universal use, for some time to come. Conversely a standard that relies on universality, or even widespread adoption, for its effect will need to be cost-effective and easy to implement.

Fortunately, modern ITS are built on highly evolvable ICT platforms, and make use of hardware/software design methods that have evolved, in the mainstream ICT world, to maximise the opportunity for generational co-existence among systems.

It also involves an industry ecosystem that includes a huge range of technical interest groups, user groups, and support groups, handling issues ranging from connector "standards" (through bodies like IEEE), mobile telephony "standards" (through the GSMA) and World Wide Web "standards" (through the W3C), up to specialist groups handling domain-specific "standards" in areas such as banking, healthcare or policing. These initiatives complement, rather than replace, formal SDO-developed standards, and something similar will need to emerge for Urban-ITS.

Many of these systems have performed very efficiently in a non-connected world, for example local "green wave" and other traffic management and control systems. Many of these have existed without the 'benefit' of standards, and have performed as efficiently as the non-connected world would envisage, often using proprietary protocols designed or used by the system provider.

Even where standardisation has occurred, and largely because of the restriction of wired and wireless capabilities, and particularly because of the limitations of scope and imagination of their developers, until the late 1990's, the options to share and reuse data were both alien, and largely irrelevant.

The consequence is that most urban transport and ITSs are currently ‘silo’ activities, and often have significant migration issues. These issue are discussed in Section D.2.4; D.2.5; D.2.6.

D.2.2 Legacy system and standards benefits

While this section will discuss issues associated with legacy systems below (D.2.3, D.2.4; D.2.5; D.2.6.), these must be viewed in the context that the ITS Standards that are in widespread use have generally, per se, proven themselves to be useful. As we have seen, several hundred ITS standards now exist, and many are of use in the Urban–ITS domain. Further, ITS has benefitted from some general ICT standards and communications standards, some of which are proving to be particularly beneficial to assist in the instantiation, deployment and support of Urban-ITS (see D.2.3.1 – [D.2.3.36]).

Standards for public transport have supported efficient systems in that sector, without (until recently) having to consider other modes of transport.

Until DATEX II, traveller information standards could largely concern themselves only with control centres and messages to field devices and radio broadcasters.

Standards for electronic fee collection of toll charges have provided technical compatibility for much of the world, and have existed in a silo communicating between tolling stations and little transponders stuck to the vehicle windshield without having to worry about the rest of the car and roadway, unless it physically interfered with the transmission of their signals. They have standardised the data sets for toll collection.

But all of these areas have legacy systems that have benefitted the road user, and Urban Administrations for many years, and it is important to realise that these systems and standards will:

a) Continue to provide beneficial service for many years;
b) Will need to co-exist with the ‘connected’ world;
c) May offer solutions and/or data for other scenarios than those for which they were originally designed;
d) At some time, there may well be benefit for them to migrate to more connected solutions;
e) May be in a position to use new technologies (such as C-ITS connectivity) to improve their service offering and/or its cost efficiency.

It is not the focus of this pre-study to identify and list all of the existing standards that may continue to provide benefit to Urban Administrations, so this pre-study, while providing a list of existing ITS standards, and their probably use in each of the target areas (Annex O), and providing a summary of key legacy systems and Standards (D.2.3), analyses existing standards only in respect of relevance to its analysed ‘Use Cases’.

D.2.3 Legacy Standards for general use

This section summarises some general extant standards that are of particular benefit in the instantiation and deployment of Urban-ITS. These are only some specific instances, and this section does not attempt nor claim to summarise all such standards, and does not list any ITS specific standards unless they have been purpose designed for general use to achieve the objectives of instantiation, deployment and support of Urban-ITS.

Legacy standards (as opposed to legacy systems) have the advantage that their protocols, transactions and data are at least specified. Fining the appropriate standards, and ensuring that the transaction and data standards are adequately specified is a first, and most important challenge. For what was adequate in definition for a closed system, and work very well within that context, may not be adequate in and open system and data reuse paradigm.

Further, while the users may sit comfortably in their control rooms with the confidence that they are compliant to a “standardised” system, that system may well describe and define its attributes and data, even transactions in a way that is different from another standardised silo system.

Two of the most beneficial standards for ITS/Urban-ITS are XML and ASN.1. XML is particularly well suited for documentation specification and ASN.1 is particularly well suited for data specification because it is abstract and provides unambiguous data specification. UML is widely used in public transport standards (for example, the conceptual data models like Transmodel or IFOPT, physical data models like NeTEx), and increasingly by the MIS sector.

D.2.3.1 XML

Extensible Markup Language (XML) is a document mark-up language which has been designed by W3C to define a set of rules for encoding documents in a format which is both machine-readable and human-readable. It is determined in the W3C XML 1.0 Specification [61] and by several other related specifications. [62] all of which made are freely available.

The design goal objectives for XML are to provide simplicity, generality and usability across the internet. [63] It provides textual data format with strong support (via Unicode) for different human languages. Although the design of XML focuses on documents, it can also be used for the representation of arbitrary data structures [64] such as those used in web services. However, the data definition, while usually adequate, is not unambiguous (as in ASN.1). XML provides the most appropriate form for the exchange of document based information in most machine<>machine systems that are not bandwidth limited. This provides a strong basis for standardised use, but is not always suitable for some low latency and bandwidth constrained data/information transfers.

Several schema systems exist to aid in the definition of XML-based languages, while many application programming interfaces (APIs) have been developed to aid the processing of XML data.

XML has become the most widely used protocol for the interchange of data over the Internet. IETF RFC 7303[65] provides rules for the construction of internet media types for use when sending XML. It also defines the media types application/xml and text/xml, which say only that the data is in XML, and nothing about its semantics. The use of text/xml has been criticized as a potential source of encoding problems and it has been suggested that it should be deprecated.[66]

RFC 7303 also recommends that XML-based languages be given media types ending in +xml; for example image/svg+xml for Scalable Vector Graphics (SVG).

Further guidelines for the use of XML in a networked context may be found in RFC 3470 [67], which addresses aspects of designing and deploying an XML-based language.

Rc_Gn08- This study recommends that in all situations where document-type data is to be transferred, and there is not a particular bandwidth restriction, XML should be used as the standard transfer syntax according to ISO8825-4”.

D.2.3.2 ASN.1

Abstract Syntax Notation One (ASN.1)(ISO 8824/8825 series) is a family of standards and notation that describes rules and structures for representing, encoding, transmitting, and decoding data in computer systems, telecommunications and computer networking. It does this in a completely abstract and unambiguous manner, and so is suitable to provide a definition for any data, regardless of the operating system or concept in which it is being used, and whose context the definition may well define, and between different, otherwise incompatible systems. The formal rules enable representation of objects that are independent of machine-specific encoding techniques. Formal notation makes it possible to automate the task of validating whether a specific instance of data representation abides by the specifications. In other words, software tools can be used for the validation.[68]

ASN.1 is a formal notation used for describing data transmitted by telecommunications protocols, regardless of language implementation and physical representation of these data, whatever the application, whether complex or very simple. It defines a formalism for the specification of abstract data types. The notation provides a certain number of pre-defined basic types such as:

integers (INTEGER),
booleans (BOOLEAN),
character strings (IA5String, UniversalString...),
bit strings (BIT STRING), etc.,

and makes it possible to define constructed types such as:

structures (SEQUENCE),
lists (SEQUENCE OF),
choice between types (CHOICE),etc.

Subtyping constraints can be also applied on any ASN.1 type in order to restrict its set of values.

Unlike many other syntaxes which claim to be extensible, ASN.1 offers extensibility which addresses the problem of, and provides support for, the interworking between previously deployed systems and newer, updated versions designed years apart.

ASN.1 sends information in any form (audio, video, data, etc.) anywhere it needs to be communicated digitally. ASN.1 only covers the structural aspects of information (there are no operators to handle the values once these are defined or to make calculations with). Therefore it is not a programming language.

ASN.1 definition can be contrasted to the concept in ABNF of "valid syntax", or in XSD of a "valid document", where the focus is entirely on what are valid encodings of data, without concern with any meaning that might be attached to such encodings. That is, without any of the necessary semantic linkages.

One of the main reasons for the success of ASN.1 is that this notation is associated with several standardized encoding rules such as the BER (Basic Encoding Rules), or more recently the PER (Packed Encoding Rules), which prove useful for applications that undergo restrictions in terms of bandwidth. These encoding rules describe how the values defined in ASN.1 should be encoded for transmission (i.e., how they can be translated into the bytes 'over the wire' and reverse), regardless of machine, programming language, or how it is represented in an application program. ASN.1's encodings are more streamlined than many competing notations, enabling rapid and reliable transmission of extensible messages -- an advantage for wireless broadband. Because ASN.1 has been an international standard since 1984, its encoding rules are mature and have a long track record of reliability and interoperability.

An ASN.1 definition can be readily mapped (by a pre-run-time processor) into a C or C++ or Java data structure that can be used by application code, and supported by run-time libraries providing encoding and decoding of representations in either an XML or a TLV format, or a very compact packed encoding format. As an example of ASN.1's universality, there are tools that have been ported to over 150 different computing platforms.

ASN.1 is widely used in industry sectors where efficient (low-bandwidth, low-transaction-cost) computer communications are needed, but is also being used in sectors where XML-encoded data is required (for example, transfer of biometric information).

To obtain full interoperability, data needs to be defined unambiguously, concisely, and able to be ported into any system. Clearly interoperability is impeded if different definition notations are used for different systems. ASN.1 has been well proven since 1984 and passed this test.

In terms of migration and local practices, where another form of data specification prevails//is used for sector specific/legacy reasons, a definition in ASN.1 should also be provided in order to enable interoperability.

Rc_Pl07- ITS data/Urban-ITS data defined in standards or data-registries should be defined in ASN.1. (Note: this does not preclude that the data may additionally also be defined in other formats if local practices require this).

D.2.3.3 ISO 14817— Requirements for TICS central data registry and TICS data dictionaries; parts 1,2 & 3

Registry' should be taken to mean an 'ITS Meta-data registry'. (Note: for those unfamiliar with the term, "meta-data" means "an underlying definition or description". Thus a "meta-data registry" contains definitions of how data is to be defined.)

Specifically, this International Standard specifies the definitions of:

- a framework used to identify and define all information exchanges;
- a framework used to extend standardized information exchanges to support local customizations and combinations;
- information modelling method for defining ITS data concepts, when used;
- meta attributes used to describe, standardize and manage each of the data concepts defined within this framework;
- requirements used to record these definitions; and formal procedures used to register these definitions within the meta-data registry.

The 'ITS Meta-data registry'/data dictionaries described by this International Standard support, and are designed to include, data concepts using alternative international, regional or national system architecture methodologies or techniques. Common 'ITS Data Registries' will ease migration and interoperability between such approaches and help to harmonise the use of data concepts between different standards.

D.2.3.4 ISO TR 12859 Data privacy in ITS Service provision [Technical Report]

The scope of this project is to provide a Technical Report to give guidance to developers of ITS standards and systems in respect to data privacy aspects and associated legislative requirements when developing and revising ITS Standards and deliverables.

The deliverable is a technical report and not a Standard, and provides general guidelines rather than a mandated requirement.

National laws shall always take precedence over International guidelines, and readers should interpret these guidelines in the context of their National legislation. Readers in EU Member States should be aware that the European Data Privacy Directive and its succeeding instruments are mandatory within EU Member states. Cases made to International courts are likely to give precedence to a combination of the OECD Recommendation and either the European Data Privacy Directive or APEC Privacy Framework as appropriate.

Those requiring guidance in respect of specific data protection and data privacy requirements in respect of ITS 'Probe' Data are referred to ISO 24100,"Basic principles for personal data protection in probe vehicle information services ".

D.2.3.5 ISO 14813-1 ITS services

This International Standard provides a description of the primary services that an ITS implementation can provide to ITS users. Those services with a common purpose can be collected together in "'ITS service domains'" and within these there can be a number of "'ITS service groups'" for particular parts of the domain. This International Standard identifies thirteen ITS service domains, within which numerous groups are then defined.

In the latest (2015) version of the standard an indication has been provided to show the relationship of each service to Cooperative-ITS. Cooperative-ITS does actually provide services that have previously been unavailable, notably those for ITS users who are on the move. For many other services, Cooperative-ITS can actually be seen as a "delivery mechanism" that can be used to enhance their use and availability. Thus for some services, Cooperative-ITS is essential, whilst for others it adds value. However, for a small number of services it is not relevant.

This International Standard is intended for use by at least two groups of people involved in the ITS sector. The first group is those looking for ideas about the services that ITS implementations can provide and the second is those who are developing ITS related standards.

For the first group, this International Standard provides service descriptions that can act as the catalyst for more detailed descriptions. It is perfectly possible for the level of detail in the service descriptions to differ from one ITS implementation to another. This may depend on whether or not the initial phase of the ITS implementation is to be supported by and benefit from the creation of an ITS architecture, even if that architecture is a sub-set of a national ITS architecture, and whether this architecture is based directly on individual services, or on groups of services.

For standards developers, this International Standard is applicable to the working groups of ISO TC204 and other Technical Committees in ISO, CEN or other SDO's who are developing standards for the ITS sector and associated sectors whose boundaries cross into the ITS sector (such as some aspects of public transport (transit), plus inter-modal freight and fleet management). This International Standard is designed to provide information and explanation of services that can form the basis and reason for developing standards'.

This International Standard is in itself, by its nature, advisory and informative. It is designed to assist the integration of services into a cohesive reference architecture, as well as promoting interoperability in the creation of sub-systems and components, and the use of common data definitions. Specifically, services defined within the service groups are intended to be the basis for definition of 'Use Cases', 'user needs' or ''user service requirements' depending on the methodology being used to develop the resultant ITS architecture, along with definition of applicable data within data dictionaries, as well as applicable communications and data exchange standards.

D.2.3.6 ISO 14813-5 Describing Architecture in ITS Standards

An ITS architecture is a framework for ITS deployments. It is a high level description of the major elements and the interconnections among them. It provides the framework around which the interfaces, specifications and detailed ITSs designs can be defined. An ITS architecture is not a product design, nor a detailed specification for physical deployment, and it is not specific to any one location. The title should be expanded to be "Intelligent Transport Systems Architecture" or to put it another way, "Systems Architecture for Intelligent Transport Systems (ITS)". This second title is perhaps the closest general terminology, but that term is sometime too specific to include many of the other aspects often associated with the term 'ITS Architecture', e.g. deployment plans.

The purpose of creating an ITS architecture is to describe what is needed to provide one or more ITS services in ways that will enable the actual ITS deployment to maximise the efficiency with which the services are provided, interoperability between sub-systems and components, and the use of multimodality in the way that the services are used in what has become a complex domain that is rapidly evolving and developing.

This International Standard defines

a) Terminology to be used when documenting or referencing aspects of architecture description in ITS standards.
b) The requirement that aspects of system architecture are to be documented and described in ITS standards.

In compiling this standard, the authors have assumed that contemporary systems engineering practices are used. Such practices are not defined within this standard.

D.2.3.7 ISO 14813-6 Use of ASN.1 in ITS Standards

This International Standard provides a formal means to enact several ISO TC204 resolutions in relation to specifying data concepts that are to be used in ITS International Standards. These resolutions were designed to ensure consistent, unambiguous and interoperable data exchange and documentation of these exchanges. IS14813-6 provides the necessary specifications to ensure consistent interpretation of these resolutions by providing formal references to several standards and in some cases specifying additional rules to promote greater consistency among standards. It is currently undergoing a revision by ISO TC204 to improve its content.

It is important to be clear that this International Standard does not require the use of ASN.1 for anything other than providing data definition in a common and flexible form. This International Standard makes specific provision for the support of use of other extant standardised syntax notations (such as EDIFACT, XML etc.) whilst maintaining interoperability and reuse by also defining these practises within an ASN.1 data definition.

Specific implementation requirements, other than those determined in the syntax notations identified above, are beyond the scope of this document.

This document also provides a means where particular ITS sector requirements, or existent International Standards, that require particular message forms and procedures that are expressed in other notations (e.g. EDIFACT, XML etc), may be referenced and reused by other ITS applications. Thus it presents an unambiguous system for identifying all the different data types and describing them and enabling them to be recorded in a common ITS Meta-data registry, and in ITS International Standards, in a common and consistent form.

D.2.3.8 ISO 17452 Using UML for ITS interfaces

This Technical Report gives guidelines for using the "Unified Modelling Language" for defining and documenting ITS/TICS interfaces. It presents these guidelines in the context of a case study for the creation of an ITS/TICS data dictionary and submissions to the ITS/TICS meta-data registry.

In UML, an interface is a collection of operations that are used to specify a service of a class or component.

ITS/TICS meta-data registry as defined in ISO 14817 builds on this definition by mapping an operation to a message, and then it extends the definition of an interface to be a dialogue (i.e. a collection of messages with in an implied protocol). This technical report conforms to these steps.

D.2.3.9 ISO 24097 Using Web Services in ITS service provision

Using web services (machine-machine delivery) for ITS service delivery — Part 1: Realisation of interoperable web services

The scope of this international standard is to provide specification for ITS sector WSs. Figure D–1 shows a high level Use Case of WSs. The main entities are: service provider, service requester, and registry. Registry includes business information and technical information (interface and policy). Figure D–2 also depicts the actions of service provider and service requester in italics.

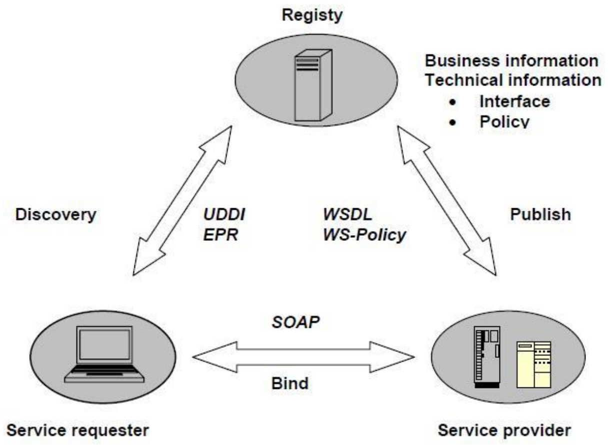


Figure D–1: WS Use Case

The first subject of this International standard is how to realize these Use Case requirements.

The second subject of this international standard is international standard WS architecture. In order to construct web services many functionalities need to be defined. To cope with this complex situation, an architecture is required. In this international standard SOA is applied. Another adopted principle is the use of metadata description of WS. Metadata are higher level (or abstract) description of WS behaviour. It enables auto-generation of both service program and consumer program. Metadata description provides a more simple and stable description of service specification and management. It also facilitates flexible evolution of ITS WS.

The third subject of this international standard is to provide a preferred user interface format for international standard WS. Figure D–1 shows the relationship between service provider and service consumer. In the ITS sector there are normally two possible combinations:

- (ITS sector service provider, ITS sector service consumer);
- ITS sector service provider, non-ITS sector service consumer).

There are many examples of (ITS sector service provider, non-ITS sector service consumer) combinations. In general service consumer's WS program development is considered to be a difficult task, so it is important to simplify the development path. The service evolution process is also important. In some cases, services may be provided for anonymous users. In this case the service provider cannot enforce the user to switch to a newly developed service. An efficient service development path and evolution process is defined in this international standard.

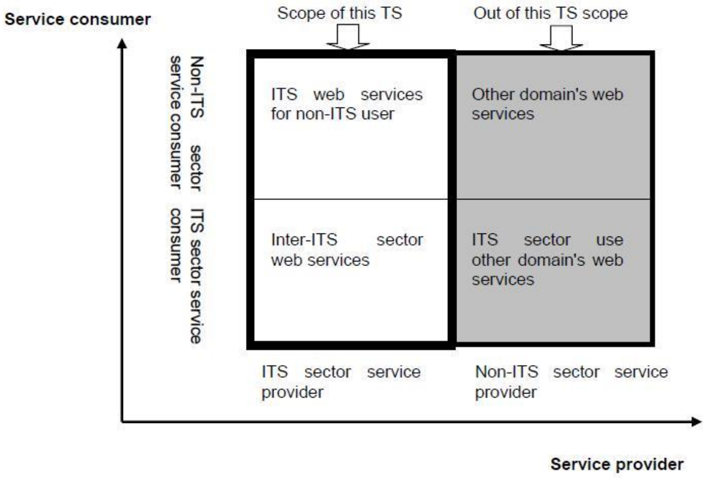

Service consumer
Scope of this TS
Out of this TS scope
Non-ITS sector service consumer
ITS sector service consumer
ITS web services for non-ITS user
Other domain's web services
Inter-ITS sector web services
ITS sector use other domain's web services
ITS sector service provider
Non-ITS sector service provider
Service provider

Figure D–2: Service provider and service consumer combination

Using web services (machine-machine delivery) for ITS service delivery — Part 2: Elaboration of interoperable web services' interfaces

As described in ISO 24097 Part1, the, second phase standards of web services metadata were delivered through 2007 to 2014 from standardization organization like W3C and OASIS, and continue to evolve. There has been to date few documents that explain how to apply new metadata standards in a consistent and comprehensive manner. Without such assistance it is not easy to use relevant standards in a consistent manner.

In addition, making WS secure is essential, but realizing secure WS requires quite vast cryptography technologies in the background, such as basic XML signature and XML encryption. So applying these fundamentals could become a major hurdle to overcome.

This work has therefore been elaborated in two Parts, Part 2 and Part 3. Part 2 (this document) covers mainly Interface metadata and Part 3 focus QoS metadata.

This deliverable (Part 2), 'Interface Metadata' covers:

- Interface metadata standard version selection (WSDL 1.1 or WSDL 2.0)
- SOAP version selection (SOAP 1.1 or SOAP 1.2)
- WSDL 1.1 SOAP 1.2 binding
- WS-I conformant WS development

D.2.3.10 ISO TR 24098 Procedures for developing ITS deployment plans [Technical Report]

The scope of this technical report is to describe the procedure for developing ITS deployment plans utilising ITS architectures. The document consists of the basic policy of ITS deployment and the procedure for developing ITS deployment plans. Framework, procedure, and requirements for the developing regional ITS deployment plans utilising regional ITS architecture are reported.

D.2.3.11 ISO TR 24529 / ISO 19501 Using UML in ITS Standards [Technical Report]

The scope of this Technical Report is the use of UML within international standards technical specifications and technical reports and related documents.

This Technical Report, discusses the application of the "Unified Modelling Language" [UML] to the development of standards within the context of " Intelligent Transport Systems"

The base standard recommended is “Unified Modeling Language” (ISO 19501), which has become the predominant object oriented modelling language, and TR 24529 prefers this modelling language over other object oriented methodologies.

UML is widely used in Public Transport standards, and increasingly by the MIS sector to develop systems and specifications. Traffic Management (DATEX II), modelling is largely specified using UML.

The Unified Modeling Language (UML) is a general-purpose modelling language with a semantic specification, a graphical notation, an interchange format, and a repository query interface. It is designed for use in object-oriented software applications, including those based on technologies recommended by the Object Management Group (OMG). As such, it serves a variety of purposes including, but not limited to, the following:

- a means for communicating requirements and design intent;
- a basis for implementation (including automated code generation);
- a reverse engineering and documentation facility.

As an international standard, the various components of UML provide a common foundation for model and metadata interchange:

- between software development tools;
- between software developers;
- between repositories and other object management facilities.

The existence of such a standard facilitates the communication between standardized UML environments and other environments.

The current version of UML, in widespread use, is version 2.0.

D.2.3.12 ISO 24531 Using XML in ITS Standards, Data Registries, and Data Dictionaries

This International Standard has been developed to assist ITS standards developers and users of ITS standards who wish to use XML, by providing a consistent definition of the rules and rule references for the use of XML within ITSs. The scope of the International Standard is to define consistent rules and rule references to provide a framework to be used when implementing XML based applications in ITS, and particularly, in specifying XML in ITS standards, ITS data registries and ITS data dictionaries. This International Standard also provides guidance and examples in respect of the use of XML in ITS, and the elaboration of XML within the ASN.1 data definitions required by ISO 8825-4, ISO 14813-6 and ISO 14817.

This document defines:

- Rules concerning the creation of XML Schemas for ensuring interoperability in various types of ITS applications that use XML. –Normative– (clause 7);
- Rules for using XML for the purpose of reusing XML Schemas. –Normative– (clause 7);
- Rules concerning registration and management of XML components in data dictionaries and data registries. –Normative– (clause 8);
- Examples of the use of XML in ITS applications. –Informative– (Annex A);
- Representation of IRI (International Resource Identifiers) and/or id related constructs of this standard – Informative– (Annex B);
- Schema header template – Informative– (Annex D);
- Example of registering XML constructs –Informative– (Annex E);
- Example of automatic generation of an XML Schema from UML. –Informative– (Annex F);
- Applying ASN.1 encoding for XML document. –Informative– (Annex G).

D.2.3.13 ISO TR 24532 Using CORBA in ITS Standards, Data Registries, and Data Dictionaries [Technical Report]

This technical report clarifies the purpose of CORBA and its role in ITS; it provides some broad guidance on usage, and it prepares the way for further ISO deliverables on the use of CORBA in ITS.

D.2.3.14 ISO TR 25100 User guide for harmonisation of data concepts [Technical Report]

The scope of this Technical Report is harmonisation of data concepts that are being managed by meta-data registry and data dictionaries such as those described in ISO 14817:2002

This technical report describes a proposed process for harmonisation of such data concepts to arrive at preferred definitions for use in formal standards, specifications, technical reports and information architecture (data) models. The proposal is based on consideration of harmonisation process used by three international groups involved in the ITS sector and in the wider sector of transport and logistics information and control systems.

D.2.3.15 ISO TR 25102 ITS Use Case pro-forma Template [Technical Report]

This Technical Report discusses the application of "Use Cases" for requirements and related aspects of a software intensive system such as an intelligent transport system.

The scope of this Technical Report is to provide a pro-forma template for the consistent consideration and development of "Use Cases" within ITS International Standards and associated deliverables.

NOTE This Technical Report provides a pro-forma template, the elements may be augmented or omitted as applicable. The technical report provides guidance to develop Use Cases and is a guide rather than a prescription to be followed without variation.

D.2.3.16 ISO TR 26999 Using process oriented methodology in ITS standards [Technical Report]

The scope of this Technical Report is the use of "Process Oriented Method" (POM) within international standards, technical specifications and technical reports and related documents.

This Technical Report, discusses the use of POM in the development of high-level system architectures for ITS. It is based on the results of work of the FRAME-S project and the FRAME Forum. The text from section 3 through to the end of the standard is therefore reproduced by kind permission of the European Commission and the FRAME Forum.

D.2.3.17 ISO TS 17427— Part 2: Framework overview [Technical Report]

This part of ISO/TS 17427 characterizes and provides an overview of the framework which enables collaborative and Cooperative-ITS to operate and defines the characteristics and components of a Cooperative-ITS (C-ITS), its context and relevance for ITS service provision, and provides references to International Standards deliverables where specific aspects of C-ITS are defined. The objective of this Technical Report is to raise awareness of and consideration of such issues and to give pointers, where appropriate, to International Standards deliverables existing that provide for all or some of these aspects. This Technical Report does not provide specifications for solutions of these issues.

This part of ISO/TS 17427 is agnostic in respect of technology and operates with whatever communications and hardware technologies can support its functionalities.

D.2.3.18 ISO TS 17427— Part 3: Concept of operations (ConOps) for 'Core' systems [Technical Report]

This part of ISO/TR 17427 provides the high-level generic requirements for the "Concept of operations" for a 'Core System' (CorSys) to support C-ITS service delivery. It is intended as an input to the planning and development elaboration of core functions that will support the deployment of cooperative intelligent transport systems (C-ITS) in a connected vehicle-highway paradigm

The objective of this part of ISO/TR 17427 is to raise awareness of and consideration of such issues and to give pointers, where appropriate, to standards existing that provide specifications for all or some of these aspects. This part of ISO/TR 17427 does not provide specifications for solutions of these issues.

This part of ISO/TR 17427 is agnostic in respect of technology and operates with whatever (and probably multiple) communications technologies and hardware technologies that can support its functionalities.

D.2.3.19 ISO TR 17427— Part 4: Minimum system requirements and behaviour for core systems [Technical Report]

The scope of this part of ISO 17427 is, as an informative document, to identify potential critical minimum system requirements and behaviour for core systems issues that C-ITS service provision may face or introduce, to consider strategies for how to identify, control, limit or mitigate such issues. The objective of this part of ISO 17427 is to raise awareness of and consideration of such issues and to give pointers, where appropriate, to subject areas and, where available, to existing standards deliverables that provide specifications for all or some of these aspects. This part of ISO 17427 does not provide specifications for solutions of these issues.

D.2.3.20 ISO TR 17427— Part 6: Core systems risk assessment methodology [Technical Report]

The scope of this 'C-ITS Risk Assessment Technical Report' is to identify critical technical and financial risks that may impact the core system deployment supporting C-ITS vehicle and highway systems service provision, and to provide means to evaluate such risks.

This 'Risk Assessment Methodology' Technical Report is designed to embrace C-ITS vehicle and highway systems where there is some institutional involvement and support, by the direct or indirect provision of core system support, and it is the risks associated with the deployment of 'Core Systems' that provide the focus of this Technical Report.

This Technical Report does not provide a calculated 'global' risk assessment for C-ITS, but identifies the principal causes of risk, and provides a consistent methodology for a jurisdiction, core system operator, or application service provider, to assess the risks that they face. The objective of this report is to raise awareness of and consideration of such issues and to give pointers, where appropriate, to standards deliverables existing that provide specifications for all or some of these aspects. This Technical Report does not provide specifications for solutions of these issues.

D.2.3.21 ISO TR 17427— Part 7: Privacy aspects [Technical Report]

The scope of this 'C-ITS Privacy Aspects' Technical Report is as an informative document to identify potential critical privacy issues that C-ITS service provision may introduce; to consider strategies for how to control, limit or mitigate such privacy issues; and to give pointers, where appropriate, to standards deliverables existing that provide specifications for all or some of these aspects. and to limit the risk of exposure to the financial consequences of privacy issues.

The objective of this report is to raise awareness of and consideration of such issues. This Technical Report does not provide specifications for solutions of these issues.

D.2.3.22 ISO TR 17427— Part 8: Liability aspects [Technical Report]

The scope of this 'C-ITS Liability Aspects' Technical Report is as an informative document to identify potential critical liability issues that C-ITS service provision may introduce; to consider strategies for how to control, limit or mitigate such liability issues; and to give pointers, where appropriate, to standards deliverables existing that provide specifications for all or some of these aspects, and to limit the risk of exposure to the financial consequences of liability issues.

The objective of this report is to raise awareness of and consideration of such issues. This Technical Report does not provide specifications for solutions of these issues.

D.2.3.23 ISO TR 17427— Part 9: Compliance and enforcement aspects [Technical Report]

The scope of this 'C-ITS - Compliance and enforcement aspects' Technical Report is as an informative document to identify potential critical compliance and enforcement aspects issues that C-ITS service provision may face or introduce; to consider strategies for how to identify, control, limit or mitigate such issues. The objective of this report is to raise awareness of and consideration of such issues and to give pointers, where appropriate, to standards deliverables existing that provide specifications for all or some of these aspects.

This Technical Report does not provide specifications for solutions of these issues.

D.2.3.24 ISO TR 17427— Part 10: Driver distraction and information display [Technical Report]

The scope of this Technical Report, 'C-ITS Driver distraction and information display', is as an informative document to identify potential critical driver distraction and information display issues that C-ITS service provision may introduce; to consider strategies for how to identify, control, limit or mitigate such issues. The objective of this report is to raise awareness of and consideration of such issues and to give pointers, where appropriate, to standards deliverables existing that provide specifications for all or some of these aspects. This Technical Report does not provide specifications for solutions of these issues.

Existing rules govern the use of technology inside vehicles to reduce driver distraction. This Technical Report identifies and discusses how C-ITS applications may fit within these existing rules and whether they raise additional risks and require further action.

D.2.3.25 EN 12896 Transmodel

The standard *Reference Data Model for Public Transport* published EN12896:2006 is known as Transmodel V5.1. Developed by a range of European projects (Cassiope, EuroBus, Harpist, Titan) it has proven its importance through diverse implementations Europe-wide. Three Transmodel-based standards have been developed or initiated after 2006:

- EN 28701: 2009 - Identification of Fixed Objects for Public transport (IFOPT): a complementary data model to Transmodel;(see D.2.3.26);
- TS16614-1 to 3: Network and Timetable Exchange (NeTEx): data exchange format based on Transmodel relating to public transport planned data for network, timetable and fares. (see D.2.3.27);
- EN15531-1 to 4 and TS15531-5: Service Interface for Real-time Information (SIRI): data exchange format based on Transmodel relating to public transport operations; (see D.2.3.28).

In order to build a coherent series of standards for public transport (Transmodel/NeTEx/SIRI), CEN TC278 WG3 took the decision to renew the standard in order to incorporate the new requirements formulated by IFOPT, SIRI, NeTEx and harmonise with overlapping standards, in particular DATEX II.

Transmodel V6 respects several recommendations as regards the methodology: modelled in UML, it is described in a modular form in order to facilitate understanding and use of the model.

Transmodel v6 splits into the following parts:

- Public Transport Reference Data Model - Part 1: Common Concepts (concepts shared by the different functional domains);
- Public Transport Reference Data Model - Part 2: Public Transport Network (routes, lines, journey patterns, timing patterns, service patterns, scheduled stop points and stop places); this part corresponds to the network description as in Transmodel V5.1 and is harmonised with/extended by the relevant parts of IFOPT;
- Public Transport Reference Data Model - Part 3: Timing Information and Vehicle Scheduling (runtimes, vehicle journeys, day type-related vehicle schedules);
- Public Transport Reference Data Model - Part 4: Operations Monitoring and Control (operating day-related data, vehicle follow-up, control actions, events, incidents);
- Public Transport Reference Data Model - Part 5: Fare Management (fare structure and access rights definition, sales, validation, control);
- Public Transport Reference Data Model - Part 6: Passenger Information (passenger information specific concepts, user queries);
- Public Transport Reference Data Model - Part 7: Driver Management (composed of Driver Scheduling (day-type related driver schedules), Rostering (ordering of driver duties into sequences according to some chosen methods), Driving Personnel Disposition (assignment of logical drivers to physical drivers and recording of driver performance);
- Public Transport Reference Data Model - Part 8: Management Information and Statistics (registered raw data).

Status:

Transmodel v5.1 has been published under the number EN 12896:2006.

Parts 1 to 3 have been issued under the number prEN12896-1:2015, prEN12896-2:2015, prEN 12896-3:2015.

Parts 4 to 8 have not yet been developed, and are overdue pending availability of project team funding. When fully published, Transmodel V6 will replace V5.1.

Web site : www.transmodel-cen.eu.

D.2.3.26 EN 28701 IFOPT

The standard IFOPT (Identification of Fixed Objects for Public Transport) has been initiated thanks to the conjunction of needs from several countries to standardize the identification and representation of the transport-related fixed objects.

Several particular problems apply to such data. One of them is the fact that the same fixed objects (stops, interchanges) are often used by several operators or several modes and appear with different descriptions and identifiers, so that complex correspondence tables have to be set up and maintained to ensure inter-modal trip planning, for instance, where it is important to uniquely identify the stops.

Another problem appears when apparently the same fixed objects (e.g. a train station, a bus stop) are considered as simple (points) or complex (clusters of points or areas) depending on the viewpoint of a subsystem (for instance, precision of the map). This aspect is often solved by the identification of several objects as one single object (a type of projection), but engenders at the same time the problem of the location referencing of the complex object that has been considered as simple, without a precise method for locating it in space.

Another aspect of the problem of referencing fixed objects for public transport is that they are often related to urban infrastructure. The latter is often relevant and used for the description of these objects. Topographical descriptors are introduced to characterise objects that are specific to public transport and, furthermore, knowledge of the access points to buildings and other infrastructure objects may be relevant for journey planning. In this case, if any change of the urban infrastructure occurs, Public transport specific data have to be updated and, in a multi-operator context, a certain incoherence of information is likely to appear.

The identification of fixed objects needs to be managed at a national level and the standard has to take into account the respective national organisational models for administering data.

The sub-models of IFOPT are represented in the figure below.

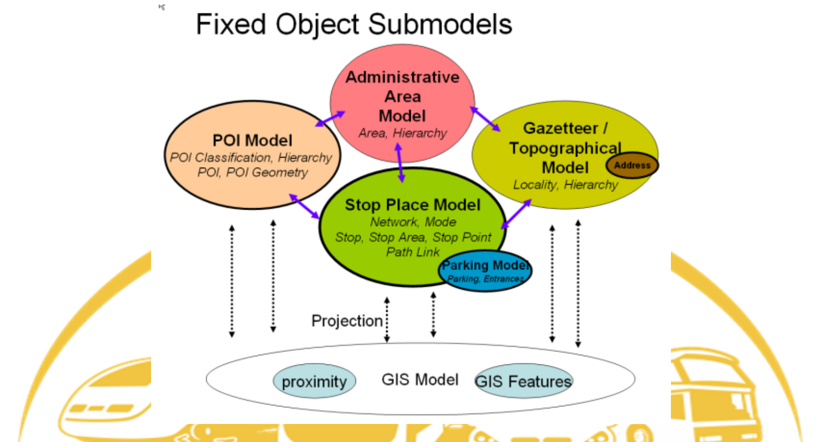

Fixed Object Submodels
Administrative Area Model
Area, Hierarchy
POI Model
POI Classification, Hierarchy
POI, POI Geometry
Gazetteer / Topographical Model
Address
Locality, Hierarchy
Stop Place Model
Network, Mode
Stop, Stop Area, Stop Point
Path Link
Parking Model
Parking, Entrances
Projection
proximity
GIS Model
GIS Features

Figure D–3: IFOPT Fixed Object Submodels

IFOPT has been developed in the context of CEN TC278 WG3 SG6 and is built as an extension of Transmodel to cover concepts related to the physical components of stops. It defines the principles of modelling and identification of the main public transport-related fixed objects such as:

- stop places and its components such as quays, boarding positions, vehicle stopping positions, etc.
- navigation paths, in particular for walking
- entrances
- equipment and facilities
- accessibility features
- etc.

IFOPT was published in 2009 as EN 28701: Intelligent transport systems. Public transport. Identification of Fixed Objects in Public Transport (IFOPT)http://www.transmodel-cen.eu

Even if IFOPT has been built in relation to Transmodel, several overlappings appeared during the development of NeTEx (TC278 WG3 SG9). This is the reason why IFOPT has been harmonised with Transmodel by the NeTEx project.

The current IFOPT version is currently published by NeTEx-Part 1: 2014 and Transmodel- Part 1&2:2015.

Web site : http://www.naptan.org.uk/ifopt

D.2.3.27 NeTEx (Network and Timetable Exchange) CEN 16614

NeTEx is an XML based *data exchange format and a set of services dedicated to scheduled (planned) public transport data.* It is based on Transmodel v6 (and thus on IFOPT) and designed for most public transport business needs, covering passenger information systems, planning systems, AVMS (Automated Vehicle Monitoring Systems) and fare management systems.

NeTEx is divided into three parts:

Part 1: network topology (networks, lines, routes, stops, connections and geographic element, etc.). NeTEx (Part 1 also provides a framework and reusable objects used by all the other parts.)
Part 2: timing information (vehicle journeys passing times, day types, calendars, etc.)
Part 3: Description of the tariff offer (fare products, access rights, usage parameters, prices, etc.).

The figure below describes the Transmodel data domain, covered by NeTEx (Transmodel defining the concepts, and NeTEx providing a mean to exchange them).

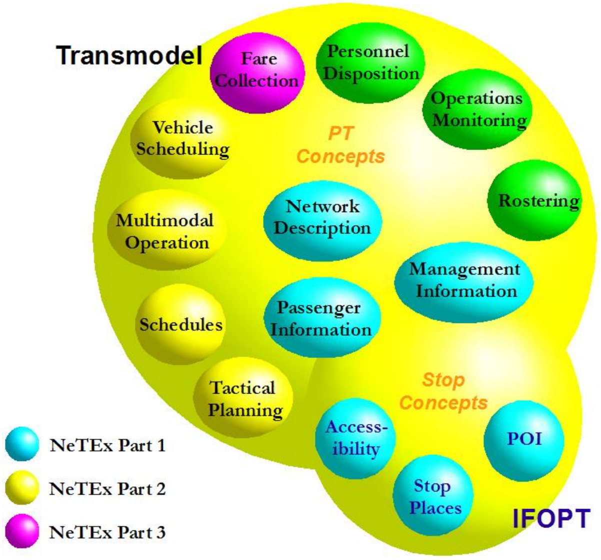

Transmodel
Fare Collection
Personnel Disposition
Operations Monitoring
Vehicle Scheduling
PT Concepts
Rostering
Multimodal Operation
Network Description
Management Information
Schedules
Passenger Information
Tactical Planning
Stop Concepts
Access-ibility
POI
Stop Places
IFOPT
NeTEx Part 1
NeTEx Part 2
NeTEx Part 3

Figure D–4: NeTEx

Status :
NeTEx Parts 1 to 3 have been published under the numbers
CEN TS 16614-1: Public transport. Network and Timetable Exchange (NeTEx). Part 1 - Public transport network topology exchange format.
CEN TS 16614-2: Public transport. Network and Timetable Exchange (NeTEx). Part 2 - Public transport scheduled timetables exchange format
CEN TS 16614-3: Public transport. Network and Timetable Exchange (NeTEx). Part 3 - Public transport network fare information exchange format.

NOTE: for the domains 'Fare Collection' & 'Passenger Information' & 'Management Information', there is only a partial alignment Transmodel/NeTEx and an update of Transmodel is necessary.

The domains 'Operations Monitoring', 'Personnel Disposition'/'Driver Scheduling', 'Rostering' are covered only by Transmodel V5.1 and an update with the current Transmodel/NeTEx version is necessary.

Web site: www.netex-cen.eu

D.2.3.28 SIRI (Service Interface for Real-time Information) EN 15531

The main scope of this standard is to provide operators and manufacturers a standard framework to exchange data concerning public transport real time information, CEN TC278/WG3/SG7 launched the SIRI project (Service Interface for Real-time Information) in 2004.

As for NeTEx, the underlying conceptual definitions used by SIRI are provided by Transmodel.
Initially targeted exchanges are mainly inter-system communication (AVMS to passenger information system for example), and SIRI 2 (2014) has completed it with the ability to communicate with end user's devices (mainly mobile phones and web browsers).

SIRI defines very broadly the concept of real time as being any changes to the information introduced after the timetable publication (SIRI information scope being limited to one single day).

As such, SIRI does not provide a full description of the planned transport offer (see NeTEx), but only the changes to this offer, assuming that at least the main components of the transport network, like stops and lines, are already known.

SIRI offers a set of web services (SOAP) for accessing the information. The most widely known SIRI service provides the estimated passing time at a specific stop (Stop Monitoring Service. But SIRI offers many other services: 'General Messaging Service', 'Vehicle Monitoring Service', 'Situation Exchange', 'Facility Monitoring', 'Production Timetable Service', 'Estimated Timetable Service', 'Stop Timetable Service', 'Connection Timetable Service' and 'Connection Monitoring Service'.

The figure below describes the Transmodel data domain, covered by NeTEx and SIRI (Transmodel defining the concepts, and NeTEx/SIRI providing a mean to exchange them).

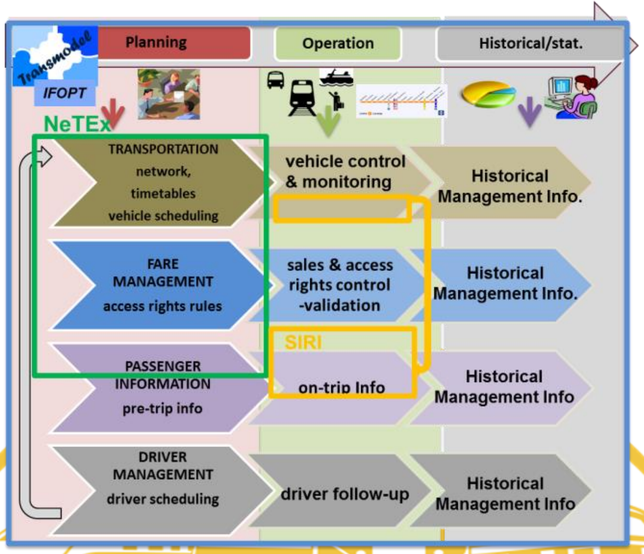

Transmodel
IFOPT
NeTEx
Planning
Operation
Historical/stat.
TRANSPORTATION network, timetables vehicle scheduling
vehicle control & monitoring
Historical Management Info.
FARE MANAGEMENT access rights rules
sales & access rights control -validation
Historical Management Info.
SIRI
PASSENGER INFORMATION pre-trip info
on-trip Info
Historical Management Info
DRIVER MANAGEMENT driver scheduling
driver follow-up
Historical Management Info

Figure D–5: Transmodel data domain

Status:
SIRI has been published in 5 parts under the numbers:

EN 15531-1: Public transport. Service interface for real-time information relating to public transport operations - Business case.
EN 15531-2: Public transport. Service interface for real-time information relating to public transport operations – Communication.
EN 15531-3 : Public transport. Service interface for real-time information relating to public transport operations – Services.
EN 15531-4: Public transport. Service interface for real-time information relating to public transport operations - Facility monitoring service.
CEN TS 15531-5: Public transport. Service interface for real-time information relating to public transport operations- Situation exchange service.

Web site http://www.siri.org.uk/

D.2.3.29 DATEX/DATEX II

This family of Technical Specifications (CEN/TS16157-x) specifies and defines component facets supporting the exchange and shared use of data and information in the field of traffic and travel.

The component facets include the framework and context for exchanges, the modelling approach, the data content, the data structure and relationships and the communications specification.

This family of Technical Specifications are applicable to:

- traffic and travel information which is of relevance to road networks (non-urban and urban);
- public transport information that is of direct relevance to the use of a road network (e.g. road link via train or ferry service).

This family of Technical Specifications establishes specifications for data exchange between any two instances of the following actors:

- Traffic Information Centres (TICs);
- Traffic Control Centres (TCCs);
- Service Providers (SPs).

Use of these Technical Specifications may be applicable for use by other actors.

This family of Technical Specifications cover at least the following types of information content:

- road traffic event information – planned and unplanned occurrences both on the road network and in the surrounding environment;
- operator initiated actions;
- road traffic measurement data, status data and travel time data;
- travel information relevant to road users, including weather and environmental information;
- road traffic management information and advice relating to use of the road network.

CEN/TS 16157-1:2011, Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 1: Context and framework

This part of the CEN/TS specifies the DATEX II framework of all parts of this Technical Specification, the context of use and the modelling approach taken and used throughout these Technical Specifications. This approach is described using formal methods and provides the mandatory reference framework for all other parts.

CEN/TS 16157-2:2011, Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing

This part of the CEN/TS 16157 specifies the informational structures, relationships, roles, attributes and associated data types, for the implementation of the location referencing systems used in association with the different publications defined in the DATEX II framework. It also defines a DATEX II publication for exchanging predefined publications. This is part of DATEX II platform independent data model.

CEN/TS 16157-3:2011, Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 3: Situation publication

This part of the CEN/TS 16157 series specifies the informational structures, relationships, roles, attributes and associated data types required for publishing measured and elaborated data within the DATEX II framework. This is specified as a DATEX II Situation Publication sub-model which is part of the DATEX II platform independent model, but this part excludes those elements that relate to the location information which are specified in CEN/TS 16157-2 and those elements that relate to VMS settings which are specified in Part 4 of CEN/TS 16157.

CEN/TS 16157-4:2014, Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 4: Variable message sign publication

This part of the CEN/TS 16157 series specifies the informational structures, relationships, roles, attributes and associated data types required for publishing variable message sign information within the DATEX II framework. This is specified in two parts, a DATEX II VMS Publication sub-model and a VMS Table Publication sub-model.

The VMS publication supports the exchange of graphic and textual content of one or more VMS plus any status information on device configuration that aid the comprehension of the informational content. This content is potentially subject to rapid change. The VMS table publication supports the occasional exchange of tables containing generally static reference information about deployed VMS which enable subsequent efficient references to be made to pre-defined static information relating to those VMS. These publications are not intended to support the control or configuration of VMS equipment. Each is part of the DATEX II platform independent model.

CEN/TS 16157-5:2014, Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part5: Measured and elaborated data publication

This part of the CEN/TS 16157 series specifies the informational structures, relationships, roles, attributes and associated data types required for publishing measured and elaborated data within the DATEX II framework. This is specified in three submodels, a DATEX II 'Measurement Site Table Publication' sub-model, a DATEX II 'Measured Data Publication' submodel and a DATEX II 'Elaborated Data Publication' sub-model.

CEN/TS 16157-6:2015, Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 6: Parking publication

This Technical Specification includes the following types of information content:

— Parking information including static content (description and attribution of parking areas, parking facilities and single parking spaces) and dynamic content (occupancy and vehicle measurement information). It also covers as well urban parking information and truck parking information.

This part of the CEN/TS 16157 specifies the informational structures, relationships, roles, attributes and associated data types required for publishing parking information within the DATEX II framework. This is specified as a DATEX II 'Parking Publication' sub-model which is part of the DATEX II platform independent model, but this part excludes those elements that relate to location information which are specified in CEN/TS 16157-2.

D.2.3.2.30 Relevant UIC rail standards

It has to be observed that Standards for the rail sector are maintained in completely different way and environment than other Standards. Rail has been dominated by the state railway companies and everything is developed and maintained in a closed environment of very few actors. Apart from level crossings, until recently, rail has been physically separate from all other forms of transport, and has evolved as a closed sector. It is under the auspices of the 'Union International des Chemins de Fer' (UIC) .

The UIC is formally just a trade body but, a little bit like the ITU's "Recommendations", its "Leaflets" have a lot more weight that the word suggests.

The full list can be found at http://www.shop-etf.com/en/leaflets-irs.html. There are more than 3000 'Leaflets' in the UIC's list. These are organised as follows:

- 1 - Passenger and Baggage Traffic(63)
- 2 - Freight Traffic(84)
- 3 - Finance, Accountancy, Costs, Statistics(144)
- 4 - Operating(331)
- 5 - Rolling Stock(787)
- 6 - Traction(299)
- 7 - Way and Works(566)
- 8 - Technical Specifications(738)
- 9 - Information, Technology, Miscellaneous(252)
    - 90 - Documentation(12)
    - 91 - Remote data transmission and data processing(79)
    - 92 - Coding(84)
    - 93 - Exchange of Energy consumption data(6)
    - 96 - Staff(39)
    - 98 - Supplies(14)
    - 99 - Miscellaneous agreements(15)
    - 9a - Reports(3)

Most of these 'leaflets' concern issues relevant to the rail sector, but section 9. 'Information, Technology and Miscellaneous' touches the MIS area (traffic management for rail is understandably very different than that for roads). However, some provide different approaches to aspects of MIS and reconciliation or translation is required.

Particularly:

Leaflet 912	"Principles governing standard messages for data exchange at international level";
Leaflet 912-3	"Directory of railway messages in the EDIFACT structure";
Leaflet 915	"Structured (data model) representation of passenger traffic data";
Leaflet 917-3	"Standardized Interface for Telematics Applications";
Leaflet 917-9	"File transfer, access and management - FTAM";
Leaflet 918	"Electronic seat/berth reservation and electronic production of travel documents - General regulations";

- Leaflet 918-1 “Electronic reservation of seats/berths and electronic production of travel documents - Exchange of messages”;
  Leaflet 919 “Specification of criteria for the computer-aided production of passenger and freight train timetables”.

It may be assumed that these leaflets are very different from approaches in Transmodel.

Additionally :

Two Standards series which have direct relevant to MIS in particular and clearly should be cited.

IEC 61375 Electric railway equipment – Train bus –Part 1: Train communication network

This part of IEC 61375 applies to data communication in open trains, i.e. it covers data communication between vehicles of the said open trains and data communication within the vehicles of the said open trains.

This standard defines these interfaces as connections to a data communication network, called the Train Communication Network (TCN).

The applicability of this standard to the train communication bus (WTB) allows for interoperability of individual vehicles within open trains in international traffic. The data communication bus inside vehicles (MVB) is given as recommended solution for the TCN. In any case, proof of compatibility between WTB and a proposed vehicle bus will have to be brought by the supplier.

This standard may be additionally applicable to closed trains and multiple unit trains when so agreed between purchaser and supplier.

NOTE Road vehicles such as buses and trolley buses are not considered in this standard.

This part of IEC 61375 defines interfaces so as to achieve plug-in compatibility:

a) between equipment located in different vehicles, and
b) between equipment located within the same vehicle.

The TCN has a hierarchical structure with two levels of busses, a ‘Train Bus’ and a ‘Vehicle Bus’:

a) for interconnecting vehicles in open trains such as international UIC trains, this standard specifies a train bus called the ‘Wire Train Bus’ (WTB);

b) for connecting standard on-board equipment, this standard specifies a vehicle bus called the ‘Multifunction Vehicle Bus’ (MVB).

In the TCN architecture, all busses share the same real-time protocols, which offer two communication services:

a) Process variables, a distributed, real-time database, periodically refreshed through broadcasting;
b) messages, transmitted on demand either as:

  - unicast messages (point-to-point) or/and
  - multicast messages.

All busses in the TCN share a common network management, which allows debugging, commissioning and maintenance over the network.

Guidelines for conformance testing are included in this standard.

The TCN is structured similarly to the ‘Open System Interconnection’ model defined in ISO/IEC 7498-1 (see Figure 1).(Figure D–6 below)

NOTE The circled numbers refer to the clauses and annexes of this standard.

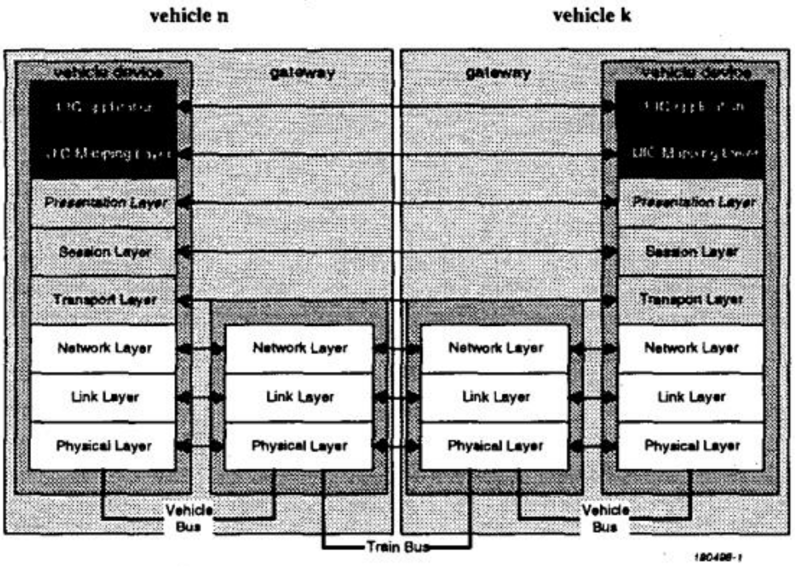

vehicle n
vehicle k
vehicle device
gateway
gateway
vehicle device
UIC application
UIC Mapping Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Link Layer
Physical Layer
Vehicle Bus
Train Bus
Vehicle Bus
180498-1

Figure D–6: (IEC 61375 Figure 1 – Layering of the TCN)

This standard has been, for editorial reasons, divided into five clauses and two annexes: Clause 1: General,

- Definitions and informative overview; Clause 2: Real-time protocols,
- Variables: Link layer interface and application layer interface;
- Messages: Link layer interface, protocols, application layer interface;
- Data representation;

Clause 3: Multifunction vehicle bus,

- Physical layer, link layer and link layer management; Clause 4: W ire train bus,
- Physical Layer, Link layer and link layer management; Clause 5: Train network management,
- Configuration, supervision and control of the network; Annex A: Tutorial on the ‘Train Communication Network’

Annex B: Guidelines for conformance test.

IEC 62580 Electronic railway equipment – On-board multimedia and telematic subsystems for railways –Part 1: General architecture

IEC 62580-1 defines the general architecture of the on-board multimedia and telematic subsystems (OMTS), so as to achieve compatibility between subsystems in the same vehicle and between subsystems on-board of different vehicles in the same train.

NOTE 1 The acronym OMTS replaces the previous OMMS (On-board MultiMedia Subsystem) definition, due to a change in the title of this standard.

The multimedia and telematic system is composed of but not limited to: A
Video surveillance/CCTV
B Driver and crew orientated services
C Passenger orientated services
D Train operator and maintainer orientated services

OMTSs installed in the same vehicle (consist) communicate by means of the consist network. OMTSs, installed in different vehicle (consist) in the same train, communicate by means of the train network.

It is likely that each OMTS exchanges information with applications installed on-ground by means of a wireless communication gateway.

NOTE 2 Board-to-ground communication is intended as a generic link, with no assumption on the underlying technology (radio, satellite or other).

As illustrated in Figure 1 of IEC 62580 (Figure D-7), the IEC 62580 series is
structured as follows: IEC 62580-1: General architecture
IEC 62580-2: Video surveillance/CCTV services

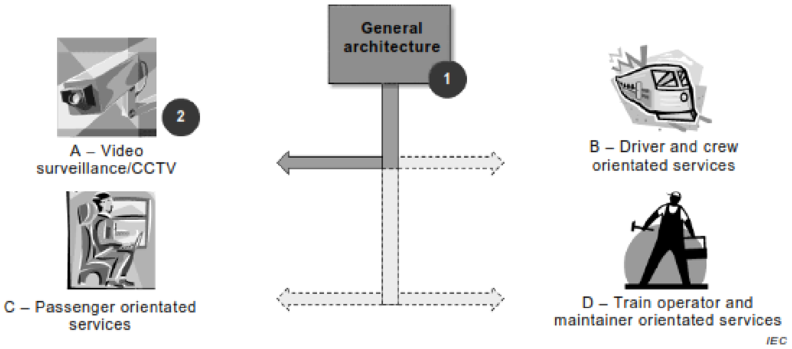

General architecture
1
2
A – Video surveillance/CCTV
B – Driver and crew orientated services
C – Passenger orientated services
D – Train operator and maintainer orientated services
IEC

Figure D–7: IEC 62580-1 Figure 1) OMTS categories and the structure of the 62580 series

Driver and crew orientated services, passenger orientated services and train operator/maintainer orientated services are matters of standardisation which can be addressed in the future.

Conclusion

The architectectural structure, framework and concept of these standards (UIC and IEC), are fundamentally different from those in Transmodel etc. For both technical and political reasons, it is unlikely that there will be any migration path to a common solution in the near future. Fortunately, these standards are constructed respecting the OSI stack and data is defined in ASN.1, so it should prove a relatively easy challenge to build translators as needed. Such work is likely to be in the time period beyond that of the CID.

D.2.3.31 Geo-referencing Standards

In respect of location and positioning, see Annex E.4.3.
In respect of Transmodel and geo-referencing, See Annex E.4.3.4.3

In general terms, ISO 3166 provides high level referencing (country codes).

In respect of interoperability, the problem starts here, because most countries have defined their own systems for geo-location, for example, the UK has:

The National Land and Property Gazetteer (NLPG) - an initiative in England and Wales to provide a definitive and consistent address infrastructure, and a 'National Street Gazetteer' and 'Street Works Addresses' and a 'Street Works Register'.

For public transport there is also guidance and schemas for the national public transport gazetteer which provides topographic information of town and settlements in the UK (in the context of public transport provision).

The 'National Public Transport Access Node' (NaPTAN) database is a UK nationwide system for uniquely identifying all the points of access to public transport in the UK. The database is closely associated with the 'National Public Transport Gazetteer'.

Every UK railway station, coach terminus, airport, ferry terminal, bus stop, taxi rank or other place where public transport can be joined or left is allocated a unique NaPTAN identifier. The relationship of the stop to a city, town, village or other locality can be indicated through an association with elements of the 'National Public Transport Gazetteer.'

This situation is replicated to a greater or lesser extent, in many countries.

In 2009, CEN has published a European standard for public transport stop description called IFOPT (Identification of Fixed Objects In Public Transport), as an extension to Transmodel and based i.a. on NaPTAN concepts. See D.2.3.26.

Conclusion

Location information has been a requirement since before the digital era, and most of it was founded on the Victorian principal of the "look-up table", and physical reference books and tables, and not related to actual physical position. Initiatives like IFOPT (see D.2.3.26) try to take this forward for public transport.
All C-ITS is based on physical location referencing (see E.4.3).

Because gazetteered referencing is institutionally entrenched, and migration to a geo-referencing based on physical location may be protracted, in the medium term we may expect to see the use of translators for some time to come.

D.2.3.32 Internet Standards

Cooperative ITS, indeed much of ITS are dependent on underlying internet standards. These are Standardised by IETF

The principle IETF standards behind internet communications and used by ITS are:

RFC 2460	Internet Protocol, Version 6 (IPv6) Specification
RFC 3587	IPv6 Global Unicast Address Format

RFC 3917	Requirements for IP Flow Information Export (IPFIX)
RFC 3963	Network Mobility (NEMO) Basic Support Protocol
RFC 4291	IP Version 6 Addressing Architecture
RFC 4294	IPv6 Node Requirements
RFC 4493	The AES-CMAC Algorithm
RFC 4861	Neighbor Discovery for IP Version 6 (IPv6)
RFC 4862	IPv6 Stateless Address Autoconfiguration
RFC 5648	Multiple Care-of Addresses Registration.

D.2.3.33 Organisation based standards and practices

Organisation based standards and practices that could be adapted, aligned or harmonised to provide a European (or global) scale of standardisation (such as UTMC or NaPTAN from the UK, DTM in the Netherlands and OCIT in the German-speaking countries).

D.2.3.34 Openly plied proprietary standards

If none of the above exist, then the specifications used by industry leaders can provide a proven springboard. Examples include transport specific specifications such as Google’s “General Transit Feed Specification” (GTFS) or more general widely accepted practices such as JAVA or Bluetooth (esp Bluetooth 4.0 & BLE).

D.2.4 Legacy system and standards issues

While legacy systems and standards can very useful, there are cases where they hinder interoperability.

The FRAME ITS Architecture, shows as at its highest level, joined up scenarios. As in Figure D–3 (and figure D–8 below).

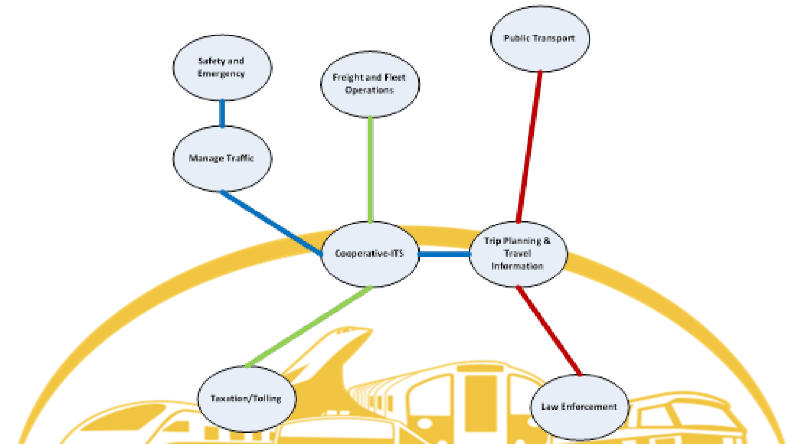


Figure D–8 : Frame connected functionality

Whereas in reality, both systems and standards have been developed in isolation, as in Figure D–9.

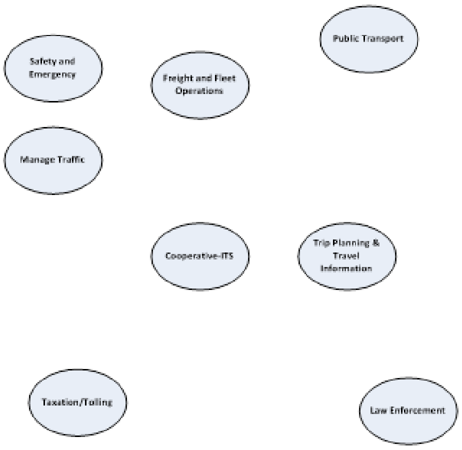


Figure D–9: Systems and standards developed in isolated Silo's

The consequence being, as stated in several places above, being that although many, if not most, of these Standards involve the use of "standardised" data concepts, data elements and protocols, they have been developed in isolation, and that the same or similar data concepts are:

a) defined differently in different standards;
b) users of one standard are probably unaware of the other definitions;
c) the data definitions are therefore scattered among some 700 or more documents produced by SDO's around the world;
d) even within standards organisations, there is no easy way find out what or where the definitions exist.

With multiple definitions, interoperability is significantly more difficult to achieve, in some cases, impossible. Data re-use is a major challenge that at best requires 'interpreter' conversion routines, in some cases is not possible because different attributes are defined in the data concept.

In order to address these issues, it is imperative that Rc_SM01 and Rc_SM03- are progressed with the highest priority

But the problem with legacy systems does not end there, as the following example from traffic management highlights.

Example: Scenario 1: Systems of different vendors in the field layer

Mr. W., staff of the technical department of the city S., is a young successor to the recently retired Mr. S., who worked in the department for 27 years. Mr. W is confronted with the situation to replace as soon as possible the 20-year-old traffic centre computers of the company S., to which only field controllers of the same company are connected so far (see Figure D–10). The system can be expected to cease operation any time due to age and lack of spare parts availability.

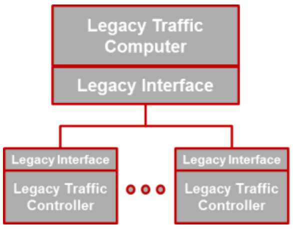

Legacy Traffic Computer
Legacy Interface
Legacy Interface
Legacy Traffic Controller
Legacy Interface
Legacy Traffic Controller

Figure D–10: Example of a mixed vendor environment in the field layer, proprietary legacy system

This wouldn't be a major problem for Mr. W. if not the approval for renewal was bound by politics and also by the audit office to the requirement to procure the new traffic centre computer via a public tender and, furthermore, to be equipped with an OCIT®-*Outstations* interface, as the next picture shows. Finally, the field devices that have so far been delivered by the manufacturer of the old traffic centre computer can be procured in the future in a competitive way.

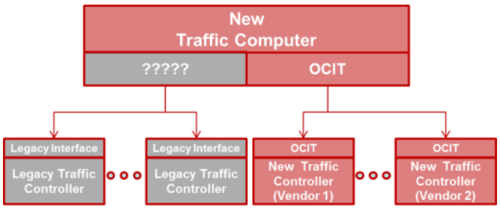

New Traffic Computer
?????
OCIT
Legacy Interface
Legacy Traffic Controller
Legacy Interface
Legacy Traffic Controller
OCIT
New Traffic Controller (Vendor 1)
OCIT
New Traffic Controller (Vendor 2)

Figure D–11: Example of a mixed vendor environment in the field layer, system of different vendors

Scenario 2: Systems of different vendors in the centre layer

Mr. K., employee of the traffic department of the city F. and for some time now responsible to build up the traffic management system of the city of F. was appointed by his chief officer Mr S. to provide a new, integrated operational messaging system for the staff of the control centre of the city of F., with which all subsystems of the city can be monitored in one place and using a single user interface.

This wouldn't be a major problem for Mr. K if not all systems which are in operation in the city of F. were of different manufacturers and the official order was to realise the new message system via a OCIT®-Instantiations or OTS 1.0-interface to be integrated into the existing system environments. The aim is a public procurement of the new system and future procurements without spending too much effort into interface design. The required system constellation is shown in Figure D–12.

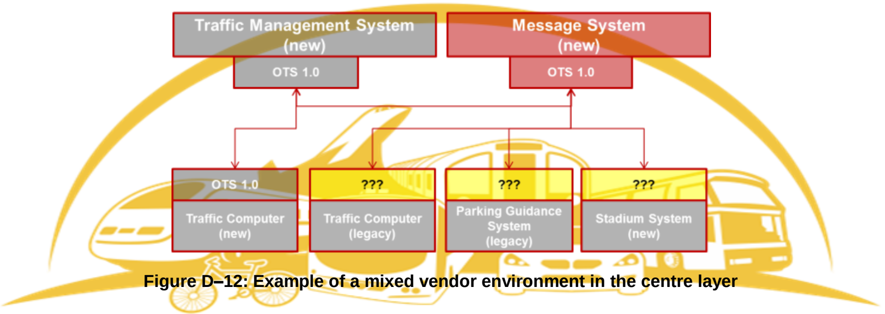

Traffic Management System (new)
OTS 1.0
Message System (new)
OTS 1.0
OTS 1.0
Traffic Computer (new)
???
Traffic Computer (legacy)
???
Parking Guidance System (legacy)
???
Stadium System (new)

Figure D–12: Example of a mixed vendor environment in the centre layer

Scenario 3: Systems of different vendors in traffic management ranging over various jurisdictional boundaries

Mr. B. is an employee of the office traffic management of the city D. and project manager of the urban traffic management system which is under construction for several years now. The system is not only connected to the traffic management system of the state administration of the country N. but also connected with the mobility platform of the private information service provider P. which is based in K.

The initial layout is shown in Figure D–13.

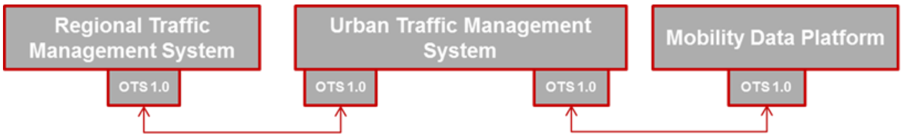

Regional Traffic Management System
Urban Traffic Management System
Mobility Data Platform
OTS 1.0
OTS 1.0
OTS 1.0
OTS 1.0

Figure D–13: Example of a mixed vendor environment ranging over various jurisdictional boundaries, legacy system via OTS 1-interface

As part of a research project that deals with extensible communications standards Mr B. intends to upgrade his OTS 1.0 interfaces to the new OTS 2 standard and to take this opportunity to establish cooperation with other private service providers on the exchange of traffic information. This wouldn't be a problem for Mr. B. if not the traffic information services of the new cooperation partners had profiles which are not yet available in the existing OTS 2 communications standard.

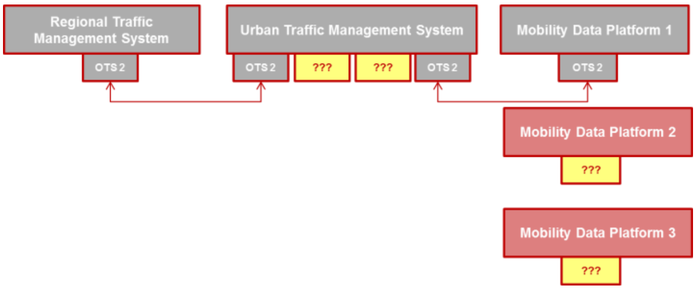

Regional Traffic Management System
Urban Traffic Management System
Mobility Data Platform 1
OTS 2
OTS 2
???
???
OTS 2
OTS 2
Mobility Data Platform 2
???
Mobility Data Platform 3
???

Figure D–14: Example of a mixed vendor environment ranging over various jurisdictional boundaries, system via OTS

D.2.5 Vendor lock-in

The associated issues of vendor lock-in are dealt with in 9.5, C.7.2; C.7.3; C.7.6; H.3.1; H.4.3.1; K.4.1.

D.2.6 Transition and migration issues

The history of the development of 'silo' solutions is discussed at length elsewhere in this report (notably 1.10, 7; 9.1; D.2.1; D.3; D.4; E.3.1; F.1.5, F.1.13; J.1.2; J.1.7). And the goal to interoperable data is well understood as a basic tenet throughout this document and especially is a theme throughout Annex D.2 (This Annex).

But the remedy is neither quick nor simple. As pointed out in D.2.1.

"Many of these systems will represent major investments for Urban Administrations, will be technically state-of-the-art, and (with luck) will work well. They will not be discarded just in order to meet a new standard, unless it is mandated by legislation or regulation."

In this 'joined-up' and interoperable Urban-ITS world several situations must be catered for. While the long term goal is to have interoperable data concepts, and only one instance of a data concept for each data subject, the reality is that in the short term, much as several generations of hardware need to operate simultaneously,

With information and communication technology, this is no longer the case. The pace of technology change – as well as the degree of interaction between ICTs – means that several "generations" of system do operate simultaneously. And where they do, either the newest must respect the oldest, or the oldest must be removed (or shielded).

Today's and tomorrow's systems need to exchange data. And, in order to enable this, if we have not done so already, we need to change our mind-set in respect to the way we think about data. Traditionally, when we have developed a system, say for parking fees in Timbuctoo, we worked out what data we needed, put it all into a data concept called "*ParkingFeeCollection*". The data concept consisted of multiple elements- say tariff, fee, vehicle numberplate, entry door, exit door- we may or may not have included the date and time in the data concept. The clue to the future- we may already have data concepts called time and date, so we may have reused that data concept. What we have now is our concept called "*ParkingFeeCollection*" which is specific to a particular car parking solution for a particular group of car parks, or maybe just one car park, in Timbuctoo. That data concept probably does not include the location and facility identification (because we knew it and it was always the same). So what we created was a silo solution that met the short term needs, but is no good at all for a multimodal information system, is of no use to traffic management, and if the vehicle was a delivery van, is no use to an urban freight situation.

When we design data concepts today, we have to consider them as a series of data objects. The combined data concept we transfer may remain unique to a local solution or transaction, but the data objects that it comprises should each specify a data definition that characterises that data object regardless of its use -.i.e. regardless of the purpose for which we designed the system. in our Timbuctoo example the data object elements of our data object may be *location, faciltiyId, entryPoint, exitPoint, vehicleClass, vehicleID, entryTime, exitTime, Tariff, paymentVerification*, (probably others as well). Within this we have multiple instances of 'Time' so we have to decide if we can represent time in an identical way, or whether we consider that *entryTime* and *exitTime* are themselves data concepts comprising multiple data elements, that make up a unique concept.

And while it is the case that the combined data concept we transfer may remain unique to a local solution or transaction, if we were to be designing a parking system for multiple locations, it would be sensible if the same data concept combined enough data objects so that it would work at any location, and at multiple locations.

Now we have two benefits. For the system designer, he only needs to design and prove one technical solution. For the reuse of data, for example in a multimodal information system, because the data is defined, and comprises standard objects, that system designer can extract the data object elements that he/she needs, and reuse that data in their system, because the data object definition, not just the value this instance, is standard and can be used in another system.

In this interoperable world, data objects characterise only the data, not the use to which it is being put.

Data concepts comprise constructs of a sequence of defined data objects which may themselves be considered as data concept objects because they are always or frequently used together.

Data concepts are defined as one or more data objects, in a defined form, and in a defined sequence, that are transferred during a transaction to achieve an objective. Those data concepts are frequently unique to that transaction type, but in many cases may be considered standardised data concepts, so both the data objects and data concepts should be named and made available for reuse.

This approach enables data reuse and data exchange in a connected world (where data may be used for purposes other than that for which it was originally designed, or even imagined that it may be used for) and enable the realisation, in this pre-study, of Urban-ITS and beyond.

However, it is inadequate that the data object and data concept definitions are buried in Annex D of EN12345, or Clause 14 of ISO 98765. Who knows that they are there other than the standards writers and a few early users? And what is the incentive to use these, as opposed to other data definitions?

All of this is well known to probably almost every reader of this document, so PT1701 tells you nothing new. But it is the job of this pre-study to identify gaps, and until there is:

- a funded and publicly and freely ITS meta-data registry;
- standards developers are obliged to submit their data object and data concept definitions to the ITS meta-data registry as part of the standards approval;
- Data already defined in extant and used TS standards are uploaded into that meta-data registry;
- Standard data objects already defined for general ICT use outside of the ITS paradigm (for example time, day, date, etc.) uploaded into that meta-data registry;
- Every entry in the ITS meta-data registry is assigned an unambiguous/unique Name;

Urban-ITS, as envisaged in the CID, will not be possible;

and further, once the ITS meta-data registry is in place and populated there needs to be a major harmonisation exercise to identify duplications, and find a consensus route to migration to the use of agreed common data objects and data concepts in the future.

In order to successfully achieve such, it has to be recognised, as stated above that existing and used data objects and data concepts *"will not be discarded just in order to meet a new standard, unless it is mandated by legislation or regulation."*

This means that the parties actively using these data concepts/objects need to be identified. They need to find a future data concept/object that will be used in future systems, and a translator developed to manage the data in the interim period. Ideally, where consensus can be achieved, to obtain a commitment to move to the new data concepts/objects by an agreed date – although this will not be practicable in many cases.

Until this is substantively achieved (and it must be recognised that it will never be perfectly achieved, Urban-ITS, as envisaged in the CID, will not be efficient.

Section 9.2; Annex A.2.2; F1.12; F.1.13; F1.14 and Annex C.5 of this report propose an EU-ICIP project. Such a project will also be of significant benefit in the migration process discussed in this section, in order to provide guidance and identify locations of relevant standards and data definitions. Even in situations where EU-ICIP protocols cannot be initially implemented because of legacy or other similar problems, operating agencies will benefit from specifying that EU-ICIP recommendations be included in all future acquisitions and upgrades, to provide a better migration path to interoperability and an open market.

PT1701 is given the instruction for *"Identifying transitional and migration issues"* involved in assisting Urban Administrations to implement and support Urban-ITS

Recommendations U16, U19, U12, U08, U10 of this report are therefore considered the main support instruments to effect successful transitional and migration issues

D.2.7 Availability of data concepts

As a consequence of sections D.2.4; D.2.5; D.2.6:

Rc_SM01- This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary. As the costs for establishing and operating such a meta-data registry/data dictionary would not be significantly different, this report recommends that such an ITS meta-data registry is made freely accessible to all SDO's involved in ITS standardisation, and OEMs installing ITS products in vehicles, and of course the jurisdictions within the EU. (1.6.6; 2.13.2; 9.4; C.7.4; D.2.6)

a) A common and available meta-data registry, where the meta data of data concepts are defined and made available for use and re-use.

the support of consequential requirements (e.g. common data registries, data repositories and data access systems.)

Rc_SM04- b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (**1.6.6; 9.4; F.1.5; G.4**; **H.4**; **I.4**; **K.3**)

Commented [BW1]:

Rc_Gn10- In order for data passed through a standardised interchangeable physical interface to be comprehensible and useable, data format and presentation standards are also required in order to achieve interoperability. (9.8; D.2.7; E.3.2; E.3.3).

Rc_SM02- Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation'. (9.4; D.2; E.3.1; F.1.5)).

Rc_PI01- PT1701 recommends that the CID supports a project team for establishing EU-ICIP. (1.6.3; 2.2; 9.2, A.2.2; D.2.6, F.1.12; F.1.13; F.1.14) .

D.3 C-ITS as a tool to overcome silos

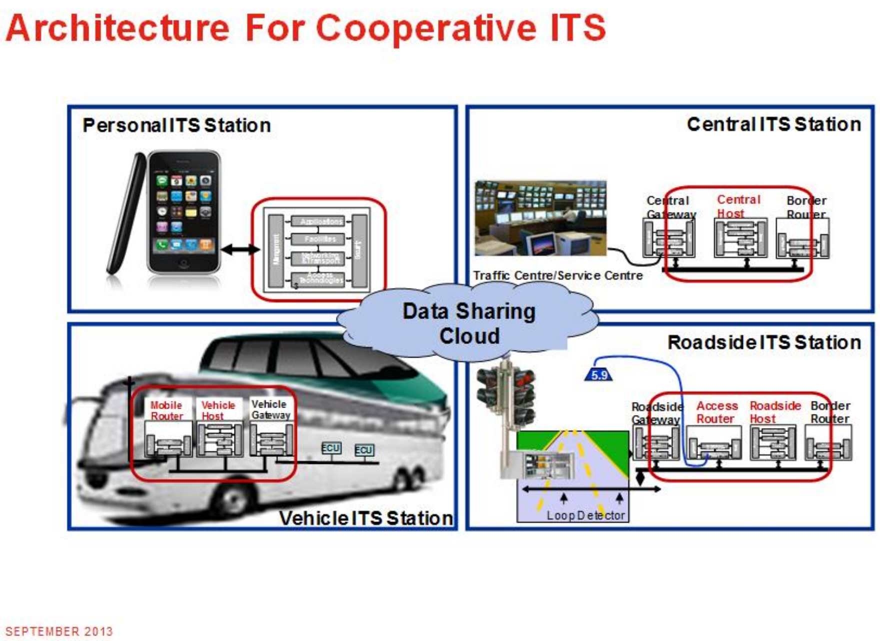
One of the significant obstacles to achieving the Urban-ITS objectives of this pre-study is the plethora of different communications media used by the different ITS and other communications systems involved in transport service provision. These have evolved through different historically logical paths, but make no sense, indeed are a major obstacle to the communications required to achieve Urban-ITS.

Almost coincidentally, many of the new data transactions involved involve what is commonly called “C-ITS – Cooperative-ITS, where there need to be standardised forms of communication vehicle<>vehicle, vehicle<>infrastructure, infrastructure<>infrastructure. So all of the areas in Urban-ITS will have to be able to make these transactions.

A Cooperative ITS is defined as a subset of the overall ITS that:

- ➢ **communicates**
  - — and shares information
- ➢ **between ITS-stations***
  - — to give advice or
  - — facilitate actions
- ➢ **with the objective of improving**
  - — safety, sustainability, efficiency and comfort
- ➢ **beyond the scope of stand-alone systems**.

(*ITS-station defined in ISO 21217 /ETSI EN 302 665, e.g. units installed in vehicles, at the road side, in traffic control/management centres, in service centres, or in hand-helds.)



Architecture For Cooperative ITS

Personal ITS Station
Applications
Facilities
Networking & Transport
Access Technologies
Management
Security
Central ITS Station
Central Gateway
Central Host
Border Router
Traffic Centre/Service Centre
Data Sharing Cloud
Roadside ITS Station
5.9
Roadside Gateway
Access Router
Roadside Host
Border Router
Loop Detector
Mobile Router
Vehicle Host
Vehicle Gateway
ECU
ECU
Vehicle ITS Station

SEPTEMBER 2013

Figure D–15: C-ITS Physical Architecture

The basis of these transactions are defined in ISO 21217 Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture.

The CALM Architecture and its related standards, standardises sessions between two ITS-stations (ITS-station<>ITS-station). An ITS-station may be a node of the infrastructure, a vehicle, field equipment. Indeed, the ITS-station may change its role (as with a police vehicle that is in the role of a vehicle until it reaches an incident, where it may change its role to be a node of the infrastructure). The basic transaction is peer<>peer (although master-slave transactions are possible). The ITS-station can connect via any probable wireless mode of communication, or in the case of infrastructure, wired media. 2G, 3G, 4G/LTE, 5.9GHz, 5.8 GHz DSRC, wireless broadband, 60 GHz, and preparations are being made for 5G. So if the urban-ITS communication point supports the ITS-station concept, it can be used for any urban-ITS communication, thus solving the historical migration issues and overcoming the legacy silo communications problems.

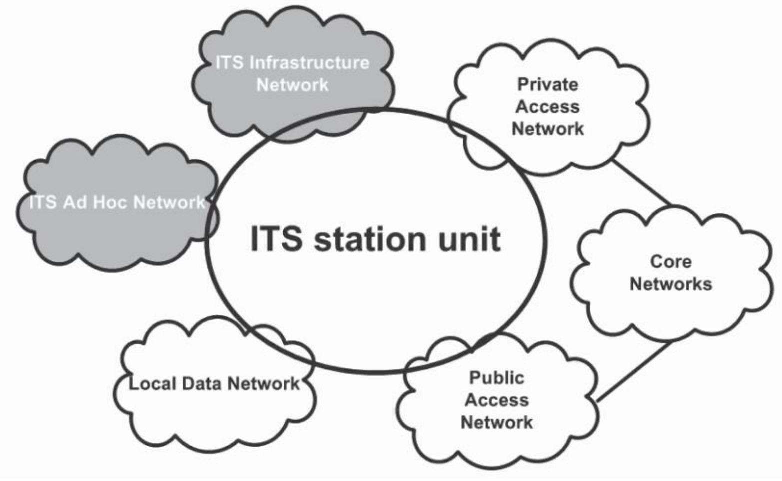

ITS Infrastructure Network
Private Access Network
ITS Ad Hoc Network
ITS station unit
Core Networks
Local Data Network
Public Access Network

Figure D–16 — Networking view of ITS communications

“Communications Access for Land Mobile” (CALM) is the acronym used to refer to ISO TC204 WG16 work items. This acronym is used in the titles of the set of International Standards on communication for “Intelligent Transport Systems” (ITS). These International Standards focus on specifying open interfaces with regard to the functionalities required for all relevant layers and entities of the ITS-station reference architecture specified in ISO 21217.

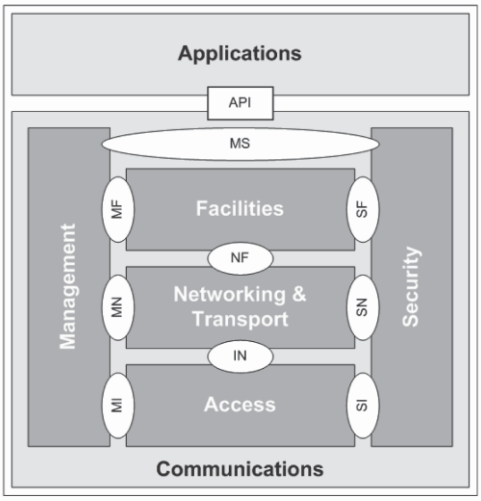


Figure D–17— Simplified ITS-station reference architecture

The set of CALM International Standards is designed to allow interoperable instantiations of ITS-stations which are based on the concept of abstracting applications and services from the underlying communication layers of the ITS-station. This abstraction and the functionalities and services that can be easily implemented make the ITS-station architecture described herein also well-suited to the development and deployment of ITS applications and services that share information amongst each other to improve the safety, sustainability and efficiency of transport systems.

The set of CALM International Standards include specifications for

— ITS-station management;

— ITS communications security;

— ITS-station facilities layer protocols;

— ITS-station networking and transport layer protocols;

— communication interfaces (CIs) designed specifically for ITS applications and services such as those designed specifically for safety of life and property;

— interfacing existing access technologies into ITS-stations;

— distributed implementations of ITS-stations;

— interfacing ITS-stations to existing communication networks and communicating with nodes thereon.

The CALM architecture therefore deals with the ever important issues of security, and station behaviour. And will work using a wide range of wireless interfaces (2G, 3G, 4G/LT, 5.9 GHz, 5.8 GHz DSRC, mobile wireless broadband, etc., according to what is available to the ITS-station unit.

The set of CALM International Standards is complemented by ITS communication International Standards from other International Standards development organizations which together form the basis for implementation of ITS communications networks around the world.

See also Annex J (Communications and security).

D.4 Organisation and interdependencies

From the perspective of the overall architecture of ITS/C-ITS, the remit for this pre-study is founded on, and focussed on, two basic premises:

a) That the viewpoint of the focus of this pre-study are the needs of the Urban Administrations (to implement/support Urban-ITS in their domains)
b) The three focal sectors of 'Multimodal Information Services', 'Traffic Management' and 'Urban Logistics'

Annex K deals with architectectural aspects associated with study in greater depth, but in order to avoid the continuation of 'silos', or, even worse, the creation of new silos, we have to take into consideration that the three identified priority domains not only overlap and need to interact, but that in order to reap the benefits that modern technology and thinking enables, there must be interaction and overlap. One of our goals must therefore to make such interaction as efficient as possible.

The FRAME architecture shows the domain of ITS as:

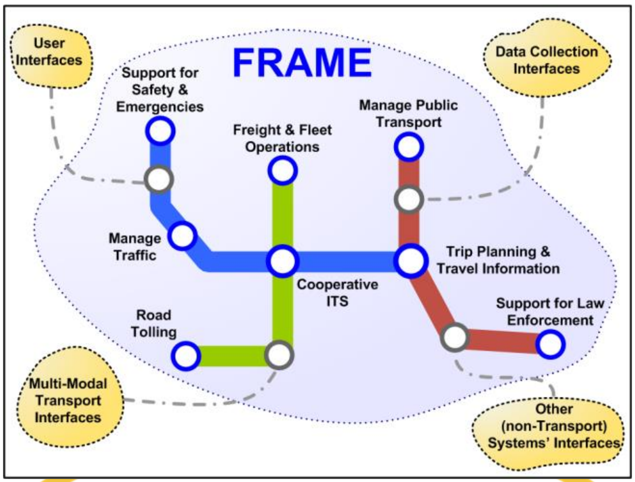

User Interfaces
FRAME
Data Collection Interfaces
Support for Safety & Emergencies
Manage Public Transport
Freight & Fleet Operations
Manage Traffic
Trip Planning & Travel Information
Cooperative ITS
Road Tolling
Support for Law Enforcement
Multi-Modal Transport Interfaces
Other (non-Transport) Systems' Interfaces

Figure D–18: High level FRAME architecture

If we overlay the three priority domains for Urban-ITS, we have a (deliberately) overlapping coverage as shown in Figure D–19.

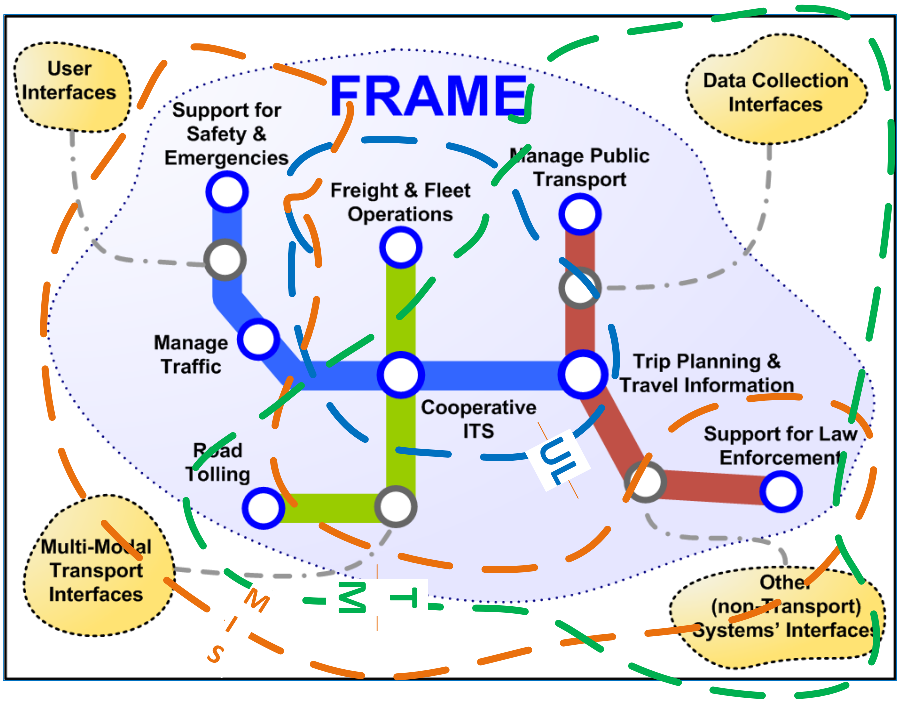

User Interfaces
Data Collection Interfaces
FRAME
Support for Safety & Emergencies
Freight & Fleet Operations
Manage Public Transport
Manage Traffic
Trip Planning & Travel Information
Cooperative ITS
Support for Law Enforcement
Road Tolling
UL
Multi-Modal Transport Interfaces
M I S
T M
Other (non-Transport) Systems' Interfaces

Figure D–19: FRAME with the 3 Domains overlaid (MIS, UL, TM)

Within this report we have therefore structured our Use Cases not only in the three areas, but also with a category where the span is across multiple domains.

Further, we have also to recognise that there are some essential prerequisites for Urban-ITS that do not directly fit into any of the three priority categories, but that it would be wrong to ignore completely.

Annex E Stakeholders and structuring

E.1 Key stakeholders

This pre-study is designed to address a context for "*the successful implementation, management and support of Urban-ITS in an environment where this is an administration controlled and led activity and not a community-wide managed or controlled activity.*"

Clearly, many Urban-ITS activities may be commercially organised and provided. Many of these would benefit from Standards, but such standards are not the focus of this pre-study, whose objective is to provide recommendations for the provision of standards to assist an administration to successfully introduce and subsequently support Urban-ITS within their domain.

The most significant stakeholder in the context of this pre-study is therefore, by definition of the remit of the pre-study, the Urban Administration. And in many cases, in order to achieve its objectives, the Urban Administration may also have to be the lead actor and driver of service provision.

The role of the Urban Administration must fall into at least four categories:

a) The promotion and implementation of the political will of the city in the direction of multimodal information services, traffic management and urban logistics;

b) The measures necessary to ensure that relevant data is available when needed by the actors involved in the provision of the identified Urban-ITS services;

c) The physical and regulatory measures necessary to implement the political will of the city;

d) The physical and regulatory measures necessary to implement the political will of the Nation State, and, where appropriate the EU. (or in a global context international agreements).

The Urban Administration is inherently the prime stakeholder in all of these activities. Whether, and where, it has to be the prime actor as well, will vary from city to city.

Annex C.3 of this Technical Report describe these and the other significant stakeholders and actors in the provision of Urban-ITS in greater detail.

E.2 High level mapping for key identified stakeholders

See E.5.4 in respect of an overview of organisations, activities, and interactions among participants and stakeholders for Urban-ITS.

See section G.2 in respect of multimodal stakeholders.

See section H.2 in respect of traffic management stakeholders.

See individual use cases in respect of urban logistics.

E.3 Overall framework required for interoperability and interchangeability

E.3.1 Interoperability

Interoperability, the "*property of a product or system, whose (communication-) interfaces are completely understood, to work with other products or systems, present or future, without any restricted access, nor complex additional implementation requirements"* [46]. This implies different requirements at the strategic layer (tailoring the components of an ITS or service to an ITS strategy), process layer (standardised cooperation and collaboration model for ITS stakeholders), information structures layer (interoperable information/domain models), ICT service layer (shared ICT-service definitions and appropriate service orchestration) and ICT infrastructure layer. (connected ICT infrastructure).

But interoperability requirements to achieve successful Urban-ITS, though crucial in mixed vendor environments, are not restricted to mixed vendor environments. Central communications architectures, centre-to-field communications, and multimodal information services rely on interoperability of equipment, communications, and data, even when there is not a mixed vendor environment.

Urban-ITS does not arrive as a newborn baby into a fresh new world. It is an evolution of many legacy developments without which we could not contemplate Urban-ITS, but whose (understandably) silo approaches now inhibit the evolution and effectiveness of Urban-ITS. As with the mixed vendor environment, those challenges exist at strategic, process, information/data, ICT service and ICT infrastructure layers.

This leads to the urgent requirements for

Rc_SM01- a) A common and available meta-data registry, where the meta data of data concepts are defined and made available for use and re-use.

Rc_SM04- b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems.

Rc_SM05- c) That a process be supported to regularly update the meta-data registry.

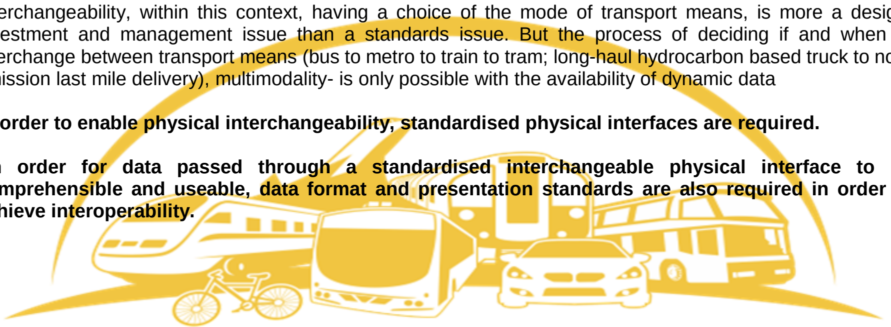
Rc_SM07- d) At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards.

E.3.2 Interchangeability

Interchangeability, within this context, having a choice of the mode of transport means, is more a design, investment and management issue than a standards issue. But the process of deciding if and when to interchange between transport means (bus to metro to train to tram; long-haul hydrocarbon based truck to non-emission last mile delivery), multimodality- is only possible with the availability of dynamic data

Rc_SM10- In order to enable physical interchangeability, standardised physical interfaces are required.

Rc_Gn10- In order for data passed through a standardised interchangeable physical interface to be comprehensible and useable, data format and presentation standards are also required in order to achieve interoperability.



E.3.3 Intermodality

See Use Cases MIS 0001 – MIS 0005 and their explanation in Annex G.

Rc_Gn09- Similarly, intermodality - the sequential change of transport means in order to achieve a journey - is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).

E.3.4 Multimodality

Multimodality - the ability to make a journey by more than one transport means is central to most of the objectives of Urban-ITS. Multimodality provides the user of the urban environment with the means to make decisions in respect of the most appropriate, efficient, comfortable means to achieve their journey, or the journey of goods, from entering the urban environment to arriving at destination or leaving the urban environment. Multimodality assists and encourage decision making regarding selecting 'sustainable' transport modes.

E.3.5 Sustainability

Sustainability is a key element of Urban-ITS. Annex D.2 discussed the growth of the world population and the trend for the vast majority of people to live in urban and peri-urban environments. Over the past quarter of a century, mankind has become sensitive to the sustainability of an environment that will support mankind, more aware of mans impact on the environment, and, within the urban environment, more aware that transportation models of the 20th century will not work in the mega-cities and urban environments of the future.

Sustainability is the capacity to endure; the ability to be maintained at a steady level without exhausting natural resources or causing severe ecological damage. Within the context of Urban-ITS, a 'sustainable' journey of a person or goods, is one that achieves successful achievement of an urban journey with no adverse effect, or minimum impact, on the environment; or, in terms of the provider of the transport means, to provide transport means that have minimum adverse effect on the environment.

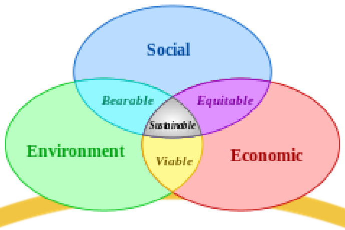


Figure E–1: Sustainable Development [50]

The United Nations 'Millennium Declaration' identified principles and treaties on sustainable development, including economic development, social development and environmental protection. This led to the 2005 'World Summit on Social Development' which identified sustainable development goals, such as economic development, social development and environmental protection [51]. Sustainable development consists of balancing local and global efforts to meet basic human needs without destroying or degrading the natural environment [52].

This report is not the place for a discussion on sustainability, but as a result of declarations and commitments made to the United Nations, and in the case of Europe, also the European environmental research and innovation policy [53] which "*aims at defining and implementing a transformative agenda to greening the economy and the society as a whole so to make them sustainable*". Research and innovation in Europe are financially supported by the programme Horizon 2020[54]], which is also open to participation worldwide. As a result, sustainability, both for reasons of heightened awareness and sensitivity, and the commitments of National governments, is a key objective of most urban governments and administrations.

In the achievement of Urban –ITS, this not only has the consequence that Urban Administrations elect to offer more green alternatives (e.g. electric or hybrid busses, bike-hire, cycleways, pedestrianised areas, etc.) but, increasingly will take measures to disrupt user choices in order to better attain their politically chosen 'sustainability' commitments.

The consequence of this to Urban-ITS and therefore to this report, is that in the context of "*urban infrastructure coordination to support Urban-ITS*", the remit to this Project Team", supporting Urban-ITS also implies using Urban-ITS to achieve political objectives (and increasingly regulatory requirements) for sustainability.

This may imply conflict between the Urban-ITS aims of the traveller "*to be able to make decisions in respect of the most appropriate, efficient, comfortable means to achieve their journey*" and be "*able to complete their journey in the most efficient and satisfactory manner*" and the Urban-ITS aims of the Urban Administration to '*create and maintain a sustainable environment'*.

As this Technical Report is directed towards assisting Urban Administrations in respect of achieving their objectives for Urban-ITS for the multimodal information systems, traffic management, and urban logistics, in the event of such areas of potential conflict of interest, this Technical Report places greater weight to the achievement of the goals of the administration than to those of the traveller.

These goals are heavily influenced by the European Commission White Paper on Transportation [56] and associated documents [57][58][59] and is seems appropriate to summarise those points that impact on the instantiation of Urban-ITS by Urban Administrations within the EU:

This document provides the executive summary of the Impact Assessment Report on the Commission's White Paper on Transport Policy, which lays down a long-term strategy that would allow the transport sector to meet its goals with a 2050 horizon.

The EC has identified four main root causes that prevent EU transport system to develop into a sustainable system:

- *Inefficient pricing: Today, most of the external costs of transport are still not internalised. Where existent, internalisation schemes are not co-ordinated between modes and Member States. Moreover, many taxes and subsidies which have been designed without the internalisation goal in view have a distorting effect on behaviour.*
- *Inefficiency of transport services: The achievement of a single, integrated and efficient transport system is delayed today by a number of remaining regulatory and market failures such as regulatory barriers to market entrance or burdensome administrative procedures which hamper the efficiency and the competitiveness of multimodal and cross-border transport.*
- *Investments to modernise the rail network and the transhipment facilities have been insufficient to address the bottlenecks in multimodal transport. Modal networks continue to be poorly integrated. TEN-T policy has lacked financial resources and a true European and multimodal perspective.*
- *Lack of integrated transport planning: When taking land-use planning or location decisions both at local level and at continental level, public authorities and companies often do not properly take into account the consequences of their choices on the operation of the transport system as a whole, which typically generates inefficiencies.*

The general policy objective of this initiative is to define a long-term strategy that would transform the EU transport system into a sustainable system by 2050. This general objective can be translated into more specific objectives:

(a) *A reduction of GHG emissions that is consistent with the long-term requirements for limiting climate change to 2 °C and with the overall target for the EU of reducing emissions by 80% by 2050 compared to 1990. Transport-related emissions of* CO_2 *should be reduced by around 60% by 2050 compared to 1990.*

(b) *A drastic decrease in the oil dependency ratio of transport-related activities by 2050 as requested by the EU 2020 Strategy for transport calling for "decarbonised transport".*

(c) *Limit the growth of congestion.*

The first two objectives overlap to a large extent, and should be considered the absolute priority in line with the' Resource Efficiency Flagship of the EU 2020 Strategy'. There are, however, also significant synergies with the third objective that would typically call for a more extensive use of non-motorised and of public transport, which reduces both the use of space and the use of energy.

At the same time, the achievement of the specific policy objectives identified above should ensure that that "current and future generations have access to safe, secure, reliable and affordable mobility resources to meet their own needs and aspirations".

Thus, within the Technical Report, it is assumed that while the objectives for Urban Administrations may vary from city to city, and from Nation State to Nation State, the objectives of all EU Urban Administrations in enabling, supporting and instantiating Urban-ITS, embrace and include these objectives. While exact objectives will vary more greatly for countries outside EU, similar consequences may be expected as a result of commitments to the United Nations by Nation States in 2005, and the 2015 UN Paris climate conference. Similar objectives may be expected for Urban Administrations globally. The consequences of these objectives will need to be taken into account in the resultant recommendations for standards.

In respect of the EU, at the UN Paris climate conference, EU has made political commitment to COP 21 (UN Paris climate conference). in respect of Transport, the EU committed to the following:

(source: http://ec.europa.eu/clima/policies/transport/index_en.htm):

The transport sector has the second biggest greenhouse gas emissions in the EU. More than two thirds of transport-related greenhouse gas emissions are from road transport. However, there are also significant emissions from the aviation and maritime sectors and these sectors are experiencing the fastest growth in emissions, meaning that policies to reduce greenhouse gas emissions are required for a range of transport modes.

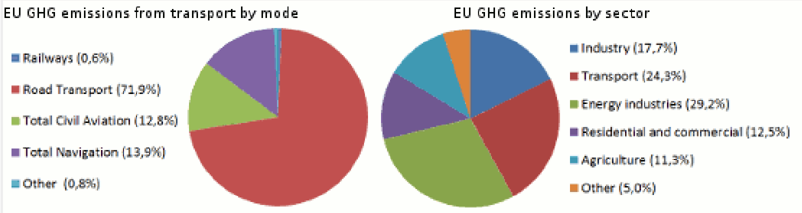


Figure E–2: EU Emissions from transport

Table E–1: EU28 greenhouse gas emissions by sector and mode of transport, 2012

By sector:	
Industry	17,7%
Transport	24,3%
Energy industries	29,2%
Residential and commercial	12,5%
Agriculture	11,3%
Other	5,0%
By mode:	
Railways	0,6%
Road Transport	71,9%
Total Civil Aviation	12,8%
Total Navigation	13,9%
Other	0,8%

Greenhouse gas emissions in other sectors decreased 15% between 1990 and 2007 but emissions from transport increased 36% during the same period. This increase has happened despite improved vehicle efficiency because the amount of personal and freight transport has increased. Since 2008 greenhouse gas emissions from transport have started to decrease. Despite this trend, transport emissions were in 2012 still 20.5 % above 1990 levels and would need to fall by 67 % by 2050 in order to meet the 2011 Transport White Paper target reduction of 60% compared to 1990.

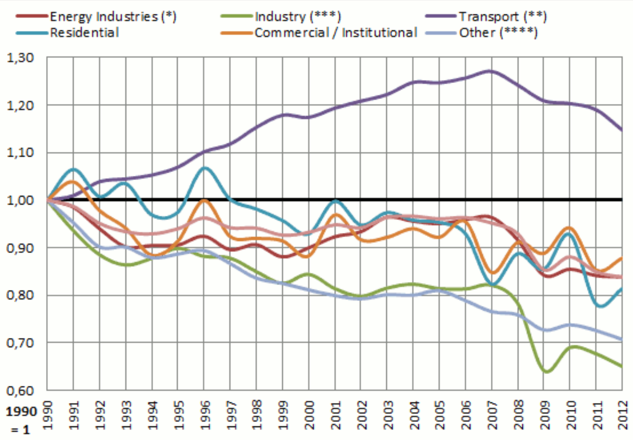


Figure E–3: Trends. Emissions EU

Table E–2: EU greenhouse gas emissions from transport and other sectors, 1990-2012

Year	Energy Industries (*)	Industry (***)	Transport (**)	Residential	Commercial / Institutional	Other (****)	Total
1990	**1**	**1**	**1**	**1**	**1**	**1**	**1**
1991	0,985009	0,935858	1,009402	1,064473	1,038497	0,952648	0,986888
1992	0,940146	0,885221	1,038667	1,007627	0,978254	0,901676	0,951123
1993	0,901696	0,863437	1,044512	1,034691	0,940998	0,90129	0,933523
1994	0,904676	0,877663	1,052493	0,969132	0,88404	0,87873	0,928836
1995	0,905661	0,89853	1,069122	0,974877	0,9135	0,886564	0,93969
1996	0,92388	0,881748	1,101439	1,067184	0,999025	0,893779	0,96242
1997	0,895784	0,87812	1,117612	1,001597	0,92356	0,866598	0,941917
1998	0,906355	0,849759	1,152909	0,981389	0,91966	0,835896	0,94114
1999	0,880741	0,825083	1,178453	0,957216	0,914411	0,824942	0,926251
2000	0,899507	0,843929	1,173855	0,92876	0,882446	0,811186	0,932151
2001	0,922864	0,814155	1,193211	0,997483	0,968569	0,799316	0,947878
2002	0,933518	0,797772	1,208118	0,947534	0,916662	0,792261	0,942007
2003	0,96404	0,815139	1,221933	0,97375	0,921653	0,801256	0,96384
2004	0,955689	0,823187	1,247299	0,957789	0,940043	0,799993	0,966126
2005	0,950459	0,813706	1,246657	0,953045	0,921989	0,809524	0,960628
2006	0,958817	0,813105	1,256491	0,929536	0,954653	0,788715	0,963339
2007	0,963525	0,82111	1,270389	0,823473	0,84789	0,765577	0,95188
2008	0,916295	0,782824	1,241761	0,887227	0,910777	0,758746	0,929195
2009	0,842117	0,641736	1,20888	0,854665	0,888021	0,726984	0,853641
2010	0,854646	0,690071	1,202982	0,92726	0,941323	0,737723	0,880728
2011	0,841354	0,676807	1,189913	0,78135	0,852818	0,725661	0,849087
2012	0,838352	0,649915	1,147048	0,813597	0,877979	0,707035	0,837749

Notes: (*) Excluding LULUCF (Land Use, Land – Use Change and Forestry) emissions and International Bunkers (**) Excluding International Bunkers (international traffic departing from the EU) (***) Emissions from Manufacturing and Construction and Industrial Processes (****) Emissions from Fuel Combustion in Agriculture/Forestry/Fisheries, Other (Not elsewhere specified), Fugitive Emissions from Fuels, Solvent and Other Product Use, Waste, Other.
EU greenhouse gas emissions from transport and other sectors, 1990-2012

A wide range of EU policies to lower emissions

As greenhouse gas emissions have been increasing for most modes of transport, the EU has so far put a range of policies in place aiming to lower emissions from the sector. These include:

- *aviation has been included in the EU Emissions Trading System (ETS);*
- *a strategy is in place to reduce emissions from cars and vans, including emissions targets for new vehicles;*
- *a strategy for reducing heavy duty vehicle fuel consumption and CO_2 emissions;*
- *a target is in place to reduce the greenhouse gas intensity of fuels;*

- *rolling resistance limits and tyre labelling requirements have been introduced and tyre pressure monitors made mandatory on new vehicles;*
- *legislation encouraging national authorities to deploy gas and electricity infrastructure; and,*
- *public authorities are required to take account of life time energy use and CO_2emissions when procuring vehicles.*

In addition to these measures influencing vehicle emissions, it is also necessary to ensure that account is taken of the impact of transport policy actions and measures on greenhouse gas emissions. This helps to ensure consistent signals to transport users and vehicle manufacturers and to achieve greenhouse gas emission reductions at lowest cost.

Transport emissions in the longer term

Significant reductions in greenhouse gas emissions from transport are required if the EU is to achieve its long-term goals. Therefore, the Commission carried out a study to investigate the sorts of policies and technologies that are needed to achieve substantial emission reductions by 2050.

The full reports and an interactive tool showing potential greenhouse gas emission reductions from different technologies and policies can be found at the:
"EU Transport GHG: Routes to 2050" project.

In respect of this pre-study, such commitments will impact journey options for transport users in order for Governments to meet their political commitments, and meet their sustainability objectives, and will place pressures on Urban Administrations to use all means available, (especially Urban-ITS) to achieve these objectives.

E.4 Systems and devices that could take advantage of common structuring and implementation guidelines

E.4.1 Benefits of a common reference data model/ Meta-data registry

One of the many things that has been hampering the deployment of Urban-ITS is the lack of a common understanding and use of both data concepts and terms. Thus for example there are different ways of describing the data concept traffic flow, such as vehicles per hour, or passenger car units per hour. In addition, used on its own, traffic flow, for example, regardless of how it is measured, may not provide a true picture of the traffic situation at the point in the road network where it is measured. For example, a low traffic flow can mean that few vehicles are passing the measuring point, or that vehicles are passing slowly. So it needs to be considered with other data, such as vehicle speed and/or vehicle headway.

In order for the various parts of an Urban-ITS implementation to work together properly through standardised interfaces that promote inter-operability, there needs to be a common understanding of how traffic flow and other data items measured. This common understanding can be provided by the use of a common reference data model, which can be manifest in the form of a meta-data registry. Setting up a meta-data registry can be accomplished by following the guidance provided in the following standards:

ISO 14817-1: Intelligent transport systems – ITS central data dictionaries – Part 1: Requirements for ITS data definitions

ISO 14817-2: Intelligent transport systems – ITS central data dictionaries – Part 2: Governance of the Central ITS Data Concept Registry

Rc_SM01-that before the end of 2016 the European Urban-ITS meta-data registry is set up and established to contain data definitions and terms used by Urban-ITS implementations for required use throughout Europe.

Setting up this meta-data registry will bring harmony to the data concepts used by Urban-ITS implementations throughout Europe. This will have the benefit of improving the use of common data concepts, which in turn will increase the potential for inter-operability and the exchange of data between ITS applications. The meta-data registry set-up process will be able to draw on the experience being gained within ISO TC204 as its Working Group 1 sets up a meta-data registry for its own internal use.

Unfortunately, just setting up a meta-data registry will not provide the complete solution. This is because ITS is continuously evolving with time as technology and travellers' expectations of service content and availability are continuously changing. This means that the data concepts ITS applications use also have to change. In order to accommodate this, it will be necessary for the meta-data registry included in the previous recommendation to be continuously updated with new data concepts. This update process must take place in a co-ordinated way to ensure backwards compatibility, harmonisation with existing data concepts and the proper planned introduction of new data concepts.

Rc_SM06- that once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires.

This recommendation will ensure that the European Urban-ITS meta-data registry will continue to contain the data concepts used by ITS applications as they evolve and change according to changes in technology and travellers' expectations of service content and availability. This will help to maintain the benefits of inter-operability provided by the exchange of common data concepts between ITS applications.

While a data dictionary/data registry provides a definition of meta-data concepts and their properties, a data model also shows the relationships between concepts within the context of the model.

A reference data model provides the means to describe how far or how near system specifications are compared to a reference model.

A reference model means that it is not necessary for individual systems or specifications to implement the complete standard. It provides a means to describe (for those elements of systems, interfaces and specifications which fall within the scope of the reference):

- the aspects of the reference that they have adopted;
- the aspects of the reference that they have chosen not to adopt.

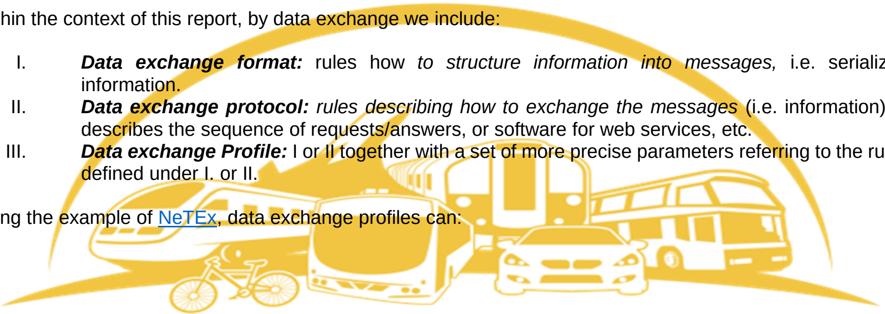
Transmodel (D.2.3.25) is an example for a reference data model for public transport.

E.4.2 Benefits of data exchange profiles

Within the context of this report, by data exchange we include:

I. ***Data exchange format:*** rules how *to structure information into messages,* i.e. serialized information.
II. ***Data exchange protocol:*** *rules describing how to exchange the messages* (i.e. information). It describes the sequence of requests/answers, or software for web services, etc.
III. ***Data exchange Profile:*** I or II together with a set of more precise parameters referring to the rules defined under I. or II.

Using the example of NeTEx, data exchange profiles can:



Define the data exchange format for a broad set of data, (called a 'Frame'). There are specific types of 'Frame' for each functional area of NeTEx, for example 'Site Frame', 'Timetable Frame', etc. These explicit 'Frames' are described in the respective NeTEx functional parts, along with the elements they contain.

SITE FRAME example:

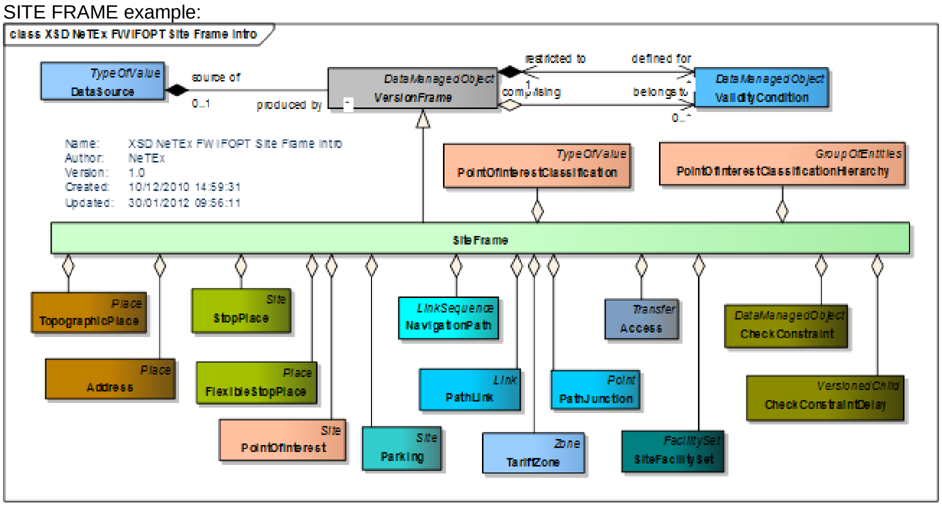

class XSD NeTEx FWIFOPT Site Frame Intro
TypeOfValue
DataSource
source of
0..1
produced by
DataManagedObject
VersionFrame
restricted to
1
comprising
defined for
belongs to
0..*
DataManagedObject
ValidityCondition
Name: XSD NeTEx FW IFOPT Site Frame Intro
Author: NeTEx
Version: 1.0
Created: 10/12/2010 14:59:31
Updated: 30/01/2012 09:56:11
TypeOfValue
PointOfInterestClassification
GroupOfEntities
PointOfInterestClassificationHierarchy
SiteFrame
Place
TopographicPlace
Site
StopPlace
LinkSequence
NavigationPath
Transfer
Access
DataManagedObject
CheckConstraint
Place
Address
Place
FlexibleStopPlace
Link
PathLink
Point
PathJunction
VersionedChild
CheckConstraintDelay
Site
PointOfInterest
Site
Parking
Zone
TariffZone
FacilitySet
SiteFacilitySet

Figure E–4: NeTEX SITE FRAME

However, in some cases, only a part of a 'Frame' is required, for instance for Stop Place exchange several elements will have to be removed from the exchange. So a specific Stop Place profile may be created, to exchange only stop information.

This means, that some elements proposed by the standards may be optional: when implementing a data exchange standard a profile is needed, i.e. it should be decided if all items of the standard will be used or not.

In addition, a number of local or national specificities can lead to a specific use or a specific codification to be used for certain information. For example, UK has a national repository for the identification of stops (NaPTAN) which require a specific codification of stop IDs, meaningless for all other European countries.

Recommendation: when determining data exchange standard profiles: the purpose of the profile and how it refers to a standard data exchange format, should be specified

A data exchange profile, in order to be understood by both parties of the exchange, has to be determined through more detailed parameters (e.g. data validity conditions within a frame, precise cardinalities, restriction to certain values of data, for instance for enumerations).

Recommendation: An open (publicly available) specification referring

- ➢ *to data versions handling for elements composing a data frame;*
- ➢ *to precise cardinalities of data occurrences;*
- ➢ *to restrictions to certain data values (if applicable);*
- ➢ *has to be available in order to enable interoperability.*

Rc_Gn06- When determining standard data exchange profiles, it is recommended to specify the purpose of the profile and how it refers to a reference standard data exchange format. And shall provide an open

(publicly available) specification, including: to data versioning; to precise cardinalities; to restrictions to certain data values.

Rc_Gn05- Recommendation: it is strongly recommended to follow a model-driven approach, i.e. to refer to a reference model for the contents of the exchanged information as described in E.4.5.2.

E.4.3 Location determination and location referencing

E.4.3.1 Introduction

Location determination refers to estimating the position of a user or client device at a particular point in space. Historically this was undertaken by using landmarks on the ground or navigating via the stars and the sun. Latterly this function has been taken over by GNSS systems such as GPS, GLONASS, COMPASS, or GALILEO.

Location referencing refers to relating the user or client device on a map. This map can be topographical in the case of a navigation system or logical in the case of a bus or tram system.

'Geographic Information Systems' (GIS), deal with information concerning phenomena associated with location relative to the Earth (ISO 19101); the hardware, software, people, and data used to capture, manage, analyse and display geospatial information for general geospatial, surfaces, and network analysis and visualization.

The GIS software and services market, excluding GNSS and remote sensing, totalled approximately $2.5 billion US dollars in 2014 and is expected to grow at around an 11% rate to above $4 billion in 2018.

Nearly all ITS applications need some form of location determination and referencing to put the data or information into a spatial context. The biggest problem is not so much this requirement, but that our legacy systems have undertaken this in different ways.

In data terms, for most systems, we need to know values and where the data was collected. For example, a loop detector is referenced to a particular point defined generally by a description of the road, the direction, the lane and a stated distance from a known reference point like a junction. Data from a moving probe vehicle will often be defined by XY coordinates based on an agreed location referencing systems such as WGS84. However, there are issues with location determination in the "urban canyon" or in enclosed spaces such as car parks or stations.

Public transport information is often referenced to a time related layer of (referenced and identified) routes and stops, but without the need to worry about where these routes and stops are in geographical space, i.e. without the need to reference to a particular point in space, just to a bus-stop reference invented and assigned locally. Location information for public transport elements like stop points, station layouts etc is typically handled independently and with varying levels of coherence: some countries have national standards, others have local or regional databases.

Historically, applications in the transport sector have spawned location referencing systems that have properties that suit the application itself. However, this silo approach has resulted in a significant number of incompatible location referencing systems, often within the same organisation.

A typical road authority may have 10 of more such different location referencing systems for traffic control, pavement management, detections, asset management and content dissemination etc.; none of which are compatible or easily translated from one to another because of different business rules or definitions. An example of this is 'lanes'; is a long exit lane from a motorway counted as a running lane, and where does it start and end?

The same is true for applications in the ITS 'Traffic Information' domain, which has at least 5 location referencing systems. When proponents of a standard for a new application start, their main aim is to make a system that is not dependant on any systems outside of their application area; so concepts like data-registries and location referencing have traditionally been disregarded, or not even considered in the first place!

In public transport information, location references – where they exist – are both inconsistent with location information on the infrastructure, and may be incoherent internally as well. For example, even where a bus stop is geo-located as a point in space, this is often unmatched with the road along which the bus will be travelling. Also, there is a logical divergence on whether the "stop" is the point that passengers should stand, of the point that the vehicle will stand. While this distinction will generally be of no significance for end users of itself, it makes multimodal information – for example, planning a walk-then-bus journey – more difficult and unreliable.

More generally, in the Urban-ITS context, multiple applications are suddenly required to cooperate. So, in a multimodal environment, the disparity between location referencing systems becomes a major issue.

The only solution is to first identify the characteristics of location referencing that can be 'application independent' and then evolve (a) a conversion strategy for the short term, and (b) a migration strategy for the long term; with constant pressure on budgets, this represents a major challenge.

E.4.3.2 The layers of a location referencing system

The synthesis of this is that there are 6 "layers" to a location referencing system. A multimodal urban traveller might need to reference (represented by the arrow) all of the layers to receive MIS.

This is shown in Figure E–5.

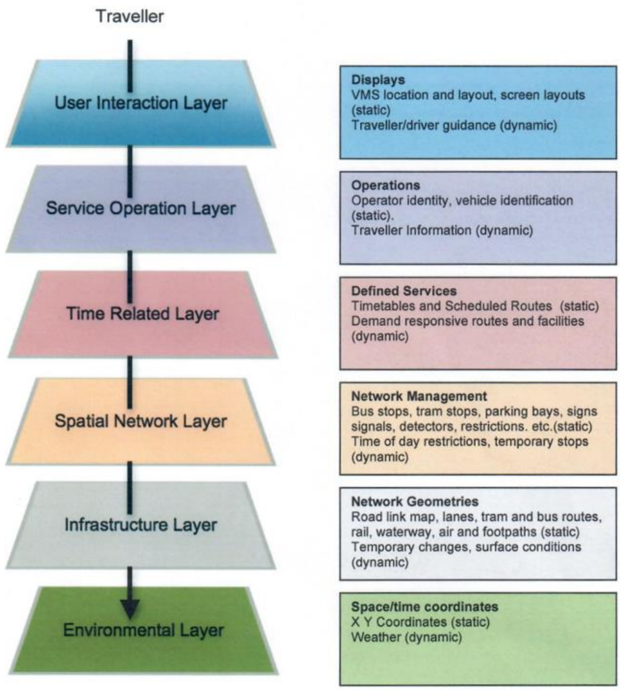

Traveller
User Interaction Layer
Service Operation Layer
Time Related Layer
Spatial Network Layer
Infrastructure Layer
Environmental Layer
Displays
VMS location and layout, screen layouts (static)
Traveller/driver guidance (dynamic)
Operations
Operator identity, vehicle identification (static).
Traveller Information (dynamic)
Defined Services
Timetables and Scheduled Routes (static)
Demand responsive routes and facilities (dynamic)
Network Management
Bus stops, tram stops, parking bays, signs signals, detectors, restrictions. etc.(static)
Time of day restrictions, temporary stops (dynamic)
Network Geometries
Road link map, lanes, tram and bus routes, rail, waterway, air and footpaths (static)
Temporary changes, surface conditions (dynamic)
Space/time coordinates
X Y Coordinates (static)
Weather (dynamic)

Figure E–5: The layers of an ITS ''Location Referencing" system

In order to make a truly 'Multimodal Information Service' available to the urban traveller, all these layers need to line up, so that, for example, the traveller knows where in the urban space the tram stop is, and the tram operator needs to see the routes compared with the routes of other transport modes.

Each of these layers has at least one set of standards, usually different between different transport modes. Some services need to access every layer, but some only a subset of all the layers.

The location determination method used in the majority of user devices generally relies on GNSS; however, whereas this has sufficient accuracy for most information based system, it will suffer from inaccuracy so that it will not be suitable for some C-ITS applications, or even stop working in the "urban canyon" where line of sight to a sufficient number of satellites will be significantly reduced. Additionally, there will be applications that will require location determination indoors (car parks and public transport stations) which cannot yet be satisfied by existing location determination systems.

E.4.3.3 What fits where?

Looking at the MIS value chain as an example, Table E–3 shows each of the processes will access some but not all of the layers, which when the information is combined will make it impossible to combine to provide a true multimodal offering.

Table E–3: An example of the correspondence of applications and layers in MIS.

	User Interaction	Service Operation	Time Related	Spatial Network	Infrastructure	Environmental
1.Planned Data Retrieval		✓	✓	✓		
2. Real-time Data Capture			✓	✓	✓	
3. Planned Data Processing		✓	✓	✓		
4. Real-time Data Processing				✓	✓	
5. Planned and real-time data combination		✓	✓	✓	✓	
6. Information Structuring	✓	✓	✓	✓	✓	✓
7. Information Dissemination	✓			✓	✓	✓

To take an example of data from road detectors entering the system; it is likely that the existing detector address will be proprietary to the UTC system; it is possible that there will be a reference to the infrastructure layer, but is unlikely to have any reference to environmental coordinates (WGS84) because the main purpose of its addressing historically has been simply to ensure that it provides data to the control algorithms for the road section.

E.4.3.4 What exists now?

E.4.3.4.1 Pre-coded location referencing (RDS-TMC)

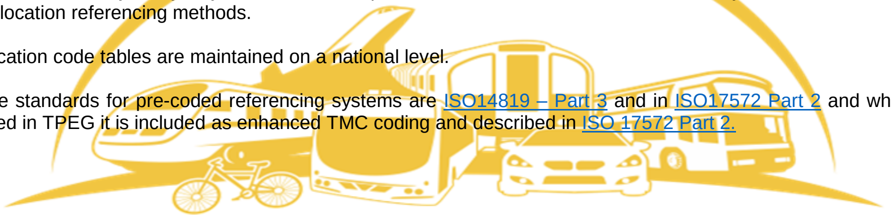
In a pre-coded location referencing system an identifier is given to a set location. This could be a point location, a linear location, route location or an area. Generally, location references are related to each other in a contiguous fashion so that an event can be described by a primary location followed by an “extent” that describes how many locations are involved.

Pre-coded location referencing is used in RDS-TMC because of the low bandwidth of the RDS data stream. A location has to be coded into 16 bits giving 64k possible locations in any given location set. The advantage of this type of location coding is that it is simple, efficient and uniquely references a location where an event exists. The main disadvantages are that: it is limited to 64k locations (which is acceptable for inter-urban networks, but possibly limiting for urban networks); it relies on synchronisation of editions between the originator of the message and the receiver; it is complex to update to add or remove new roads and intersections.

Pre-coded location referencing sits in the spatial network layer with direct linking to the Infrastructure and Environmental layers by way of location description and WGS84 coordinates. It is used by DATEX II as one of its location referencing methods.

Location code tables are maintained on a national level.

The standards for pre-coded referencing systems are ISO14819 – Part 3 and in ISO17572 Part 2 and when used in TPEG it is included as enhanced TMC coding and described in ISO 17572 Part 2.



E.4.3.4.2 On the Fly Location Referencing Systems (TPEG-loc)

“On-the-fly” location referencing is used where there are fewer limitations on bandwidth. The advantages are that there are no issues over synchronisation of location set editions between the originator of the message and the receiver. In an on-the-fly location referencing system an X-Y coordinate is used (in TPEG it is WGS84) to describe a point, or a pair of X-Y coordinates to describe a link. Unfortunately, a WGS84 point may not be sufficiently accurate to describe a point unambiguously. Examples of this are where a road runs parallel and close another road or one road crosses another on an over-bridge; or in an urban sense where a canal, or tram track is between roads of the same name. This is overcome in TPEG-loc by the addition of an additional descriptor for the location (e.g. a road number and direction). In urban areas this might still not be sufficiently unambiguous due to the small differences in maps, so AGORA add a series of descriptors, which describe the geometry of the roads surrounding the location to enable accurate map matching, rather than the end user device simply snapping to the nearest road. On-the-fly location referencing sits in the environmental layer with references to the Infrastructure layer.

Standards in the area are ISO TS 21219 parts 21, 22 and 23.

Other initiatives are underway. *Tomtom* (large vendor) is suggesting that its OPEN LR location referencing system (www.openlr.info) be used as an industry standard to be further developed by all. Open LR is an on-the-fly location referencing system and exits in the environmental layer.

E.4.3.4.2 INSPIRE

A major recent development has been the entering in force of the INSPIRE Directive in May 2007, establishing an infrastructure for spatial information in Europe to support community environmental policies, and policies or activities which may have an impact on the environment.

The INSPIRE directive (2007/2/EC) – implemented and amended under several Commission regulations) aims to create a European Union spatial data infrastructure. This will enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe.

INSPIRE is based on the infrastructures for spatial information established and operated by the 28 Member States of the European Union. The Directive addresses 34 spatial data themes needed for environmental applications, with key components specified through technical implementing rules. This makes INSPIRE a unique example of a legislative “regional” approach.

To ensure that the spatial data infrastructures of the Member States are compatible and usable in a community and transboundary context, the Directive requires that common ‘Implementing Rules’ (IR) are adopted in a number of specific areas (metadata, data specifications, network services, data and service sharing and monitoring and reporting). These IRs are adopted as ‘Commission Decisions’ or ‘Regulations’, and are binding in their entirety. The Commission is assisted in the process of adopting such rules by a regulatory committee composed of representatives of the Member States and chaired by a representative of the Commission (revised Comitology procedure).

The INSPIRE specifications for network referencing and data definitions (Transport Networks) are out of alignment with those in common practice within the many highway administrations. INSPIRE is centred on ISO 19100 series standards. This series does have a definition of ‘transport nodes’. A ‘transport node’ is a location that facilitates transfers between transport modes, transport networks and/or transport means. ISO 19147, Geographic information -- Transport nodes, which is limited to the transport of persons and the static getting-on and getting-off points, was published in 2015. Work on an additional standard for transport nodes for freight transport is expected.

E.4.3.4.3 ISO 19136 GML (Geography Markup Language)

GML (Geography Markup Language) is an XML dialect designed to describe and exchange geographical features, with possible business extensions through profiles and application schema.

This allows describing of generic geographic data sets containing points, lines and polygons. It is also deigned to allow de definition of business specific application schemas that are specialized extensions of GML. Using application schemas, users can refer to roads, highways, and bridges instead of points, lines and polygons.

Clients and servers with interfaces that implement the OpenGIS® 'Web Feature Service Interface Standard '(see http://www.opengeospatial.org/standards/wfs) read and write GML data.

The project OPTICITIES provides a list of known, publicly accessible GML application schemas, selecting only those possibly related to domains:

- CityGML - a common information model and GML application schema for virtual 3D city / regional models. Direct link to the CityGML homepage.
- Coverages - an interoperable, encoding-neutral information model for the digital representation of spatio-temporally varying phenomena (such as sensor, image, model, and statistics data), based on the abstract model of ISO 19123
- INSPIRE application schemas, available on http://inspire.ec.europa.eu/schemas/
- LandGML - a GML implementation equivalent to LandXML
- OS MasterMap GML
- WXXM - Weather information exchange model

The standard in this area is ISO 19107:2003 Spatial schema and the OGC Simple Feature Common Architecture).

E.4.3.4.4 EN/ISO14825:2011 GDF (Geographic Data File)

GDF (Geographic Data Files) is a CEN-ISO standard designed to describe and transfer road networks and road-related data. Much more than a generic GIS standard, GDF provides a structured description of the road network and related data for in-vehicle or portable navigation systems, traffic management centres, or services linked with road management systems, including public transport systems.

Its primary use is for car navigation systems, but it can also be used in many other transport and traffic applications such as fleet management, dispatch management, traffic analysis, traffic management, and automatic vehicle location. Most recent extensions include information for pedestrian navigation, 3-D map rendering, and 'Advanced Driver Assistance Systems' (ADAS).

Data in GDF format are provided by many map vendors such as Navteq, TomTom, Mapscape BV, GeoSmart, Automotive Navigation Data, AutoNavi and NavInfo.

Despite the existence of the GDF standard, the nature of model abstractions, as well as semantic interpretations and proprietary content extensions lead to interoperability issues between GDF map products from different vendors. In practice the GDF files are not fully interchangeable due to vendor specific extensions.

The standard in this area is EN/ISO14825:2011 Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0

E.4.3.4.5 Transmodel

Transmodel includes a set of principles for geo-referencing, and derived standards (SIRI, NeTEx) build on this to provide a node-and-link based system where elements are related to the '*Service Operation', 'Time Related', 'Spatial Network' and 'Infrastructure' layers.* It is possible to link them with XY coordinates in the environmental layer.

(For a description of Transmodel see D.2.3.25).

E.4.3.5 Where are the gaps in location referencing?

Two Use Cases have been constructed, one for location referencing and one for location determination.

	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Urban-ITS Interoperable Location Referencing**
M	**Use Case reference /id**	**GEN-0001 v3 20151124**
M	Description	Provision of a real time continuous location referencing system for the Urban-ITS environment. The referencing system should allow for planned and real-time data.
M	Scenario	An ITS deployment needs to draw data (for MIS, TM or UL purposes) from different modal systems, possibly under the ownership and control of several different organisations. In order to be able to compare routes, vehicle positions and interchange locations/structures effectively, it needs a common location referencing system.
M	Scope	To be able to place planned and real-time data in a universal location referencing environment so that control systems for the various modes can interact to provide seamless services to the urban traveller.
M	Actors Involved	Public transport operators Traffic managers Trip planning service providers ‘travel information provider’s Car park operator Location referencing providers Location determination providers Freight shippers Other travel mode providers Road maintenance operators Geographic information providers
M	Stakeholders	EU and National governments Urban administrations Public transport authorities Road operators Travellers
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	That each element in the Urban-ITS chain is prepared to provide links to this universal location referencing system.

M	Identified standards (not exhaustive list)	ISO/EN 14819-3 Traffic and travel information (TTI) TTI messages via traffic message coding - part 3 location referencing for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT C . ISO/TS 21219 Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) - part 21,22, 23. CEN/TS 16157-2 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing. ISO 17572-3 Intelligent transport systems (ITS) -- Location referencing for geographic databases – Parts 1,2 and 3. ISO 19147:2015 Geographic information -- Transfer Nodes. ISO/TS 1910XX Geographic information. ISO 14825 Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0. Various Transmodel, SIRI and NeTEx – Locations. EN 12896 Transmodel v6- Part 1: Common Concepts (Location Model, Projection Model). TS16614-1; Network and Timetable Exchange — Part 1: Network Topology. CEN/ISO TS 19091, Intelligent Transport Systems - Cooperative-ITS - Using V2I and I2V Communications for Applications Related to Signalized Intersections (SPaT, MAP, SRM, SSM) . ETSI EN 302 637-1 Cooperative Awareness Message (CAM). ETSI EN 301 637 -2 Decentralised Environmental Notification Message (DENM).
M	Standardisation gaps identified	There is no shortage of standards in the location referencing arena, the problem is that many of the methodologies are not compatible. The gap here is to ensure that multiple systems can all describe locations in the urban setting in such a way that they can cooperate to provide ITS services.
	Recommended actions	Development of standards: refer to the list above. A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Urban-ITS Location and Time Determination**
M	**Use Case reference /id**	**GEN-0002 v3 20151124**
M	Description	Provision of a location and time determination system that will work in the urban canyon and provide positioning and timing information in enclosed spaces.
M	Scenario	ITS deployments generally need to determine the position of an ITS station to a high degree of accuracy and reliability within the urban area and within structures such as multi-storey car parks.
M	Scope	Satellite positioning systems work well in the inter-urban space where there is no shielding of satellites by trees or tall buildings. The positional accuracy is adequate for must travel applications with the exception positioning of autonomous vehicles. However, they do not work well in some urban environments where a reduced number of satellites in line of sight due to the shielding effects of tall buildings (the urban canyon). There will also be applications where positioning inside buildings such as multi-storey car parks requires location determination.
M	Actors Involved	Public transport operators Traffic managers Trip planning service providers 'travel information provider's Car park operators Location referencing providers Location determination providers Freight shippers Other travel mode providers Road maintenance operators Geographic information providers
M	Stakeholders	EU and National Governments Urban administrations Public transport Authorities Road Operators Travellers
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	That location determination systems are freely available.
M	Identified standards (not exhaustive list)	There are a number of standards in this area, most are for determination of the position of objects. These range for from the simple radio direction finder available since the 1950s through to systems that use a number of beacons inside buildings using tagged objects. ISO 19116 Geographic information -- Positioning services.
M	Standardisation gaps identified	Standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate way.
	Recommended actions	Development of standards: refer to the list above
O	Other information	

E.4.3.6 Future requirements

Annex C.8 describes the scenarios for autonomous vehicles. In future the requirement for location referencing and determination will be of a far higher order of accuracy and reliability than for conventional Urban ITS applications. Presently a map in the Urban-ITS context only needs to provide data to an accuracy of about a metre; this is enough to describe lanes and other road features and to determine the position of stops in the public transport domain.

The maps required for an autonomous vehicle will have to be far more precise and accurate than location referencing and determination used today because it will need to continuously provide updated detailed information about the world to the car. It is likely that location determination will need to be in the 10s of millimetres and that objects/hazards on the route will also need to be described and to 10's of mm accuracy.

The map will change from a static asset to a dynamic asset which itself will need to be continuously updated as objects/hazards are not necessarily static. It is likely that the maps will be updated continuously in a cooperative manner from measurements taken from other vehicles.

E.4.3.7 Location referencing recommendations

Due to the nature of the silo development there are, for individual applications, no gaps, as the location referencing system has been designed to fulfil the needs of that application. The problems come when one needs to combine the data and information from one application with that from another application, the coding and business rules will rule out a simple combination exercise.

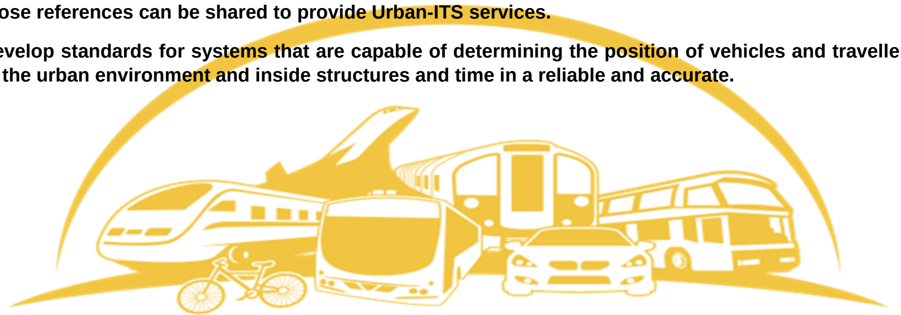
When combining applications and their associated data structures from applications that have been developed in silos, there are four options:

a) Do nothing and muddle along as before and not achieve full Urban-ITS integration;
b) Develop something new that encompasses all of the legacy applications;
c) Take an existing location referencing method and apply and adapt it across all the legacy applications; or
d) Develop a framework that can translate between different referencing systems.

The best practical option would be Option d. In a similar way to that which may be proposed for EU-ICIP, we could have a strand that would tie in the location reference elements together within the parameters set in the INSPIRE framework (see http://inspire.ec.europa.eu/)

Rc_SM09- A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services.

Rc_Gn11- Develop standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate.



E.4.4 Open urban data access portal

E.4.4.1 Availability of the portal

One of the main pre-requisites for successful ‘Multimodal Information Services’ (MIS) is the ability of service providers to have open access to both real-time and static data, and for this data to be about a variety of different travel modes. The availability of access to this data will enable service providers to offer services that enable travellers and those who move goods and freight to make informed choices about the most appropriate modes of transport to use for a particular journey or freight movement. Other services will be able to provide up to date real time travel information so that, for example, commuters can work out what time they need to leave for work, or will arrive home at the end of the working day. Travellers who make occasional journeys will be able to get assurance about the progress of their trip and what changes they have to make before they reach their final destination so that their trip becomes more comfortable.

Although the need for open access to this data may sound obvious, this does not mean that it will be easy to achieve. This is because the data to which service providers will need open access must come from a variety of sources, that will almost certainly be managed by a variety of organisations, some public and others privately owned.

The whole process of data access will be simplified if the data is freely available on request and from an urban data access portal. This portal will have to be managed by an organisation, which should also be responsible for collecting/receiving and collating the data as well as making it coherent. For the urban data access portal to be established a number of issues will need to be addressed of which the following are just a sample:

a) How will the portal be provided, and although it may have one entry point, do there need to be multiple stores of data behind it?
b) Where will the data stores for the portal be located and can they be in some virtual location (e.g. the cloud) or must it be physical locations?
c) How will the portal be accessed, will access controls be necessary, what security will be needed and other management issues?
d) What type of organisation should manage the data store(s) behind the portal, collate the data and how will this activity be funded?
e) How will organisations providing data for access through the portal have any of their commercial sensitivities protected?

Rc_SM11- It is recommended that an EC funded project is established to define the way in which multimodal travel data can be made freely available from an urban data access portal to European MIS service providers.

NOTE: To clarify. This recommendation is to extend and/or update existing standards (NeTEx, SIRI DATEX II), not to redefine nor define an alternative for those standards.

A benefit of the data being freely available is that it will encourage more providers to enter the service provision market and reduce the cost of providing those services to travellers and those responsible for moving goods and freight. The more transport modes for which data is available from an urban data access portal for use by service providers, the greater will be the benefit of the services that are provided from it.

E.4.4.2 Accuracy of data available from the urban access data portal

Even when all the access and availability issues highlighted in the previous section have been resolved, the success of the urban data access portal will depend on the accuracy and coherence of the data that is available from it. Thus, for example, the data will have to be available in units of measurement that are recognised across

Europe, additionally, it will almost certainly need a date/time stamp and a location reference. This will impose requirements on the data collection, collation and coherence processes because they will have make any measurement conversions and organise the data by both date/time and location; as well as of course transport mode, plus in some cases transport provider, so that, for example, the data provided by different but competing public transport operators can be differentiated.

In order to make accurate and coherent data available from the urban data access portal it will need to conform to a standard. Separate standard(s) will also need to be created for the data that is to be collected or provided for use by the portal.

Rc_MI27- It is recommended that a CEN Project Team is set up to create the standards for the form(s) in which data is to be made available from the urban access data portal, and for the minimum criteria for data that is collected/ provided use by the portal. ***See MI 11/30/31/33/34.***

E.4.5 Structure of Public Transport Service related data

E.4.5.1 Data categories

Public transport related data are of various types and are usually categorised from two different points of view.

On one hand data domains are defined in terms of public transport related business areas they serve, on the other hand, they are also viewed from the point of the time stage, as regards their usage and validity.

As regards the main business areas, the following are identified:

Transportation activities related to:

- Network topology description;
- Timing information and vehicle scheduling (runtimes, vehicle journeys, day type-related vehicle schedules);
- Operations monitoring and control: vehicle follow-up control actions;
- Passenger information: activities related to informing the (future) passengers of the transportation services;
- Fare management: activities related to fare structure and access rights definition, fare product sales, access rights validation & control, payment, billing.

(Source: NeTEx:2014)

A temporal (time related) dimension of these business areas may be considered; the data they need may be for planning, operations or statistics and thus be characterised also by a temporal dimension.

As the distinction between temporal categories “planning” and “operations” is not always very precise, for example the “operational” or “daily” data may have an existence of several hours and may then be modified (e.g. a timetable data provided as the target timetable planned in advance and assigned to an operational day), or an event that may be planned in advance for an operational day or occur without any forecast. The ‘Public Transport’ community identified a criterion to categorise the data according to a time-dimension: ‘planning’ activities (and thus the corresponding data) are those that take place before an operational day, ‘operation’ is all that happens during an operational day.

In the context of public transport, it is important to keep this distinction in mind since it has a number of consequences, namely in respect of management and usage:

The time-dimension describes how long in advance information is known, and for how long it will stay valid (or with very minor changes).

The life cycle describes the data life time which refers the required refreshment frequency to keep the data meaningful.

- *Planned (static) data* are often shared, their lifecycle is longer than an operational day; they are considered as stable enough to be exchanged over longer periods; they play the role of reference data for dynamic data.
  Example: planned passing time (16h30) of a bus at a particular stop on Sundays.

- *Operational (dynamic) data* have a short lifecycle (one operational day). they often refer to planned data, as for example an observed passing time may refer to a planned passing time.
  Example: Observed passing (16h32) time of a bus at a stop on 2015/11/08 is referring to the planned one for the particular operating day 2015/11/08.

The distinction between these two aspects of data is important for interface design: bulk exchanges of data files may occur for planned data, but for operational data, incremental exchanges are more appropriate.

Rc_PI06- Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between:

- ***planned data*** **(often called static), with a lifecycle longer than an operational day;**
- ***operational data*****, with a short lifecycle,**
- ***statistical data,*** **i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.**

As an example, EN12896:2006 (Reference data model for public transport - known as 'Transmodel)' also considers this threefold classification.

Transmodel covers a most the data requirements for the transportation, fare management, passenger information and (driving) personnel management functional domains for the three temporal dimensions.

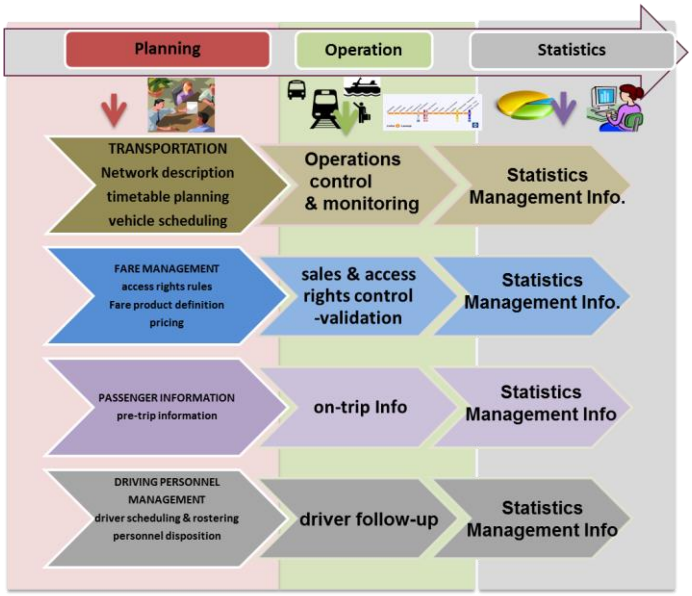

Planning
Operation
Statistics
TRANSPORTATION
Network description
timetable planning
vehicle scheduling
Operations control & monitoring
Statistics Management Info.
FARE MANAGEMENT
access rights rules
Fare product definition
pricing
sales & access rights control -validation
Statistics Management Info.
PASSENGER INFORMATION
pre-trip information
on-trip Info
Statistics Management Info
DRIVING PERSONNEL MANAGEMENT
driver scheduling & rostering
personnel disposition
driver follow-up
Statistics Management Info

Figure E–6: Transmodel example of data categorisation in terms of functional/temporal coverage

In this context, the functional viewpoint expresses the main purpose of a data, but once defined, a data has the same definition when used in another functional domain. This characteristic when specifying data models is particularly important to ensure the generic independence of a concept.

Rc_Gn04- ***It is recommended that there is generic independence of a concept. i.e. autonomous; free from control in action, judgement, etc. and not dependent on anything else for function, validity, etc; separate.***

The concepts have to be generic as opposed to specific to a domain, user or mode
The concepts have to be elementary: they are building blocks

Generic independence is important when describing a reference data set.

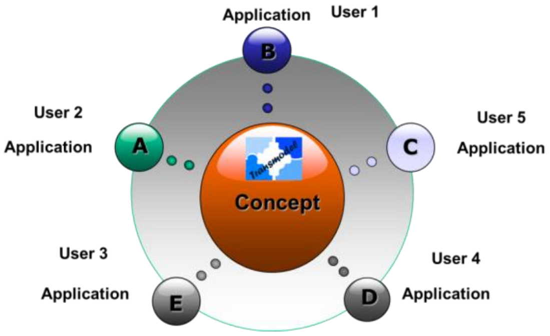
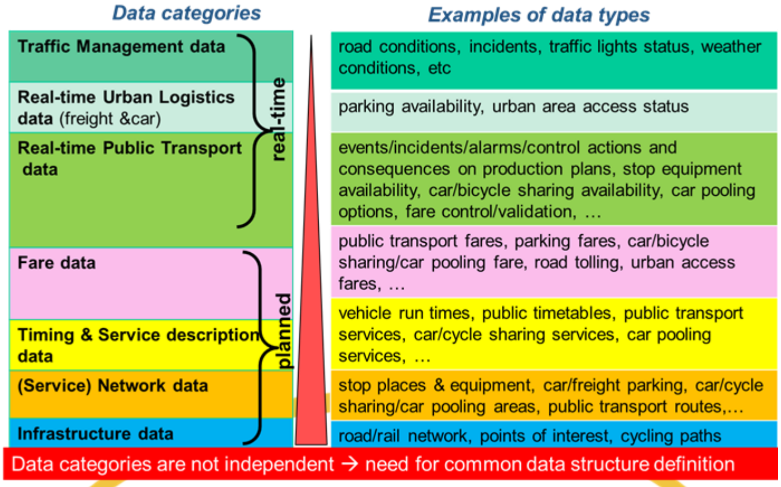


Figure E–7: Generic approach to data definition

To express the inter-dependence of some data sets from each other, the categorisation may also be presented using semantically coherent data clusters – **information categories**. The figure below shows the main categories that may be identified in the context of urban mobility:



Data categories	Examples of data types
Traffic Management data	road conditions, incidents, traffic lights status, weather conditions, etc
Real-time Urban Logistics data (freight &car)	parking availability, urban area access status
Real-time Public Transport data	events/incidents/alarms/control actions and consequences on production plans, stop equipment availability, car/bicycle sharing availability, car pooling options, fare control/validation, …
Fare data	public transport fares, parking fares, car/bicycle sharing/car pooling fare, road tolling, urban access fares, …
Timing & Service description data	vehicle run times, public timetables, public transport services, car/cycle sharing services, car pooling services, …
(Service) Network data	stop places & equipment, car/freight parking, car/cycle sharing/car pooling areas, public transport routes,…
Infrastructure data	road/rail network, points of interest, cycling paths

Data categories are not independent → need for common data structure definition

Figure E–8: Urban mobility relevant information categories

The inter-dependence of information categories leads to the definition of a data structures, best described as a ***conceptual data model****.*

E.4.5.2 Benefits of a model driven approach

Since the early 90's, the public transport community has recognised the importance of data modelling as a stable "element" to describe information systems. If the system boundaries are expressed through functions, as shown in the figure below, two data standards that have been developed, each, with its own boundary. However, the fact that they both are based on the principles listed above (generic data model), makes it possible to harmonise both - and even bring them together to a single one (Transmodel v6). [88]

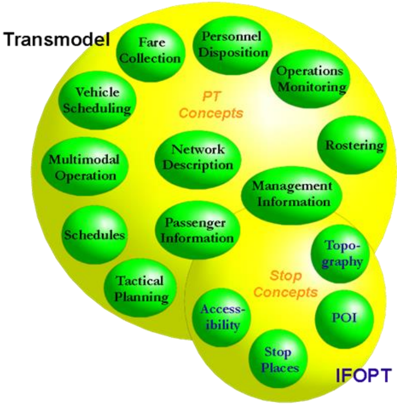

Transmodel
Fare Collection
Personnel Disposition
Operations Monitoring
Vehicle Scheduling
PT Concepts
Rostering
Multimodal Operation
Network Description
Management Information
Schedules
Passenger Information
Topo-graphy
Tactical Planning
Stop Concepts
Access-ibility
POI
Stop Places
IFOPT

Figure E–79 Example of model driven approach to harmonise data standards

This has a practical consequence, namely, if several systems based on different standards, intend to communicate, and exchange data, - for instance - an open specification of the data model they use eases data translation and thus interoperability of these systems.

One benefit of a model driven approach is the comparative ease with which harmonisation or mapping of two data standards can be achieved, and system interoperability can be obtained.

- ➢ The rapid evolution of public transport information system;
- ➢ the difficulty of exchanges between modes;
- ➢ the fact that several applications need multi-source and multi-modal data,

brought the public transport community to take into account all the public transport modes (bus, coach, tram, train…) and to represent the constraints associated with environments involving several transport operators in order to avoid development in 'silos'. This caused the standard developers to consider rather a mobility-centric approach than a mode-centric approach.

*Another benefit of a generic, conceptual data model is **independence of a particular transport mode or operator.***

The interoperability of systems is one of the main goals in the public transport world. Besides the necessity of building their information architecture on a solid reference data model, they need to exchange data and model-driven design facilitates this. In this context, data exchange formats and protocols are described, and are often standardised. Data exchange formats make use of several information technology protocols or standards: such as Edifact, XML, etc. or even very simple ones like CSV.

The existence of a common reference conceptual model, which define the semantics - data definitions and structure. (i.e. defining how the different data concepts differ from each other) of “what” is being exchanged makes it possible to further adapt the implementation schema without re-starting from scratch

The following figure illustrates this approach as chosen by the series of public transport data standards Transmodel and NeTEx.

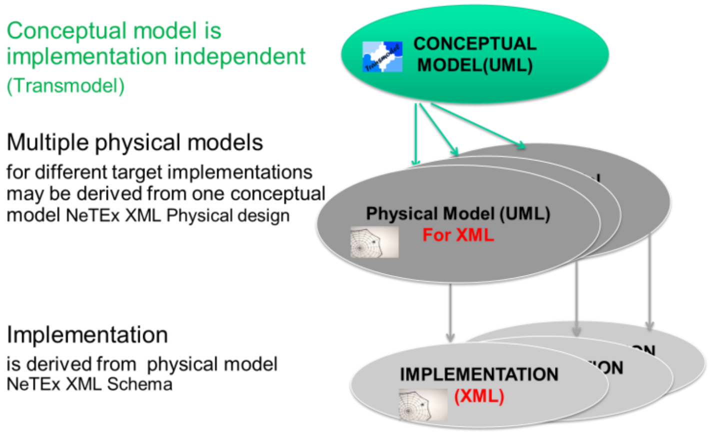

Conceptual model is implementation independent
(Transmodel)
CONCEPTUAL MODEL(UML)
Multiple physical models
for different target implementations may be derived from one conceptual model NeTEx XML Physical design
Physical Model (UML)
For XML
Implementation
is derived from physical model
NeTEx XML Schema
IMPLEMENTATION
(XML)

Figure E–10: Model driven design

Rc_Gn05- It is recommended that for all ITS data definition and data exchange standards, that a model driven approach is followed:

- **a model driven approach provides independent data structures which are the key for service continuity in the case of system evolutions, such as technology changes or system extension.**
- **The inter-dependence of information layers leads to the definition of a *data structures*, best described as a conceptual data model.**
- **a model driven approach eases harmonisation and/or mapping of two data standards enabling system interoperability.**
- **a generic, conceptual data model is generic independence of a particular transport mode or operator.**
- **A model driven design allows for many implementations relying on a commonly understood data structure specification (definitions and relationships between data concepts).**

E.5 High level generic ‘Concept of Operations’ for city/administration support for Urban-ITS

E.5.1 General

A concept of operations (CONOPS) is a document describing the characteristics of a proposed system from the viewpoint of an individual who will provide and/or use that system. It is used to communicate the quantitative and qualitative system characteristics to all stakeholders.[70]. CONOPS are widely used in the military, governmental services and other fields, and are considered highly appropriate for all areas of joint operations planning. Increasingly, CONOPS are used in ITS design to ensure that all relevant aspects of the system are being considered and controlled. A CONOPS Standard is available to guide the development of a CONOPS document.[71] The Institute of Electrical and Electronics Engineers (IEEE) CONOPS Standard is structured around information systems, but the standard may be applied to other complex systems as well. This section is organised consistently with that Standard.

A CONOPS generally evolves from a concept and is a description of how a set of capabilities may be employed to achieve desired objectives or end state.[69]

The requirements for this pre-study include:

Providing a high level generic ‘Concept of Operations’ for city/administration support for multimodal travel, traffic management and urban logistic aspects of Urban-ITS

This section therefore considers, from the point of view of the Urban Administration, *their* goals and objectives regarding Urban-ITS, and, using the typical CONOPS parameters, the general high level strategies, measures that they may be likely to use to achieve these objectives

This concept of operation is elaborated at the very highest level, it does not provide CONOPS for any particular applications service, nor even category of service. Rather, is summarises the generic objectives and management strategies for an Urban Administration in order to support Urban-ITS in the three categories identified by the CID as categories requiring priority support (multimodal travel, traffic management and urban logistic aspects of Urban-ITS).

It should be recognised that while this CONOPS overview is adequate from the perspective of helping to understand the role(s) of the Urban Administration in the implementation and support of Urban-ITS, significant further work will be required to develop a more detailed CONOPS in the form of a guide which will consider the concept of operations for Urban Administrations from the perspective of change to a multimodal business paradigm, and provide guidance and advice, particularly in respect of:

- Organisational management;
- commercial issues;
- change management.

E.5.2 Statement of the goals and objectives of the Urban-ITS

Improved traffic flow, safety and quality of life. All of these things are possible when road users have access to better information and advice about the traffic situation, with more information geared to the individual. This demand-driven approach means that collective intervention by road operators can be downsized and targeted at those moments when it really matters. The business sector can respond to that demand by introducing innovations and pioneering technologies that are also attracting a great deal of interest internationally.

Technology and society are developing all the time. Within ten years, the majority of vehicles, and/or the drivers of those vehicles, will be digitally connected. That trend is set to continue, and over a period of 15-20 years almost the entire fleet will be permanently connected to other vehicles and online services. In the longer term, we will also begin to see automated vehicles on our roads. These developments will offer countless opportunities for a more high-quality information supply to road users, and more cost-effective (public) traffic management. Public authorities and the business sector need to work together on an approach that makes the most of all these opportunities. This will enable the business sector to retain or even extend its leading position. After all, good accessibility is an essential pre-condition for economic growth.

The development of road traffic/travel information and traffic management is not new. Over the past years, these domains have been professionalised and that trend is continuing. But at the moment there is certainly room for improvement in the synergy between initiatives and investments made by market parties and road operators. At the same time, the dividing line between traffic management and mobility management (influencing the demand for mobility, often pre-trip) is becoming blurred by technological developments and the emergence of information services targeted at individuals. More and more cooperative services are emerging. All of these developments require open (European or Global) standards and greater collaboration in order (to realise a smart and substantive consistent mix of information (using smartphones, navigation systems and collective information channels on, above and along the road). However, this smart mix cannot be realised automatically. The transition will have an effect on public and private responsibilities. Public authorities and the business sector will have to tackle these challenges together.

E.5.3 Strategies, tactics, policies, and constraints affecting the Urban-ITS

There is a de facto division of responsibilities between public roads authorities, who have functional needs, and private sector ITS suppliers, who control the technical specifications of their products. However, to achieve successful integration, the public authority must impose some technical constraints at least on the interfaces of the products he acquires.

This requires a culture change, which may be assisted in several different ways: by informing, guiding or leading. Ideally Urban-ITS should be developed in partnership, both between public and private sector stakeholders and between different public roads authorities. To assist this, a Roadmap for Urban-ITS has been developed essentially as part of the White Paper "*Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system*"[56][57]

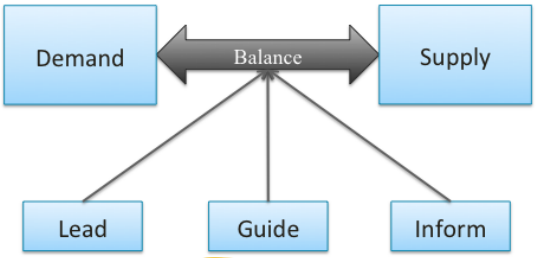


Figure E–11 : Urban-ITS Roadmap

The roadmap comprises six building blocks: four substantive and two process-oriented building blocks. The building blocks and their connections were established and agreed by stakeholder working parties. Together, they provide opportunities for innovation and efficiency for public authorities and the business sector.

By implementing this approach, the traditional distribution of roles will change, notably through stimulating market development consistent with the standards developed in coordinated working groups.

In this way, the intensification of pre-competitive collaboration will ensure that the supply of new technology and services is more consistent with public demand. This will more effectively utilise the creativity in the market. The road user's awareness of all these new services can be increased by means of competition and communication.

The six transition routes are:

I. From collective influence to a smart mix of collective and individual services
    a. The huge growth in private information services (smartphones/apps, navigation systems, use of the PC at home) means that the collective influence (by means of DRIPs, matrix signs) has less influence and is therefore less necessary.
    b. The development perspective is a consistent mix of collective and individual information services.
    c. This signifies a change in the distribution of roles and tasks between the market and public authorities.
    d. This mix will look differently on the urban road network than on the motorways and will continue to change.

II. The changing role of roadside systems
    a. The change is expected to lead to fewer stand-alone systems on the roadside. After all, some of the functionality of the roadside systems will overlap with that of systems in vehicles and perhaps hand-helds.
    b. Cooperative systems also make it possible to introduce new functionalities such as shock wave attenuation and platooning. This type of functionality requires a reliable supervision function from the roadside. In addition, a change will come about in the way traditional functions are introduced. For example, the function of loops in the road surface for the collection of traffic data and automatic incident detection may be taken over in the long term by direct communication between vehicles and the infrastructure.
    c. The emergence of cooperative systems (C-ITS) will make roadside systems for the traditional functions simpler, more maintenance-friendly and less expensive.

III. From local/regional to national coverage for road traffic/travel information and traffic management.
    a. The road user travels from door to door and in doing so experiences the road network as one cohesive whole. He/she will not notice that different road operators are responsible for different parts of the road network.
    b. Even more so than now, therefore, traffic management will be configured/designed regionally and, where necessary, nationally. Different road operators will jointly implement network-wide regulation strategies.
    c. Given this development, it is important to explore the consequences, opportunities and possibilities that the enhanced collaboration of road operators and private parties offer for the use and organisation of traffic control centres, for example.

IV. From business to government (B2G) to business to consumer (B2C) and business to business (B2B)
    a. Public authorities are aiming for more cost-effective traffic management.
    b. Due to the changing perspective for private earning models for road traffic/travel information services there will be less need for these services to be structurally funded by public authorities.
    c. This change requires an understanding of how market parties can create balanced earning models and the requisite pre-conditions. It will also require market parties to focus their services (for example, parking navigation in the cities) particularly on (road) users (consumers) and the business sector (business).
    d. This also requires a trustworthy long-term perspective on which the parties concerned can base their own investment strategies.

V. From ownership of data to maximum openness and availability of data (public and private)

a. Openness and availability of data is an important enabler for innovations in road traffic/travel information and traffic management.
b. On a European level, open data is now mandatory for public authorities and, in principle, public authorities must make all of their data about road traffic/travel information and traffic management openly available.
c. This change requires all the parties involved in road traffic/travel information and traffic management to have access to as much data as possible and requires all owners to make as much of their data as possible available to others, preferably openly but if necessary under certain conditions and on payment of a fee.

VI. From government supervision to public-private collaboration and alliances

a) The interaction between public authorities (local, regional and national administrations) and private service providers (navigation companies, the automotive industry, geo-business, the transport industry, and the developers of services and applications) and the end users is changing, as are the underlying earning models.

b) Mutual dependency means that no single party can dominate and exercise overall control. Structural consultation platforms are necessary in which agreements can be made, for example, about standardisation and data availability and quality.

E.5.4 Organisations, activities, and interactions among participants and stakeholders for Urban-ITS

The main stakeholders and participant for Urban-ITS identified in Annex E.1 above, can be grouped as:

- Data providers;
- Road operators / authorities / city government;
- Data providers;
- Knowledge institutes;
- Automotive industry;
- Road users/travellers.

Their activities and interactions can be summarised as follows:

Service providers will focus on providing (information) services that are geared to the needs and wishes of individual road users. These services will be designed to enable those road users to make the best possible choices when using the road network - before, during and after their trips.

These services will enable road users to, as closely as possible, travel from door to door quickly, safely, comfortably, in an environmentally friendly way and at the best price. Furthermore, market parties will continue to supply the systems needed by the road operators to manage traffic.

Road operators / authorities / city governments will facilitate the choices of the individual road user to the maximum by making sufficient road capacity available within the social pre-conditions and political objectives of safety, quality of life and accessibility. When these pre-conditions are threatened, such as in the case of crises and calamities, or when individual choices are counterproductive for large groups of road users, public authorities can intervene collectively by enforcing local traffic measures (orders and/or prohibitions).

As part of this joint effort, **data providers** will play a greater role in gathering, processing and enriching data (for road operators and other private parties). Moreover, communication with road users will largely take place by means of non-roadside-based information channels such as navigation systems, smartphones and technology in the vehicle.

The **knowledge institutes** are widely represented. They develop new systems / standards, support with algorithms and research.

The **automotive industry** is a data provider and service provider combined. The vehicle on-board system collects data, distributes these data and sends personalized advice to the road user.

More than ever, support of the road user who will provide information, advice, orders and prohibitions, will become a joint public-private effort with support of the knowledge institutes. The reliability experienced by road users ultimately depends on the consistency between the information and advice they receive and the actual situations they encounter on the road. This advice will take on more and more of a multimodal character. The social importance of a stable supply of information to road users will therefore necessitate public-private coordination and supervision.

E.5.5 Clear statement of responsibilities and authorities delegated for Urban-ITS

City governments/Urban Administrations are often statutory responsible to address specific urban problems such as safety, quality of life and accessibility. The successful deployment of ITS can only happen with the active participation and leadership of city governments/Urban Administrations with their wide overview in responsibilities for mobility planning and city/urban management. They know which solution is best suited for the local context and to combine different solutions if needed.

Close cooperation between public authorities, industry, research, and education is crucial for the deployment of Urban-ITS. All stakeholders need to understand each other's needs, and cities play an important role in identifying and representing the needs of citizens.

ITS solutions for urban mobility in a government view should focus in particular on:

- soft modes: public transport, walking and cycling;
- advanced information for users;
- intermodality for both passenger and freight transport, with a stronger focus on freight as this is less well developed;
- interoperability standards, e.g. for ticketing;
- traffic control, navigation surveillance and guidance;
- incident management;
- road safety education, training and awareness-raising for vulnerable road users;
- operation of green zones/low emission zones;
- vehicle safety and control systems, as much as electronic payment and enforcement.

E.5.6 Equipment required for Urban-ITS

The Urban-ITS consists of different building blocks, divided into layers. The main layers are support, central, roadside, vehicle and traveller / vulnerable road user (VRU). Each layer consists of different systems. These systems are connected to each other via different communication channels.

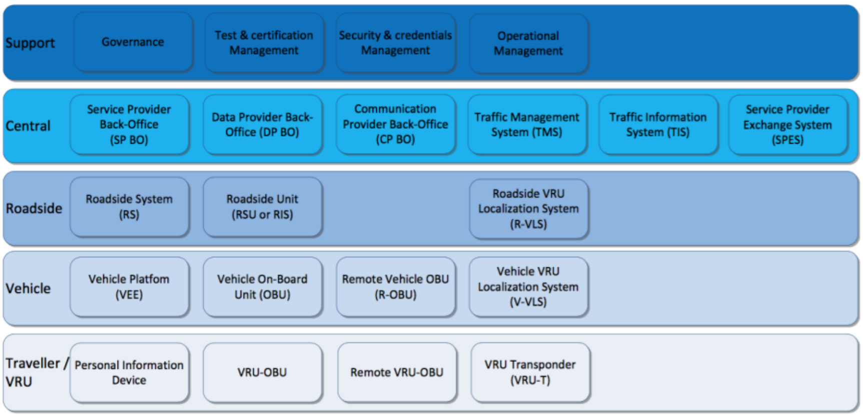
a) Support layer: Sub-systems to support the overall system e.g. governance, test and certification management and security and credentials management;

b) Central (or back-office) layer: Sub-systems to support connected vehicles, field and mobile devices and to perform management and administration functions. The sub-systems in this layer are typically virtual systems that can be aggregated together or geographical or functions distributed;

c) Roadside layer: Covers the ITS infrastructure on or along the physical road infrastructure, e.g. surveillance or control devices (signal/lane control, ramp meters, or systems to supply information to connected vehicles;

d) Vehicle layer: Covers the intelligent/cooperative on-board systems (advanced driver assistance / safety systems, navigation, remote data collection or information). Also specific sub-systems for fleet–type vehicles are included e.g. for signal priority, monitoring activities, fleet management or passenger services;

e) Traveller or vulnerable road user (VRU) layer: Covers both "personal" devices (e.g. mobile devices, navigation devices) and specific systems connected to vehicles of VRU's or VRU's itself (e.g. tags).

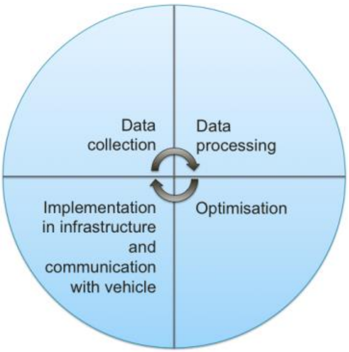


Support	Governance	Test & certification Management	Security & credentials Management	Operational Management		
Central	Service Provider Back-Office (SP BO)	Data Provider Back-Office (DP BO)	Communication Provider Back-Office (CP BO)	Traffic Management System (TMS)	Traffic Information System (TIS)	Service Provider Exchange System (SPES)
Roadside	Roadside System (RS)	Roadside Unit (RSU or RIS)		Roadside VRU Localization System (R-VLS)		
Vehicle	Vehicle Platfom (VEE)	Vehicle On-Board Unit (OBU)	Remote Vehicle OBU (R-OBU)	Vehicle VRU Localization System (V-VLS)		
Traveller / VRU	Personal Information Device	VRU-OBU	Remote VRU-OBU	VRU Transponder (VRU-T)		

Figure E–12: Layers and systems for Urban-ITS [91]

E.5.7 Operational processes for the Urban-ITS

Although the services in the field of Urban-ITS may be different, the processes are for the services are almost the same. The processes are divided into four steps:


Data collection
Data processing
Implementation in infrastructure and communication with vehicle
Optimisation

a) Data collection:
  - Vehicles
  - Direct local (wifi-P, bluetooth)
  - Priority (KAR, wifi-P)
  - Indirect (Internet, FCD)
  - Road side (induction loops, camera)
  - Status other traffic signs
  - Status network
b) Data processing:
  - Priority, convenience
  - Analysis and storage
  - Traffic management information
  - User information
c) Optimisation:
  - Circulation, safety, environment, convenience
  - Intersection, route, network
  - Car, public transport, bikes, pedestrians
d) Implementation in infrastructure and communication with vehicle:
  - Status
  - Priority

- Route
- Time-to-green
- etc…

E.5.8 Role of the jurisdiction in Urban-ITS

Within the European Union the role of the jurisdiction lies at multiple levels.

In respect of the single market and issues of pan-European need (identified where the Parliament of the EU, or the European Council (A council of the Prime Ministers of the Member States of the EU) has passed legislation/regulations/Council Directives that recognise pan-European requirements, and implement legislation that must be effected in every EU Member State), the European Commission is charged with being the monitor, supervisor, or implementer of such legislation/regulations/Council Directives. This is often effected through “Commission Delegated Regulations”.

In most cases the National Parliaments of EU member states are required by the EU legislation to devise and codify National Legislation to bring the EU legislative requirement into effect. And the EU holds the Member State responsible for so doing. This means that in most cases, the Law/Statute that is brought into effect is a National Law, with citizens and administrations being accountable to National Legislation, and the Member State being held accountable by the EU to bring such National Legislation into effect.

Beyond such pan-European issues, the principle of subsidiarity applies, and therefore the bulk of traffic regulation, and aspects of road management, public transport management, etc., are the responsibility of National Governments of the Member States of the EU.

National Governments, to a greater or lesser extent, and varying from Member State to Member State, also bring into effect a local subsidiarity in respect of local governance, and will delegate the management of many aspects of local governance to these local (and most often elected) administrations. This is particularly true for traffic and transport matters, and in respect of delegation to Urban Administrations who manage the governance of local affairs.

The effect on the Urban Administration is that it is in some respects the legislative regulator and enforcer, while in other respects, it is the body held subject to and accountable to the law.

The jurisdiction may therefore in some cases be the National Government, and in others the local authority, and (very occasionally) may be the EC acting on behalf of the legislature of the Parliament and Council of the EU.

The role that the jurisdiction (where that is the role given to the local governance authority) in respect of implementation and support of Urban-ITS may therefore vary from being the Regulator enforcing a regime that is politically decided at a local level, or may be the organ of imposition of will of the National Government, and may also be subjected to the political and structural pressure of the European Commission, implementing the will of the EU through ‘Commission Delegated Regulations’, or encouragement through EC initiatives.

Practically, in respect of Urban-ITS, the local administration has to decide whether it takes simply an enabling role, an enabling and evangelistic role, or takes a pro-active role.

Once the concept of Cooperative ITS is embraced, the issue of core system support will need to be addressed. C-ITS core systems may be operated nationally, or locally or, most likely by both. In the case of a local core system, the local authority needs to decide if it operates the core system in order to best manage and promote the benefits of C-ITS/urban-ITS within its domain, or leaves this function largely to the commercial sector. ISO TR 17427-3 (Intelligent Transport Systems – Cooperative-ITS- Concept of operations CONOPS) for core systems) provides guidance for the design and operation of core systems, (in the case that the local jurisdiction/urban authority elects to take on this role).

E.5.9 Role of the Urban-ITS prime service provider

Traditionally the Urban-ITS prime service provided has always been local government and as such it led the development of services whose main focus was some combination of traffic management, parking and public transport. The scope and content of these services was driven by what was important to the citizen, i.e. the voter. Typically, the most important aspects of services to citizens were a combination of safety, quality of life, accessibility and net cost.

The current Urban-ITS is technology driven, so mainly flow oriented services.

For the future there will be several major changes. Firstly, local government will not always be the prime service provider as commercial organisations are beginning to provide services such as public transport and road maintenance. In some cases, these commercial organisations will in fact be owned by local government, but not necessarily the one responsible for the jurisdiction in which the service is provided. This "privatisation" of services has already begun to happen in varying degrees across many European nations and may well become more prevalent with time. The advent of Cooperative-ITS is likely to accelerate this move towards the involvement of commercial organisations in Urban-ITS, although local government will still have ultimate responsibility for services such as traffic management, all be it with commercial organisations participating in services such as data gathering and data archiving.

A second change will be that the focus of services will have a greater emphasis on improving the environment. This causes issues for the local government because the costs of the development of the technology to support these services are high while the social benefits environmental improvement are less direct then the social cost related to travel time loss or safety. Therefore, it is necessary to increase the scale and collaborate with other local government stakeholders and commercial organisations.

A third change will be that the evolutions of technology will enable new, complementary approaches to some key areas of transport policy. For instance, there are many new opportunities to enhance safety (e.g. for the vulnerable road user) through vehicle telematics and C-ITS, which will be important in the overall planning of Urban-ITS. This causes issues for the local government because the costs of the development of the technology to support these services are high, while much of the development and investment is dependent on other parties (in particular the vehicle OEMs).

Finally, the ongoing challenges of public finance mean that it will be harder for individual Urban Administrations to deliver the full range of (potentially valuable) services by themselves.

For all of these reasons, it is necessary to increase the scale and collaborate with other local governments and commercial organisations. The traditional distribution of roles will change, if only by just stimulating market development and through the enhanced standardisation required by a coordinated effort.

In this way, the intensification of pre-competitive collaboration will ensure that the supply of new technology and services is more consistent with public demand/political requirements. This will more effectively utilise the creativity in the market. The road user’s awareness of all these new services can be increased by means of competition and communication.

E.5.10 Role of the Urban-ITS application service provider

Traditionally the provision of Urban-ITS application services depended on investments from local government and transport agencies. They were each responsible for developing their own applications to support the services they desired, although in recent times these investments have become low due to financial constraints.

However, a certain evolution is taking place as regards information provision, for instance multimodal information provision, with the emergence of mobile devices on one hand and, on the other hand, of the opening of data to application providers. In a way a public-private partnerships take place in the sector of multimodal information as data is provided by the public sector and private companies develop a whole range of applications available on smart phones. This evolution is in principle positive, however, different problems appear:

- the problem of the availability and accuracy of this open data,
- the problem of different data semantics and formats and
- the fact that many applications may ignore relevant data sources.

This is the main reason for the standardisation recommendations in the MIS domain.

In the traffic management domain, there have been a number of research projects that have looked at way of improving the way that the operations of traffic signals can be better optimised to improve the flow of vehicles through junctions. These projects and other trials of applications have looked at such things as count down timers and giving priority to certain types of vehicle. The growth in work on Cooperative-ITS is actively developing applications that enable vehicles to interact with traffic signals so that their speeds and the traffic signal timings can be modified in real time to better optimise the flow of traffic. Those there is now a much broader range of application service provider involved, encompassing local authorities who tend to specify what the service shall do, plus commercial and research organisations in the equipment supply and automotive domains who actually develop the applications.

E.5.11 Role of the Urban-ITS user

The reliability of ITS applications experienced by road users ultimately depends on the consistency between the information and advice they receive and the actual situations they encounter during their trips, or the experiences of freight shippers. That is not to say that the reliable operation of the applications is not important – it is and there are no short cuts to applications reliability. In addition, the use of distributed processing and wireless communications which are fundamental parts of Cooperative-ITS is providing many challenges for the provision of proper reliable security and privacy of the user – see Annex J for further discussion on this subject.

As regards multimodal information services, the reliability, timeliness, completeness, accuracy and relevance of the information that is provided to users is a necessary condition for them to accept a modal shift, i.e. to leave their individual cars at home or at park and ride facilities and to use public transport. Thus "getting it wrong" is not an option and users will quickly cease to access travel information if it is not relevant to the trip they are making or about to make. The same applies to freight shippers who will continue to use road transport as the primary means of moving goods if transport information is not reliable and timely.

As a user of travel information the traveller can also become a “data collector”, either actively or passively using their mobile devices to provide valuable data about the current operational state of the transport network. This may be done as individuals, or part of a user group to improve the quality of the data because it is not "coloured" by the experiences and observations of a few individuals. A downside is that this data will take time to collect and should be perhaps regarded more as a "moving average" rather than a definitive representation of current operational state.

The principle of users behaving collectively as “data collectors” has been adopted by several groups or organisations. A good example of this is *OpenStreetMap* (OSM), a collaborative project to create a free editable map of the world. Over one million contributors make *OpenStreetMap* possible. Worldwide, the OSM community collects data about roads, railways, paths, waterways and even bicycle routes. In addition to the transportation ways that are mapped, data is gathered on features along the roads, such as businesses, buildings (private and public), parks and natural areas, land use, cultural resources, and recreational facilities.

Such groups, however, make use of their own data semantics and data exchange formats. For this reason, common data semantics, reference data models and data exchange format standardisation is of prime importance to make use of such huge collaborative efforts, but, at the same time to coordinate such developments.

E.5.12 Generic characteristics for all instantiations of the Urban-ITS application service domain

Service oriented
Traffic lights optimization, time to green etc.

E.6 Standards requirements

Identifying standards requirements to assist/guide/support cities and administrations to provide support for Urban-ITS such as:

- Information level (standards and support measures for defining the meaning of data and messages);
- Application standards (to define the rules and procedures for exchanging information data);
- Communications transport standards (to provide specifications for common rules and procedures guidelines that cities and administrations may wish to consider adopting to exchange application data between point 'A' and point 'X' on a network);
- Subnetwork standards (to define the rules and procedures guidelines that cities and administrations may wish to consider adopting for exchanging data between two 'adjacent' devices over some communications media).Identifying existing standards and widely used technical means (such as DATEX II, XML, FTP, SNMP, STMP, TCP,UDP, PPP, Ethernet, ASN.1,UTMC,OCA etc.).

E.7 Identifying standardisation gaps

The process for identifying standardisation gaps has been to start from the Use Cases, and start by (at a high level) identifying the requirements of the Use Cases, and then identify what standards are already available and appear to meet the requirement or part of it), and thereby to identify gaps.

Once a gap has been identified then it has to be assessed as to whether a standard or support action is needed in order for an Urban Administration to implement/support this aspect of Urban-ITS, and where appropriate a recommendation made.

In practice the task turns out to be more complex. In some areas, such as urban logistics, the tasks are relatively few in number, so each Use Case can be assessed separately. In the area of MIS, however, there are many hundreds of possible Use Cases if every aspect/combination is considered, so these Use Cases tend to be built on the major Use Case groupings.

On the other hand, the MIS Use Cases are well defined, whereas, at this Interim Report stage, in the limited time available to the PT, we have yet to clearly enough define some of the UL Use Cases to be able to identify standardisation gaps. We hope/expect to have clarified most these Use Cases by the time of the final report. (or dismissed the Use Cases simply as being no more than ideas during the lifetime of the CID.)

E.8 The process of consensus

It is often remarked that '*by the time it takes that a Standard is approved, it is already obsolete*'. And in the past, this has sometimes been the case (although generally the statement is a significant exaggeration). Standardisation is about gaining consensus for a specification, and has the benefit that that standard is generally accepted in the community. Where there are multiple options or views, gaining consensus can take some considerable time. This is further prolonged if the standard is written as the technology is evolving. However, the process of standardisation, not just the final deliverable, is one of the major benefits of the standardisation process.

In the past, SDOs have erred on the side of caution with many check and ballot phases, but mindful of the criticism, have speeded up their approval procedures, and deliverables face fewer and shorter balloting processes. And the time it will take to develop a standards deliverable now depends more on the time required to obtain reasonable consensus for a solution is now the critical duration that controls the speed of approval. Nevertheless, the contention between "*do not put it into the market place until full consensus is achieved and every last technical issue is resolved*" and "*we need a deliverable to work on now!"* remains.

Rc_Pl02- PT1701 recommends that the standards deliverables recommended in this Technical Report, approved and published as "Technical Specifications" (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards. (Annex E.7)

Rc_Pl03- This Technical Report recommends that CEN considers adopting a process where once a work item is created, the first approved deliverable can be published as a TS, and the same approved work item can enable the subsequent development as a full Standard. (This is already the case in ISO, but after publication of a TS, CEN currently requires the creation and approval of a new work item to develop the TS into a full Standard, which incurs delays).

Rc_Gn15- PT1701 recommends that CEN develop a guide Technical Report) to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm.
The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm.

Important note: In an ideal world, the PT would have had time and intent that all of its recommendations were the consensus of the PT. However, the aforementioned brevity of time available to the team made this impossible, so the recommendations are those of the PT members who actually researched an aspect rather than the consensus of all of the PT members. In reality, even if time had been available, the deliberately disparate backgrounds of the team members, with different expertise and different priorities would in all likelihood have forestalled any attempt at consensus across the whole PT.

This is particularly true in respect of prioritisation between recommendations, and so the PT will limit itself between relative prioritisation within a specific sector, and will rely on feedback to the interim report, especially from Urban Administrations, in respect of prioritising between recommendations.

Technical Report: Intelligent Transport Systems

Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

Annex F Panoptic (Multi-category) requirements

F.1 Panoptic (Multi-category) requirements — Objectives, summary and scope addressed

F.1.1 Objectives

This section addresses areas that, in the opinion of the PT1701 Project Team, cross the identified categories (multimodal information systems, traffic management, and urban logistics) and/or apply generally in the considerations and recommendations of this Technical Report.

F.1.2 Summary

“Urban-ITS” as opposed to any particular aspect of ITS, implies the cooperation and interoperation of ITSs to enable the urban transport environment to function more efficiently Aspects to enable “Urban-ITS” to function in a meaningful and effective fashion.

F.1.3 Scope

Requirements for standards to enable Urban Administrations, ‘ to implement/support Urban-ITS that span several areas of Urban-ITS activities/service provision.

F.1.4 Stakeholder engagement

See Annex P.

F.1.5 Common/Interoperable data

Recommendations in this section of this Technical Report are made within the strong belief understanding and recommendation that in order for the multimodal information services aspects of this Technical Report to be achieved it is essential that there is a common meta-data registry/data dictionary available to all relevant actors throughout (in the context of this report) the countries of the EU 28, and other countries who regularly access and use the Standards recommended in this Technical Report. In a global context, especially where requirements may specify uses in vehicles (which tends to be a global marketplace), a globally agreed meta-data registry/data dictionary is strongly recommended.

A European (or global) meta-data registry/data dictionary will not happen by itself, and the business case is commercially difficult to sustain by commercial interests alone, when the majority of benefit fall to the Administrations, in this case Urban Administrations, and to the politicians of the Jurisdiction (in this case the European Union), the realisation of whose political aspirations and policies are made more possible by the existence of such a meta-data registry. Within the context of the ambition for Urban-ITS, and the scale of costs for implementing any solution in the transport sector, the set-up and operating costs for such a meta-data registry /data dictionary are trivial.

Rc_SM01-This report therefore recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary. As the costs for establishing and operating such a meta-data registry/data dictionary would not be significantly different, this report recommends that such an ITS meta-data registry is made freely accessible to all SDO's involved in ITS standardisation, and OEMs installing ITS products in vehicles, and of course the jurisdictions within the EU.

However, there is a further need in respect of interoperability that relates to the legacy of a quarter of a century of ITS development and, one has to say, 23 years of ITS standardisation development, much of which has been in a technical or geographical 'silo' environment. This is not a strong criticism, because in the 1990s the worlds of the specialist areas were very different and largely not interconnected, nor did anyone have the vision to see how quickly they would become inter-connectable, nor the benefits (for example 'joined-up', interoperable and multimodal 'Urban-ITS') that may accrue. But the consequence is that there are probably now some 500 or more CEN, ISO, ETSI, IEE, SAE standards for ITS, and, in addition, many communications related standards used by ITS whose definitions are inconsistent.

In order for interoperability to work, these data concepts need to be recognised, specified/described consistently and unambiguously, and a harmonisation/migration process undertaken. It will never be practicable to 'impose' anything on legacy systems, but conversion routines, and agreement to the use of common data in next generation systems is achievable, at least within the European Standardisation environment of CEN/CENELEC/ETSI/ISO.

Rc_SM02- Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation'.

F.1.6 Multimodality

Multimodality can only be achieved if there is access to data regarding other modes.

F.1.7 Creation of (multimodal) transport datasets

This Annex concerns the requirements that span all, or at least several of the areas involved in Urban-ITS, and particularly across more than one of the three priority areas identified in the remit to PT1701.

Interoperability and re-use of data is therefore crucial in this context. The principles espoused in Annex E.3, and particularly E.3.1, and F.1.5 are highly relevant in respect for panoptic requirements. To summarise, that is that data should be defined to characterise the data, independent of any specific application and registered in a central and freely available common data registry.

F.1.8 Multiple means of communication

This Technical Report is based on the assumption that the prime means of communication between vehicles, and between vehicles and the infrastructure will follow the general architecture of ISO 21217, i.e. will be ITS-station <> ITS-station communications, using one or more of the multiple, and many, wireless communications media supported by ISO 21217 and its associated Standards.

Communications between specified actors within the infrastructure will use general ITU based telecommunications standards, which will be agreed between the sender and the receiver, and may evolve and develop over time. Where a communication channel is to be accessible to other users, the communication means and protocols shall be defined within the standards which govern their application usage.

F.1.9 Creation of urban-interurban interfaces

Whilst the context of Urban-ITS is focussed on journeys made within an urban area or conurbation, most Urban-ITS cannot exist in isolation to transport systems that are beyond the urban boundary. Indeed, a significant proportion of movements within an urban or conurban zone are interurban or international journeys that either start or stop in the urban area, also a significant proportion of commuting journeys will originate or terminate outside of the urban area.

The vehicle classes that may cross this boundary and must be taken into account are: trains; coaches; ferries; freight; taxis, passenger cars, powered two wheel vehicles, and cycles. All these vehicles could be involved in international, national or regional journeys.

To ensure a smooth passage in and out of the urban area and efficient connection with urban multi-modal systems will therefore require the exchange of information and data not only between service providers within the urban area, but also between information and control centres in other urban areas and regional control centres between. It will also require communications between vehicles and the infrastructure. Equipping inter-urban vehicles to operate effectively in the Urban-ITS environment, and ensuring exchanges of data between control and information centres, will be essential in order to reap the gains achievable by Urban-ITS.

In order to obtain the required information, we need to consider timetables (schedules of the arrival and departure and types of vehicle) of the different non-urban modes and special events that may influence the running of the non-urban services. In order to obtain the required data, we need to enable the exchange of real time data, for instance: actual arrival and departure times of non-urban vehicles; the travel times of vehicles through the links between the external network and the boundaries of the urban network; the exchange of meta-data, e.g. ANPR reads, to allow the calculation of arrival times and rate of arrivals; fleet logistic data to enable the scheduling of deliveries etc.

External networks can be classified as either neighbouring urban networks (including networks managed by third parties, such as large airports, that have a local character), or interurban networks.

For neighbouring urban networks, the kinds of data that might be generated will be similar to those within the urban network, but they are much more likely to have been acquired under different mechanisms – for example, the systems suppliers are likely to be different.

The principal impact of this is to significantly increase the need for standardising data that could otherwise be left proprietary. For instance, an urban system may need to draw data from, or send control messages to, a park and ride site, an electric charging point or a roadside C-ITS-station managed by its neighbour.

This could be done directly with the end-device but in many cases it will be more efficient to manage this through centre-to-centre links with the neighbouring authority – in the way that SIRI does for real time public transport information or DATEX II for (interurban) road networks.

Interurban vehicles could be physically equipped in the same way as any other vehicle within the urban area, to allow them to operate in the Urban-ITS environment, but may need to exchange additional data. Given appropriate interoperability, inter-urban vehicles could work with the urban traffic control systems to (where appropriate) have priority at signals.

In the logistic sector, equipped freight vehicles should work with the urban authority to enable effective and efficient scheduling of delivery, and may need to work with the urban authority where there are transport corridors' and windows that control freight movements within the urban space.

The urban-interurban interface will therefore consist of common data definitions, standardised interchange protocols and agreed communication protocols.

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F.1.10 Use of open standards, architectures and specifications

It is an underlying tenet of this Technical Report that recommendations are based on the use of open standards, architectures and specifications. Any technical solutions developed within this report are hereby declared, by the publication of this Technical Report, to be placed in the public domain, and therefore should be considered as 'prior art' in respect of any subsequent intellectual property claims.

That said, it may be that specific aspects of the standards recommendations of this Technical Report may only be achievable using proprietary technology, may be best achieved where the intellectual property owner has made the technology freely available by licence for specific application areas, or where it is the accepted sector-wide practice to use a specified proprietary technology. Where this is the case it should be stated clearly in the standards document.

F.1.11 Enable rather than prescribe or proscribe

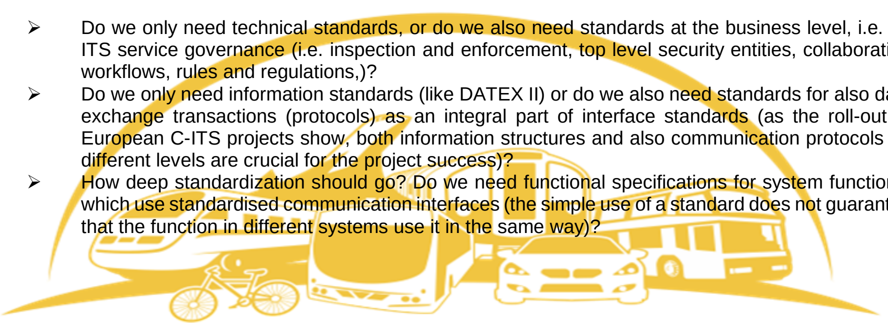
It is an underlying tenet of this Technical Report that recommendations are based on the use of open standards, architectures and specifications that best enable the achievement of the objectives of the Standards. Standards recommend a consensus driven solution to achieve an objective. Standards do not proscribe any other solution, nor do they prescribe the use of any other solution.

Where the proscription of any solution is deemed to be required by a jurisdiction (for example to prevent radio interference preventing a standardised technical solution from operating effectively), or the prescription of any standardised solution is deemed to be required by a jurisdiction (for example to impose a common solution within its domain), these are deemed to be political issues that are managed by the imposition of Regulations by the appropriate jurisdiction. That regulation may achieve its objectives by the prescribed use of one or more Standards Deliverables, but is obtained because of the Regulation that enforces such compliance.

F.1.12 Obtaining consistency across the European Community, and across wider domains

While the focus of this pre-study is to enable rather than to prescribe, and the principles of subsidiarity will to a large extent cover the instantiation of Urban-ITS, this does not necessarily assist achieving the interoperability and consistency across the European Union, or any cooperation between jurisdictional domains that require consistency. If Urban-ITS were simply a local issue involving local assets and services, differences between instantiations would be of lesser significance. However, travellers, vehicles of all descriptions, and passenger service vehicles (from the local bus to the intercity train), move not only within conurbations, but between them, and between countries and states. Therefore, some level of consistency is essential. Further, as described at some length in Annex E.4, to achieve efficiency in a mixed vendor environment, open standards are required. Annex E.4.4 posed three questions, none of which have quick and easy answers, and none of which are assisted in their solution by the rapid evolution and development of ITS capabilities. The questions to be faced are:

- Do we only need technical standards, or do we also need standards at the business level, i.e. for ITS service governance (i.e. inspection and enforcement, top level security entities, collaboration workflows, rules and regulations,)?
- Do we only need information standards (like DATEX II) or do we also need standards for also data exchange transactions (protocols) as an integral part of interface standards (as the roll-out of European C-ITS projects show, both information structures and also communication protocols on different levels are crucial for the project success)?
- How deep standardization should go? Do we need functional specifications for system functions, which use standardised communication interfaces (the simple use of a standard does not guarantee that the function in different systems use it in the same way)?



The difficulties to provide clear answers to these questions lie in the consequence of the disruption to the status quo caused by the advent of Urban-ITS technologies (or the advent of ITS technologies in general), and the evolving and changing nature of Urban-ITS. When is a standard needed? and when is it an appropriate time to develop and publish a Standard? Recommendation RC_PI02- of this Technical Report advocates that all Urban-ITS standards deliverables are first published as “Technical Specifications”. This enables much faster development and availability, but importantly enables specifications to be tested while the situation is still evolving, and if necessary enable revisions or improvements before a final standard is published. Of course it imposes migration responsibilities in the event of change, but it helps to provide a situation where standards deliverables are available at an earlier stage.

But this is still not adequate, and further, in an evolving situation alternatives, sometimes competing, will be available.

CEN TC278 PT 1603, with the remit to provide outreach for PT1602’s “Roles and Responsibilities in Cooperative-ITS” quickly established that, once you moved away from standardisation specialists, and into the offices of implementers, engineers and administrators, there was a poor understanding of ITS standards, or even the reasoning behind their need. Implementers, in general, were more focussed on and interested in issues such as risk assessment, privacy, liability, driver distraction, enforcement, compliance, and security. And in respect of implementation, needed clearer guidance on aspects such as a framework overview, the concept of operations for ITSs, and minimum system requirements, before they were interested in or saw the relevance of particular ITS standards. Information on these particular subjects has been made available in the form of ISO Technical Reports, but this requires enough interest to go out and buy these publications.

In the USA, with a need for greater compatibility and interoperability, and a requirement for the ability to support a mixed-vendor environment (see Annex C.7.6) and avoid vendor lock-in, the DoT sponsored the development of the US NTCIP – “National Transportation Communications for ITS Protocol.”

The US NTCIP only covers centre<>field and centre<>centre communications, but provides clear guidance to road administrations in the 50 states of the USA on what standards are available, what are recommended, and provides a basis for regulation where necessary, by reference to the NTCIP. While NTCIP is a voluntary set of protocols, the US DoT also requires compliance to NTCIP in order to gain central DoT funding for many state implemented projects.

The NTCIP is a family of standards that provides both the rules for communicating (called protocols) and the vocabulary (called objects) necessary to allow electronic traffic control equipment from different manufacturers to operate with each other as a system. The NTCIP allows traffic control systems to be built using a "mix and match" approach with equipment from different manufacturers (described in this pre-study as a ‘mixed vendor environment’). NTCIP standards are designed to reduce the need for reliance on specific equipment vendors and customized one-of-a-kind software.

The scope of NTCIP is limited to centre<>field and centre<>centre devices, and does not take into account V2V, V2I, I2V. But it is not the limited scope that causes PT1701 to give reference to it, but the context of providing a focal point for information and guidance, and reference to which (adopted/relevant) standards are available and how they fit into the needs of instantiating and managing an intelligent transport system.

The US NTCIP both provides a guide an acts as a focal point for developing standards, and develops (US National) standards. The role envisaged for a “**EU**ropean **I**TS **C**ommunications, **I**nformation and **P**rotocols” (EU-ICIP) guide would be to act as a focal point to guide, inform and advise about the existing raft of standards, and how and in which combinations to use them It is not envisaged that EU-ICIP it would develop standards, which are already adequately developed for ITS by CEN, ETSI and ISO.

Such a guide and support framework would seem to be appropriate to assist the introduction and instantiation of Urban-ITS in a reasonably consistent manner across Europe, without binding the Nation States to implement a large raft of measures and standards, but by guidance as to the best options available, and would be beneficial in the wider context of the ISO community worldwide. EU-ICIP does not contend with the US- NTCIP, but rather, is complementary to it, at a higher level, and across a broader ITS context than the centre<> centre and centre<>field equipment communications context of US NTCIP.

While this pre-study has the prime focus to identify gaps and standards that are necessary for Urban Administrations to instantiate/support Urban-ITS, there is little point in having these additional standards if those who they are designed to assist do not know they exist, or cannot understand their relevance to any situation that they are facing. So along with the identification of gaps in standards, and focussing the attention of the Commission towards assisting filling the gaps, PT1701 is of the opinion that it is essential to also make guidance, information and support available to those who will have to make use of or require compliance to these standards

PT1701 considers that further guidance, awareness raising, and technical support, to Urban Administrations is made available, and part of the EU-ICIP guide could provide information, awareness raising, and technical information and guidance both as reference documents, and also for new issues as they arise.

The EU-ICIP Guide would be designed to be an educational tool, created to assist planners, specification writers, and implementers in understanding the various EU-ICIP adopted standards and how to use them.

The EU-ICIP Guide would also explain the motivations behind the use of EU-ICIP and provide the identification/selection of *practical* profiles on both information and communications standards, and combinations thereof to achieve service provision objectives.

See also: (1.6.3; 2.2; Annex C.5; Annex A.2.2; D.2.6; D.2.7; F.1.13; F.1.14; F.3.1.1))

Such guidance, which we provisionally call the “European ITS Communications and Protocols” – (EU-ICIP, or perhaps E-ICIP, EU-TCITSP or similar [there would be benefits keeping a similar sounding acronym to NTCIP]) could take something like the following form:

F.1.13 Objectives of EU-ICIP

The transportation industry has had a history of deploying systems with unique data definitions and proprietary communications protocols. Equipment, systems, field devices from one manufacturer or developer were not interoperable with those of other manufacturers or developers. Traffic control and management systems have been particularly impacted by this, and as a result, expansion of the system after initial deployment can generally only be done using equipment of the same type and usually the same brand as in the initial deployment, unless there are investments in major systems integration efforts. The early introductions of ITS have exacerbated, rather than cured these silos.

With proprietary protocols, there is little to no opportunity for realistic competitive bidding as additional field devices are added to the system, due to the lack of interchangeability Nor is there any opportunity for realistic competitive bidding to add additional types of field devices to the system, due to the lack of interoperability. (See Annex C.7.6; C.7.2; C.7.3 above and H.1.2; H.3.1; H.4.3.1; K.4.1, below, remixed vendor environments).

EU-ICIP would support a family of open (existent) standards, referencing both common communications protocols and data definitions, that in combinations enable Urban-ITS/ITS to function and be managed, and would explain the combinations required or recommended.

EU-ICIP would explain to and enable Urban Administrations, road authorities and EU Member states to understand the mesh of standards needed to attain their goals for Urban –ITS, and ITS in general, and provide guidelines to move from abstract architectural concepts to effective instantiation. It would provide EU and the member states with the basis for regulated requirements to achieve its political objectives, and effective instantiation of Urban-ITS in the context of a general ITS environment. The principles of EU-ICIP would be available and adoptable in the context of the wider global ITS community, although some constraints will be regionally appropriate, and the EU-ICIP will always have to be explicit about both global benefits and benefits/constraints as they affect the EU Member States.

EU-ICIP will provide to those outside of EU who wish to cooperate/integrate with its ITS environment, with clear reference points of the standards compatibility/compliance required to achieve compatibility with EU systems. This need has been expressed to PT members by ministers and senior civil servants from countries such as Turkey, Israel, and the Russian Federation.

Unlike NTCIP, EU-ICIP would not develop standards, but would provide knowledge of, information about, and recommendation and guidance on the introduction and use of existing ITS-standards (and possibly standards under development), particularly in the Urban-ITS environment, and the combinations required to best achieve ITS application service provision..

EU-ICIP would identify relevant standards required to achieve the Urban-ITS objectives expounded in the CID.

In addition to communications standards, the EU-ICIP adopted protocols would define common data definitions and open protocols through referenced data standards, or data sections of ITS standards.

The proper use of EU-ICIP open-standards in an ITS deployment will allow future expansion of the system to benefit from true competitive bidding, as well as allowing other types of ITS to be added. EU-ICIP would embrace and recommend an entire family of standards designed to meet the communications and data needs of actors in the ITS environment (for example I2I (TMC<>roadside devices, TMC<>TMC, road operator<>emergency services<>jurisdiction etc.), V2V, V2I, I2V, etc.).

EU-ICIP is designed to support a family of communications and data standards for transmitting data and messages between computer systems used in Intelligent Transportation Systems (ITS). The communications standards specify a set of rules for how messages are coded and transmitted between electronic devices, and in the case of many ITSs, across wireless interfaces. The equipment at each end of a data transmission uses the same specification to successfully communicate, and use common data concepts.

EU-ICIP would provide guidance, information and consistency for agencies implementing and operating Urban-ITS/ITS. EU-ICIP will assist interagency coordination and allows equipment of different types and different manufacturers to be mixed within the same or communicating systems.

Even in situations where EU-ICIP protocols cannot be initially implemented because of legacy or other similar problems, operating agencies will benefit from specifying that EU-ICIP recommendations be included in all future acquisitions and upgrades, to provide a better migration path to interoperability and an open market.

While retrofitting legacy equipment and systems to comply to EU-ICIP recommendations support is not practical in most situations, it will normally provide a path to migrate a system gradually, since it is possible to operate a mixture of EU-ICIP and non-EU-ICIP devices in the same system, though not on the same communications line. Equipment may also continue to use a current protocol even though the device may also support EU-ICIP as a second protocol. Integrating legacy equipment and systems with EU-ICIP-conformant upgrades in this manner will help to ensure that an operating agency’s systems and equipment remain useful and compatible long into the future.

The objective will be to promote that all future devices will logically support the appropriate EU-ICIP protocols, at least as an option, and that manufacturers will seek to offer the appropriate EU-ICIP protocols in order to remain competitive in the market place, thus providing operating agencies with the mixed-vendor opportunities espoused.

EU-ICIP will enable agencies to exchange information and (with authorization) basic commands that enable any agency to monitor conditions in other agencies’ systems, and to implement coordinated responses to incidents and other changes in field conditions when needed. Such data exchange and coordinated response can be implemented either manually or automatically. One agency can monitor, and issue basic commands, if authorized, to information systems and field devices operated by another agency, even though those devices may be from a different vendor than those used by the monitoring agency.

Potential applications of interagency coordination include:

a) Enabling Urban-ITS;
b) Coordinating timed information transfers in a multimodal environment;
c) Providing real-time traveller information in a multimodal environment;
d) Coordinating traffic management across jurisdictional boundaries;
e) Providing traffic signal priority across boundaries;
f) Monitoring traffic volumes on another agency's roadway;
g) Coordinating the operation of a freeway ramp meter with an adjacent traffic signal;
h) Posting a warning message on another agency's dynamic message sign.

EU-ICIP will allow a management system to communicate with a mixture of device types on the same communications channel, or operate a system over a choice of communications channels which increase the probability of successful matching, or operate a system over multiple communications media.

For example, with the addition of appropriate application software in the system computer, a dynamic message sign could be installed near a signalized intersection, and the computer could communicate with the sign controller using the communications line or channel already in place for the traffic signal controller if certain aspects of the communications protocols, that is, the 'Data Link' and 'Physical layer' protocols are the same. Another example would be to support information provision to vehicles using 5.9 GHz, 5.8 GHz, 4G and 5G communications simultaneously if multiple wireless communication's protocols are supported. The communications network is usually one of the components of an ITS that requires the most resource investment. EU-ICIP will ensure flexibility in the future use of that component.

See also (1.6.3; 2.2;9.2, A.2.2; D.2.6,F.1.12; F.1.14; F.3.1.1; D.2.6; D.2.7) .

F.1.14 Organization of an EU-ICIP Guide

An EU-ICIP Guide would be divided into sections, for example, perhaps something like:

a) Section 1—Introduction providing a brief overview of EU-ICIP as well as a discussion of the motivations that led to the adoption of EU-ICIP supported standards and its objectives, and discuss the ethos and issues involved.

b) Section 2—Understanding EU-ICIP – would provide a general purpose technical overview of EU-ICIP and the EU-ICIP Framework.

c) Section 3—Procuring EU-ICIP would presents an overview of the procurement process and issues related to procurement within the EU context, and provide general guidelines for international use.

d) Section 4—How to Use – would explain elements of EU-ICIP standards and how to use them in combination in the development and implementation of developing agency requirements and specifications.

e) Section 5—Designing EU-ICIP compliant systems - would deal with issues facing those who have the task of designing the communications element of ITSs that use EU-ICIP protocols. It would address wired and wireless communication.

f) Section 6—Implementing EU-ICIP – would be directed at systems implementers, including software and hardware developers for Urban-ITSs, both vehicle facing systems and infrastructure facing systems; software and hardware developers and systems integrators. In particular, some of the lessons learned and common pitfalls encountered during actual deployments would be discussed and shared, with suggested solutions.

g) Section 7 - Strategic level aspects.

h) Section 8 – Information level aspects.

i) Section 9 – Application level aspects.

j) Section 10 – Communications aspects.

k) Section 11 – Subnetwork aspects.

l) Section 12—EU-ICIP Testing - intended principally for test documentation developers, and conformance management, assessment and testing.

While the FRAME architecture describes the 'what' is to be achieved, the EU-ICIP guide will provides the *'How'* to best achieve at the current time (and will therefore be a living and hopefully regularly revised guide)

EU-ICIP would therefore provide a basis for information and knowledge of what standards are available, especially in the context of Urban-ITS, and provide the basis for interoperability and regulated requirements for ITS in Europe, informing potential users of the compatibilities and incompatibility issues of various options, and provide the opportunity for training opportunities, and guidance to universities to assist training programmes for ITS experts.

EU-ICIP would be a natural follow on to the EU initiative of the C-ITS platform, and is envisaged as a living guide that would evolve and develop with the opportunities that technical evolution brings. As it would be a guide, and would not itself develop standards, the set-up and maintenance costs would be, in comparison to NTCIP, quite small.

Such an initiative would not only benefit Member States, but would be of benefit to those who wish to align their systems to those of EU, such as geographically adjacent states and prospective Member States.

Rc_PI01-PT1701 recommends that the CID supports a project team to establish EU-ICIP.

F.2 Panoptic (Multi-category) requirements — Relevant business/service areas and applications identified with key stakeholders

By definition, panoptic requirements cross all business/service areas.

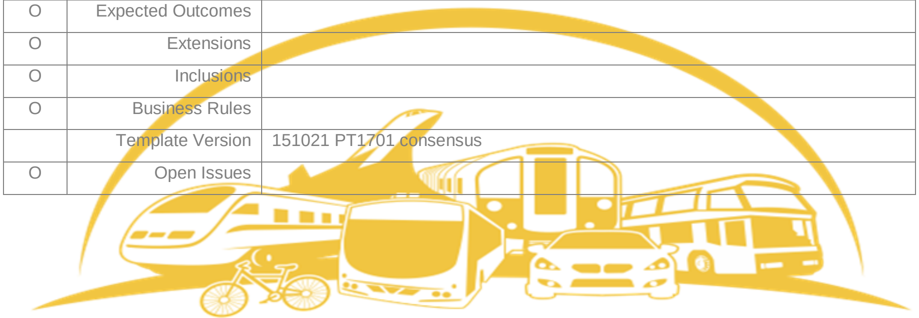
F.3 Panoptic (Multi-category) requirements — Gap and overlap analysis involving European and international SDOs and their relevant deliverables

F.3.1 Panoptic (Multi-category) requirements — Standards to achieve objectives

F.3.1.1 Use Case ULG-0001 EU-ICIP Use Case

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**EU-ICIP**
M	**Use Case reference /id**	**ULG-0001 v1 20151110**
M	Description	European ITS communications and information protocols (EU-ICIP)
M	Scope	EU-ICIP will provide a basis for information and knowledge of what communications and data standards are available, especially in the context of Urban-ITS, and provide the basis for interoperability and regulated requirements for ITS in Europe, informing potential users of the compatibilities and incompatibility issues of various options, and provide the opportunity for training opportunities, and guidance to universities to assist training programmes for ITS experts.
M	Scenario	a) Section 1—Introduction providing a brief overview of EU-ICIP as well as a discussion of the motivations that led to the adoption of EU-ICIP supported standards and its objectives, and discuss the ethos and issues involved. b) Section 2—Understanding EU-ICIP – would provide a general purpose technical overview of EU-ICIP and the EU-ICIP Framework. c) Section 3—Procuring EU-ICIP would presents an overview of the procurement process and issues related to procurement within the EU context, and provide general guidelines for international use. d) Section 4—How to Use – would explain elements of EU-ICIP standards and how to use them in combination in the development and implementation of developing agency requirements and specifications. e) Section 5—Designing EU-ICIP compliant systems - would deal with issues facing those who have the task of designing the communications element of ITSs that use EU-ICIP protocols. It would address wired and wireless communications f) Section 6—Implementing EU-ICIP – would be directed at systems implementers, including software and hardware developers for Urban-ITSs, both vehicle facing systems and infrastructure facing systems; software and hardware developers and systems integrators. In particular, some of the lessons learned and common pitfalls encountered during actual deployments would be discussed and shared, with suggested solutions. g) Section 7 - Strategic level aspects h) Section 8 – Information level aspects i) Section 9 – Application level aspects

		j) Section 10 – Communications aspects k) Section 11 – Subnetwork aspects g) Section 12—EU-ICIP Testing - intended principally for test documentation developers, and conformance management, assessment and testing. While the FRAME architecture describes the ‘what’ is to be achieved, the EU-ICIP guide will provides the ‘How’ to best achieve at the current time (and will therefore be a living and hopefully regularly revised guide) EU-ICIP would be a natural follow on to the EU initiative of the C-ITS platform, and is envisaged as a living guide that would evolve and develop with the opportunities that technical evolution brings. As it would be a guide, and would not itself develop standards, the set-up and maintenance costs would be, in comparison to NTCIP, quite small. Such an initiative would not only benefit Member States, but would be of benefit to those who wish to align their systems to those of EU, such as geographically adjacent states and prospective member states.
M	Actors Involved	All actors involved in Urban-ITS implementation
M	Stakeholders	All stakeholders involved in Urban-ITS implementation
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	There are many standards already available for communications and data to enable Urban-ITS, but they are not coordinated, and in many cases unknown to potential users
M	Standardisation gaps identified*	EU-ICIP Technical Specification or Technical Report, followed by an ongoing maintenance programme
O	"UseCase" level	
O	Requirements Reference	(1.6.3; 2.2;9.2, A.2.2; D.2.6,F.1.12; F.1.13; F.1.14; F.3.1.1; D.2.6; D.2.7) .
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



F.3.1.2 Use Case ULG-0002 Urban-ITS Interoperable Location Referencing

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Urban-ITS Interoperable Location Referencing**
M	**Use Case reference /id**	**ULG-0002 v3 20151124**
M	Description	Provision of a real time continuous location referencing system for the Urban-ITS environment. The referencing system should allow for planned and real-time data .
M	Scenario	An ITS deployment needs to draw data (for MIS, TM or UL purposes) from different modal systems, possibly under the ownership and control of several different organisations. In order to be able to compare routes, vehicle positions and interchange locations/structures effectively, it needs a common location referencing system.
M	Scope	To be able to place planned and real-time data in a universal location referencing environment so that control systems for the various modes can interact to provide seamless services to the urban traveller.
M	Actors Involved	Public transport operators Traffic managers Trip planning service providers ‘travel information provider’s Car park operator Location referencing providers Location determination providers Freight shippers Other travel mode providers Road maintenance operators Geographic information providers
M	Stakeholders	EU and National Governments Urban administrations Public transport Authorities Road Operators Travellers
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	That each element in the Urban-ITS chain is prepared to provide links to this universal location referencing system.

M	Identified standards (not exhaustive list)	ISO/EN 14819-3 Traffic and travel information (TTI) TTI messages via traffic message coding - part 3 location referencing for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT C. ISO/TS 21219 Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) - part 21,22, 23 . CEN/TS 16157-2 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing. ISO 17572-3 Intelligent transport systems (ITS) -- Location referencing for geographic databases – Parts 1,2 and 3. ISO 19147:2015 Geographic information -- Transfer Nodes. ISO 6709 Standard representation of geographic point location by coordinates. ISO/TS 1910XX Geographic information. ISO 14825 Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0. Various Transmodel, SIRI and NeTEx – Locations? EN 12896 Transmodel v6- Part 1: Common Concepts (Location Model, Projection Model). TS16614-1; Network and Timetable Exchange — Part 1: Network Topology . CEN/ISO TS 19091, Intelligent Transport Systems - Cooperative-ITS - Using V2I and I2V Communications for Applications Related to Signalized Intersections (SPaT, MAP, SRM, SSM) . ETSI EN 302 637-1 Cooperative Awareness Message (CAM). ETSI EN 301 637 -2 Decentralised Environmental Notification Message (DENM).
M	Standardisation gaps identified	There is no shortage of standards in the location referencing arena, the problem is that many of the methodologies are not compatible. The gap here is to ensure that multiple systems can all describe locations in the urban setting in such a way that they can cooperate to provide ITS services.
	Recommended actions	Development of standards: refer to the list above. A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such away that the data associated with those references can be shared to provide Urban-ITS services.
O	Other information	

F.3.1.3 Use Case ULG-0003 Urban-ITS Location and Time Determination

	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Urban-ITS Location and Time Determination**
M	**Use Case reference /id**	**ULG-0003 v3 20151124**
M	Description	Provision of a location and time determination system that will work in the urban canyon and provide positioning and timing information in enclosed spaces.
M	Scenario	ITS deployments generally need to determine the position of an ITS-station to a high degree of accuracy and reliability within the urban area and within structures such as multi-storey car parks.
M	Scope	Satellite positioning systems work well in the inter-urban space where there is no shielding of satellites by trees or tall buildings. The positional accuracy is adequate for must travel applications with the exception positioning of autonomous vehicles. However, they do not work well in some urban environments where a reduced number of satellites in line of sight due to the shielding effects of tall buildings (the urban canyon). There will also be applications where positioning inside buildings such as multi-storey car parks requires location determination.
M	Actors Involved	Public transport operators Traffic managers Trip planning service providers 'travel information provider's Car park operators Location referencing providers Location determination providers Freight shippers Other travel mode providers Road maintenance operators Geographic information providers
M	Stakeholders	eu and national governments Urban administrations public transport authorities road operators travellers
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	That location determination systems are freely available.
M	Identified standards (not exhaustive list)	There are a number of standards in this area, most are for determination of the position of objects. These range for from the simple radio direction finder available since the 1950s through to systems that use a number of beacons inside buildings using tagged objects. ISO 19116 Geographic information -- Positioning services
M	Standardisation gaps identified	Standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate way.
	Recommended actions	Development of standards: refer to the list above
O	Other information	

F.4 Panoptic (Multi-category) requirements — Potential revision of existing standards, new standards development and international harmonisation tasks based on gap/overlap results

See Use Cases above and Recommendations in Annex A of this pre-study report.

F.5 Panoptic (Multi-category) requirements — Roadmap with targeted deliverables and concrete actions to speed up deployment of Urban-ITS

See Annex P; Annex A, and 1.5 Executive Summary.

F.6 Funding issues

See Annex A.

Annex G Multimodal Information Services (MIS)

G.1 MIS Objectives, summary and scope addressed

G.1.1 General

One of the main objectives of Urban Administrations is to ensure a smooth and cost-effective mobility of the citizens to:

- ease the movement of people and goods, and answer to the citizens' demand for reliable and easy to use travel information;
- ensure accessibility of the towns and their economic development;
- reduce environmental and socio-economic impacts of transport;
- re-conquer public space from private car use for eco-friendly modes and urban planning.

Multimodal Information Service (MIS) has an important role to play to reach this goal, as it is an incentive for the users to change their mobility routines from the exclusive use of private vehicles.

MIS brings together the data from all modes of transport within the urban setting to provide services that will aid the urban traveller to access the most effective options for a journey.

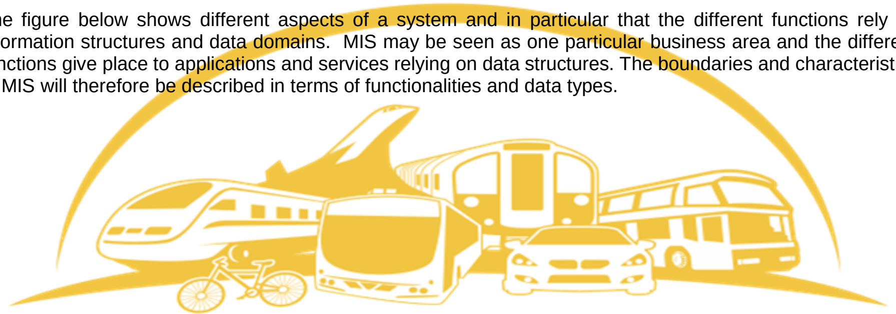
The scope of MIS is to look at the combination of information services from different transport modes in the urban environment to:

- enable the urban traveller to make the optimum choice of mode and route to reach an intended destination;
- enable the urban traveller to switch between modes en-route to reach an intended destination optimally;
- enable the city administration to provide a balanced effective transport offering within the constraints of cost and policy.

The functionalities may be based on either:

- long term or mid-tem *planned data* only; or,
- real-time data, i.e. the *actual transport offer* adapted to operational changes induced by incidents that occur during the operating day and real-time data from other urban systems.

The figure below shows different aspects of a system and in particular that the different functions rely on information structures and data domains. MIS may be seen as one particular business area and the different functions give place to applications and services relying on data structures. The boundaries and characteristics of MIS will therefore be described in terms of functionalities and data types.



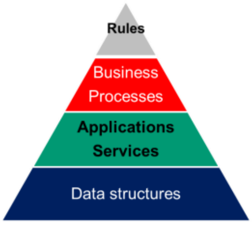


Figure G–1: MIS Aspects

Functional aspects

Information provided by MIS may be twofold and represent either:

- *general information* on transport in a given area - available modes of transport, public timetables, network maps, etc.; or,
- *tailored information,* i.e. on travel options concerning a specific trip from A to B; this includes a trip planning function, providing one or more particular trip plans (i.e. spatial trip patterns and timing).

In the case of tailored information (i.e. when the trip plan is determined), a guidance function (navigation aid) may also be an important addition. Such a function may concern pre-trip, or on-trip, information provision, and be based either on *scheduled* data or on *real-time* data (as described above). However, it is particularly important for this functionality in the case of on-trip information provision to be based on data as current as possible.

General information on available fare products, prices, types of fare documents, conditions of use, discounts, retail options is also part of the delivered output of MIS. In the case of particular trip plan option, it may comprise the corresponding price to be paid according to the particular criteria (time, user profile, etc.).

Information aspects

Many discussions have taken place in the past regarding the right time-scale to consider for the characterisation of *real-time* data. It was agreed that the reference data model for public transport (*Transmodel*) considers the data related to an operational day, possibly modified by events occurring during an operational day as *real-time* data; for data from other urban systems, real-time means that the data is available soon after generation (generally from detectors or systems).

Real-time data outside of the public transport domain can comprise at least:

- flow, speed and occupancy (stationary vehicles) data from an Urban Traffic Control (UTC) system;
- the status of traffic signals and signing systems;
- weather and road surface conditions;
- incidents;
- the occupancy levels of car parking.

In addition to the traditional modes in the urban context, new mobility services have been considered for MIS, such as:

- car sharing;
- car- pooling;
- public bicycle sharing services;
- park & ride;
- bike & ride;
- etc.

The consideration of these modes implies that the following data structures have to be taken into account:

- alternative fuels infrastructure, including:
  - information on location and availability of stations,
  - charging models
  - capacity at stations,
  - (integrated) payment schemes,
  - etc.

- A European standardisation deliverable on reference data model, common data dictionary and metadata structure for multimodal information services is required.

G.1.2 Stakeholder engagement

Several stakeholders in the urban multimodal travel arena have been contacted in a preliminary stage of this pre-study and these included:

- Urban administrations; (Le Grand Lyon, Greater Paris);
- Public transport authorities; (TFL, ……)
- Industry bodies;(TISA)
- Public transport associations (e.g. UITP: Union Internationale des Transports Publics)

A number of these organisations were approached with the MIS value chain and the set of Use Cases that had been derived from it. These Use Cases had already identified gaps and recommendation for action. These gaps and recommendations have been checked against the experiences and views of those consulted and either added to or adjusted. At the end of the process a tested set of fully populated Use Cases were available.

G.1.3 Common/Interoperable data

See Annex F.1.5; J.1.3.

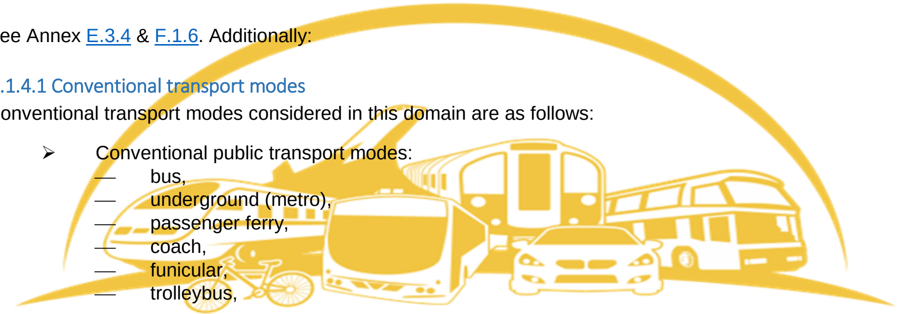
G.1.4 Multimodality

See Annex E.3.4 & F.1.6. Additionally:

G.1.4.1 Conventional transport modes

Conventional transport modes considered in this domain are as follows:

- Conventional public transport modes:
  - bus,
  - underground (metro),
  - passenger ferry,
  - coach,
  - funicular,
  - trolleybus,



  - tram,
  - water,
  - cableway,
  - links to long distance rail;
- Individual conventional modes:
  - private cars,
  - powered two/three wheel vehicles,
  - cycles;
- Freight vehicles;
- Walking.

G.1.4.2 New alternative transport modes

In addition to the conventional transport modes the use of new, shared, forms of transportation have increased exponentially. These new services also offer the opportunity for:

- greater mobility choices;
- first and last mile solutions to help travellers connect with public transport;
- reduced traffic congestion (hence lower CO2 emissions);
- decreased parking issues;
- independence for those who cannot afford or choose not to own a personal vehicle;
- new opportunities for door-to-door mobility for travellers with specific mobility impairment.

They contribute to the attractiveness of public transportation when a connection is made with the conventional public transport modes.

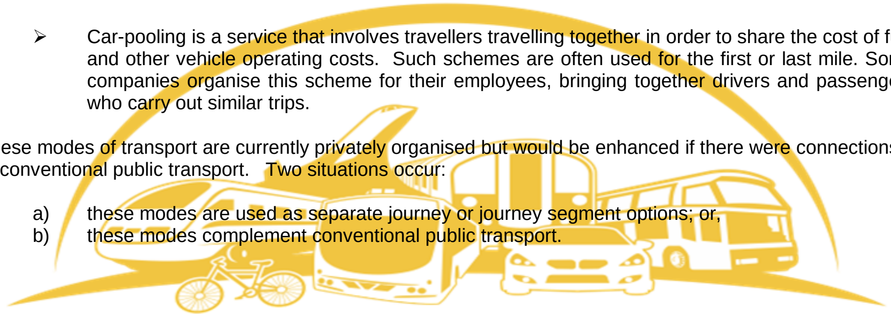
The most important ‘New Modes’ are:

- Bicycle sharing: a fleet of bicycles is made available to the public. There are a number of different possible operational solutions:
  - allowing users to pick up bicycles from a location (where a fixed predetermined places are provided for bicycle parking) and return them to another predetermined bicycle parking place;
  - allowing users to rent bicycles hourly or daily and return them to the rental location;
  - use of “connected bicycles” that use GNSS and lockers and which do not have to be left in predetermined places.

NOTE: “Cycles” in this context can be defined as: bicycles, electric bicycles, scooters, etc.

- Car sharing is a service that allows members of a community the use for a short term of a car from a fleet of cars.

- Car-pooling is a service that involves travellers travelling together in order to share the cost of fuel and other vehicle operating costs. Such schemes are often used for the first or last mile. Some companies organise this scheme for their employees, bringing together drivers and passengers who carry out similar trips.



These modes of transport are currently privately organised but would be enhanced if there were connections to conventional public transport.   Two situations occur:

a) these modes are used as separate journey or journey segment options; or,
b) these modes complement conventional public transport.

In both cases, several sources provide planned (mainly for parking places, fares and service conditions) and, real-time data, (mainly availability, but also sales or usage-related).

Parking places for bicycle/car sharing may have specific equipment (e.g. battery re-charging for electric vehicles). For car-pooling, specific traveller pick-up areas or meeting places can be at a common location, but may also specify parking places; which have to be defined and advised to the traveller together with the description of the conditions of use, booking and fares.

One of the issues with car-pooling locations can be similar to conventional public transport stops: in the same location, the availability of parking places for these services may be defined by different organisations, but when they are shared by several organisations, a duplication of data may occur. It is therefore vital to model such areas and unambiguously identify them to give travellers coherent information.

It is therefore desirable to enable exchange of data (cycle/car sharing places, car-pooling pick-up places and availability of vehicles, booking opportunities, etc.) in order to:

- group them on a single platform (repository); or,
- provide them to a multimodal information provider system in particular, to enable calculation of inter-modal trip plans involving these modes.

The data formats for these modes should be Transmodel-compliant and standard data exchange formats for the new modes, coherent with NeTEx and DATEX II, in order to guarantee coherence with conventional transport.

Rc_MI01- It is recommended that EC makes call for experts and offers funding for the Transmodel update project, so that it can align Transmodel with the Urban-ITS paradigm and accommodate new modes.

If the EC takes the decision to provide funding to the finalisation of Transmodel update, it is recommended to inform the reader on the evolution of the standard and to issue a TR “Public Transport- Reference Data Model – Informative Documentation” as an update of the first edition (which is related only to Transmodel v6 Parts 1, 2 and 3.

.

Rc_MI07- Recommended Standard update: To develop the update of the TR "Transmodel informative documentation".

See also Annex F.1.6.

G.1.4.3 Flexible Transport Services

The ‘Flexible Transport Service’ (FTS) sector covers a range of several non-scheduled public transport operation types. It is considered as “public transport” as it is available to the public, but may be operated by private operators. Flexible services can operate on regular line topologies or on a flexible topology.

Examples include:

- Virtual line service;
- Flexible service with main route;
- Corridor service (flexible service without main route);
- Fixed stop area-wide flexible service;
- Free area-wide flexible service;
- Hail and ride service;
- Mixed types of flexible service);
- DRT (Demand Responsive Transport) is a special case of FTS linked to the demand
    - Frequency dependent on loading (more units available when busy).
    - Available on call (dial-in request services etc.).

Taxi operations are sometimes considered as belonging to this area.

Two CEN standards, Transmodel and NeTEx have modelled and categorised the different types of FTS in respect of planned space and time aspects. They provide a model for the flexible network, describe service booking rules and timing aspects. Transmodel is in this respect the standard reference data model whereas NeTEx provides, a Transmodel compliant, physical data model and data exchange format.

See also G.1.5 and G.1.7.

G.1.5 Creation of (multimodal) transport datasets

Multi-modal datasets in standardised formats will need to be available and accessible. This will build on concepts in *Transmodel* as well as other significant Standards such as DATEX II and TPEG, and will need to cover (as a minimum):

- network topology description, related to infrastructure;
- timing data (such as timetables);
- service description (vehicle journeys, vehicle follow-up, etc.);
- current operational status;
- potentially prices/fares.

The existing standards themselves are inconsistent (often overlapping) or incomplete in these areas. Moreover, Transmodel, DATEX II and TPEG, and others such as INSPIRE and GDF, will have to be revised to accommodate the new modes, as well as harmonised (or at least effectively cross-mapped) in order to support the interoperability between modes and between sectors such as traffic management and urban logistics.

Examples of the required enhancements and harmonisation are:

- operational data for FTS (planned data is already covered by Transmodel and NeTEx);
- for fares, Transmodel will need enhancement to align with NeTEx (cover long distance train, introduce more explicit fare parameters, extend the description of fare products, etc.);
- for historic data sets (resulting from operations management of conventional transport or new modes), Transmodel needs to be extended;
- parking models are covered by both Transmodel and DATEX II, he status of both models has to be clarified and a unified solution proposed;
- for infrastructure data models provided by GDF and INSPIRE the status of both models has to be clarified and a unified solution proposed.

Transmodel/DATEX II will need a coordinated harmonisation in theses aspects. A detailed description of desirable enhancements is provided in G.4 - Recommendations

G.1.6 Multiple means of communication

See F.1.8.

G.1.7 Creation of urban-interurban interfaces

This section refers to data exchange formats (messages and APIs).

Data used for urban-interurban integration, including for operational management, will be required in a standardised format. This will need to cover (as a minimum):

- ➢ infrastructure networks (e.g. roads, rail, waterways) including junctions (extensively modelled by GDF and INSPIRE);
- ➢ public transport multimodal network;
- ➢ traffic flows/speeds/journey times;

Strategic datasets such as:
- ➢ diversion routes;
- ➢ freight routes;
- ➢ historic datasets on base data like traffic flows,

are also required.

DATEX II will need to be enhanced with respect to road and traffic IT in a way that encompasses the needs of Urban Administrations, and will need to draw on the operations/control specifications developed by UTMC, OCIT etc.

NeTEx already covers the links between urban and long distance rail/coach regarding network and timing data. However, a clarification as regards the infrastructure data also modelled by GDF has to take place.

As regards FTS, NeTEx already specifies a standard model and data exchange format for planned data, but for real-time FTS data, a coordinated enhancement of SIRI/DATEX will be required.

All interfaces will have to be enhanced (or developed in coherence to NeTEx/SIRI/DATEX II/TPEG) to cover the 'New Modes' described in G.1.4.2.

G.1.8 Use of open standards, architectures and specifications

G.1.8.1 Data standards and interoperability

For many years, business areas have been described through functions, and data flows between functions. However, standardisation concerns about such an "architectural approach" have shown significant disadvantages, as a functional split is not a sufficient enough stable element in a system description. It is particularly useful to describe system/service boundaries but a functional split is ambiguous. This is the reason why data rather than functions and data exchanges between functions became the focus of standardisation in data exchange, public transport and broadcast information services.

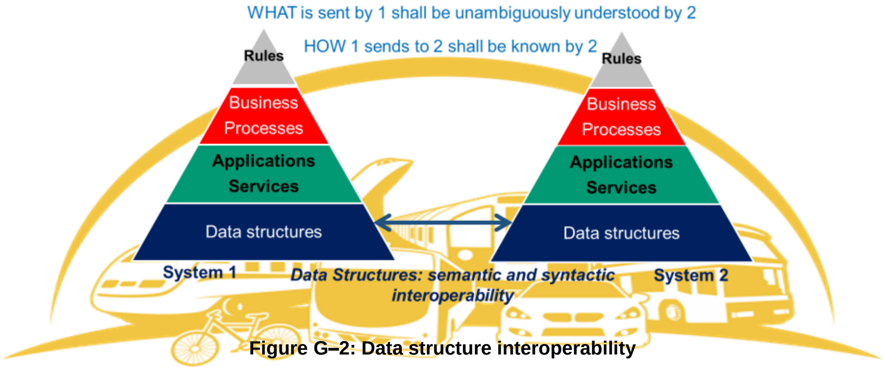

WHAT is sent by 1 shall be unambiguously understood by 2
HOW 1 sends to 2 shall be known by 2
Rules
Business Processes
Applications Services
Data structures
System 1
Rules
Business Processes
Applications Services
Data structures
System 2
Data Structures: semantic and syntactic interoperability

Figure G–2: Data structure interoperability

Interoperability of systems became the watchword within standardisation.

Seeking interoperability may be defined as the task of building coherent services for users when the individual components are technically different and managed by different organisations.

In the context of MIS, the different components are in particular different data categories and sources, which the service has to access.

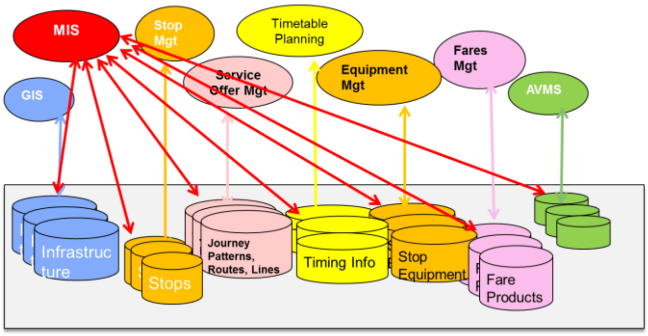


Figure G–3: MIS access to different data categories

Taking into account the fact that the different data categories are inter-dependent and in order to guarantee the semantic interoperability of MIS applications for public transport applications, a *Public Transport Reference data model* has been standardised *(Transmodel, EN 12896. See Annex D.2.3.25)*. To facilitate the syntactic interoperability of MIS applications using public transport data, two data *exchange standards,* based on Transmodel, have been elaborated*:*

- *NeTEx (for planned data);* and,
- *SIRI (for real-time data)).*

Additionally, and in respect of specific aspects of MIS, a range of standards are available:

ISO/FDIS 14296:2015 Extension of map database specifications for applications of Cooperative-ITS

This International Standard provides the map-related functional requirements, data model (logical data model/logical data organization), and data elements for those applications of Cooperative-ITS that require information derived from map databases.

This International Standard supports the ‘basic set of applications (BSA) for Cooperative-ITSs, driving support services, and navigation services for in-vehicle and multi-modal travel.

Six application categories (map display, positioning, route planning, route guidance, service/poi information access and address location) for navigation functionality are the same as those defined **in ISO/TS 20452:2007** Cooperative-ITS (including driving support), and multi-modal travel support functions, are now defined by this International Standard.

ISO/TS 20452:2007 Requirements and Logical Data Model for a Physical Storage Format (PSF) and an Application Program Interface (API) and Logical Data Organization for PSF used in Intelligent Transport Systems (ITS) Database Technology.

ISO 17572-1 First edition 2008-12-15 Location referencing for geographic databases —Part 1 General requirements and conceptual model.

ISO. 17572-2 First edition 2008-12-15 Location referencing for geographic databases — Part 2 Pre-coded location references (pre-coded profile).

ISO 17572-3 2008-12-15 Location referencing for geographic databases — Part 3 Dynamic location references (dynamic profile).

ISO 17252 specifies 'Location Referencing Methods' (LRM) that describe locations in the context of geographic databases and will be used to locate transport-related phenomena in an encoder system as well as in the decoder side. ISO 17252 defines what is meant by such objects, and describes the reference in detail, including whether or not components of the reference are mandatory or optional, and their characteristics.

ISO 17252 specifies two different LRMs:
- ➢ pre-coded location references (pre-coded profile);
- ➢ dynamic location references (dynamic profile).

ISO 17252 does not define a physical format for implementing the LRM. However, the requirements for physical formats are defined.

ISO 17252 does not define details of the Location Referencing System (LRS), i.e. how the LRMs are to be implemented in software, hardware, or processes.

ISO 17267:2009 Navigation systems -- Application programming interface (API).

ISO TC204 WG17 AWI 17438-4 & DIS 13111-1 for indoor navigation.

TC204 WG8 ISO 17185-3 ITS — Public transport user information — Part 3: Use Cases for journey planning systems and their interoperation.

ISO 17185 is a recent International Standard that is designed to establish a solid foundation for a surface public transport user information provision framework. This is intended to address the current issue that whilst many public transport operators already have transport-related information systems, public transport users are often not provided with travel information regarding their journey in an appropriate and timely manner. In essence it is a *Process Framework* rather than a concrete standard.

The intention is that ISO 17185 will be fully consistent with currently available regional and national standards related to international public transport. Given that requirements and standards for public transport user information provision vary from country to country, this International Standard provides a guiding framework rather than new rules regarding how MMTIPS should be implemented.

ISO 17185 is composed of the following parts: Part 1: Standards framework for public information systems; Part 2: Data and interface standards catalogue and cross reference; and Part 3: Use Cases for journey planning systems and their inter-operation.

The goal of the framework is to facilitate inter-operability of public transport-related information using different national and regional standards, help to guide evolution of standards worldwide to a common framework, identify gaps in existing standards and translate between existing standards, to facilitate public transport users including worldwide travellers (ISO 2015).

A visualisation of how the ISO 17185 standard fits with already available national and regional standards is shown below:

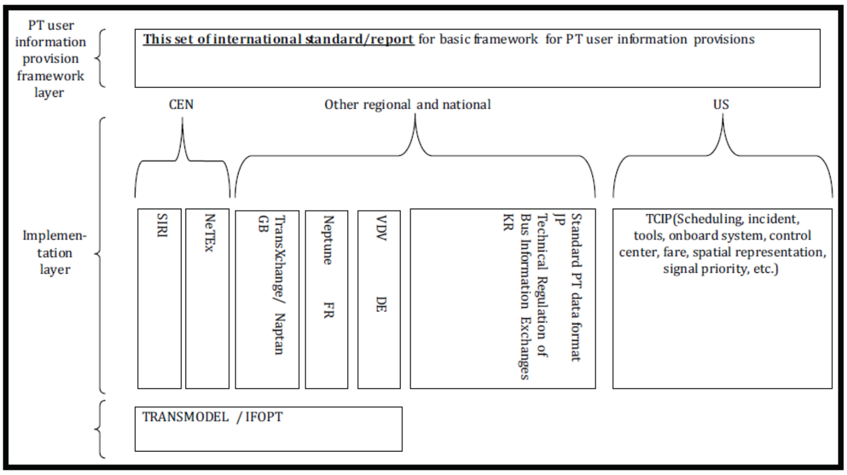

PT user information provision framework layer
This set of international standard/report for basic framework for PT user information provisions
CEN
Other regional and national
US
Implemen-tation layer
SIRI
NeTEx
TransXchange/ Naptan GB
Neptune FR
VDV DE
Standard PT data format JP
Technical Regulation of Bus Information Exchanges KR
TCIP(Scheduling, incident, tools, onboard system, control center, fare, spatial representation, signal priority, etc.)
TRANSMODEL / IFOPT

Figure G–4 Relationship of ISO 17185 and existing regional/national standards

G.1.9 Enable rather than prescribe or proscribe

See Annex F.1.11.

G.2 MIS Relevant business/service areas and applications identified with key stakeholders

G.2.1 MIS Business service area

It is assumed that “Urban-ITS” concerns broad conurbations, which may comprise low density or even rural areas, such as the Ile-de-France region.

Therefore, in terms of transport modes in the particular context of Urban-ITS, MIS considers:

- Public transport modes: bus, underground (metro), passenger ferry, coach, funicular, trolleybus, tram, water, cableway;
- Links to the modes long-distance rail and long-distance coach, in the sense that information provision in broader urban areas is linked to these modes;
- Alternative public transport modes: car sharing, bicycle sharing, car-pooling;
- Private transport modes: private cars, taxis;
- Freight vehicles;
- Walking.

As stated in 8.1, ITS stakeholders can be split into four categories comprising those who:

- *want ITS*, such as Urban administrations, road operators, transport authorities;
- *make ITS,* such as system and component suppliers, communications and infrastructure providers;

- *use ITS,* such as travellers, freight shippers; and
- *rule ITS*, usually national governments, the EU, and perhaps indirectly those who create standards.

Service providers fall into any combination of the categories “Want”, “Make” and “Use”, depending on what they do. All stakeholders will have different expectations for what the services that ITS can provide will mean to them and their organisations.

The actors and stakeholders in MIS are defined as in Annex C.3.

G.2.2 MIS Applications (Use Cases) information layers and data types

NeTEx and SIRI proponents have both have recently expressed additional requirements that have implications on the reference data model (Transmodel). Transmodel similarly requires update and extension.

Within these domains there is also overlap between standards. This is partly the case for the infrastructure data model developed on one hand by GDF- group (ISO TC204 WG3) and on the other hand by the INSPIRE directive.

Some standards are missing. For example, a reference data model and data exchange format for information needs referring to the new modes.

The main types of recommended actions that have been identified thanks to the analysis of the MIS uses cases below are:

- update of Standards;
- development of new Standards;
- harmonisation of Standards.

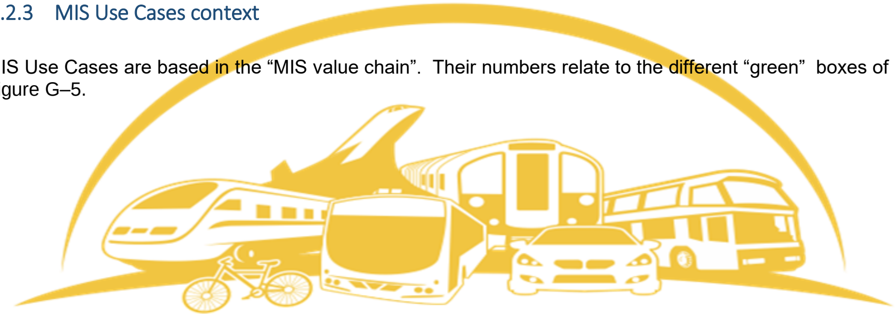
In this context a *Standard* refers mainly to: a *conceptual data model*, a *data exchange format*, or a *data exchange profile*.

A *standard reference* refers mainly to conceptual data models and means that it is not necessary for individual systems or specifications to implement the standard as is and as a whole. However, it must be possible to describe (for those elements of systems, interfaces and specifications which fall within the scope of the standard):

- the aspects of the standard that they have adopted;
- the aspects of the standard that they have chosen not to adopt.

G.2.3 MIS Use Cases context

MIS Use Cases are based in the “MIS value chain”. Their numbers relate to the different “green” boxes of Figure G–5.



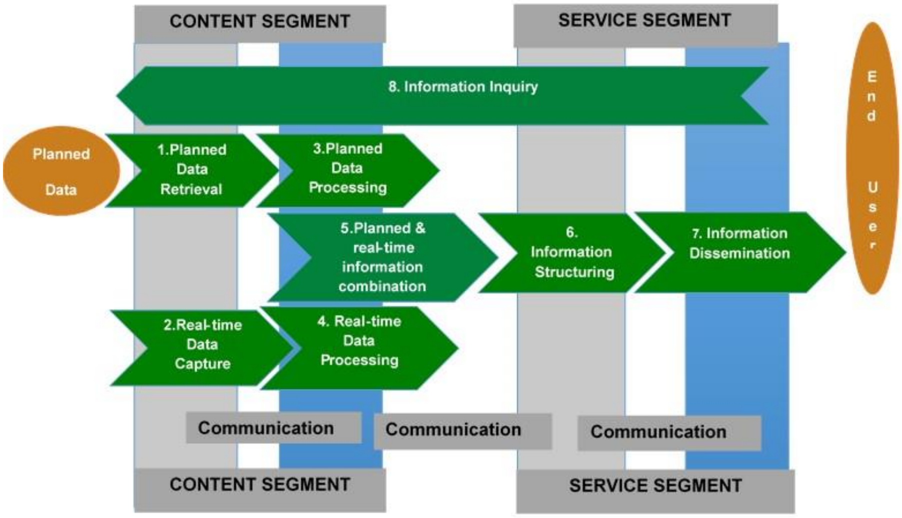

CONTENT SEGMENT
SERVICE SEGMENT
8. Information Inquiry
End User
Planned Data
1.Planned Data Retrieval
3.Planned Data Processing
5.Planned & real-time information combination
6. Information Structuring
7. Information Dissemination
2.Real-time Data Capture
4. Real-time Data Processing
Communication
Communication
Communication
CONTENT SEGMENT
SERVICE SEGMENT

Figure G–5: MIS Value chain

For some “green” boxes (in Figure G–5) there will be more than one Use Case, in which case they will have a sub-number (e.g. 3-1).

The Use Cases below concern the following modes: individual cars, conventional (urban) public transport modes, ‘New Modes’ (car/cycle sharing, car-pooling, including electric vehicles/cycles), freight, walking.

For trip planning, in particular, access to inter-urban/long distance rail/coach (planned and real-time) data is included and provides door-to door multimodal trip plan options.

Trip plan options are either

- mono-modal: in this case trip multimodal planners provide, if available, several trip options using other modes, or
- inter-modal: in this case the trip plans concern multiple modes for one trip.

The term “profile” means here “generic data exchange profile”, i.e. data types to be included in a data exchange frame. Further specifics of a profile are to be seen in the context of local agreements.

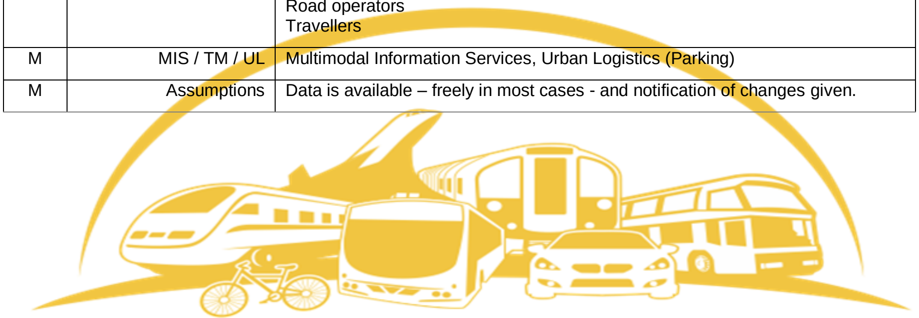
The following list of Use Cases and related recommendations are summarised below:

G.2.4.1 .... UC-MIS-0001 MIS Planned Data Retrieval
G.2.4.2 .... UC-MIS-0002 MIS Real-time Data Capture
G.2.4.2.1 UC-MIS-0002-1 MIS Operational Raw Data Provision
G.2.4.3 .... UC-MIS-0003 MIS Planned Data Processing
G.2.4.3.1 UC-MIS-0003-1 MIS Scheduled Trip Plan Provision
G.2.4.3.2 UC-MIS-0003-2 MIS Planned Data Updating
G.2.4.4 .... UC-MIS-0004 MIS Real-time Data Processing
G.2.4.4.1 UC-MIS-0004-1 MIS Real-time Data Updating
G.2.4.5 .... UC-MIS-0005 MIS Actual Trip Plan Provision
G.2.4.5.1 UC-MIS-0005-1 MIS Dynamic Car-pooling
G.2.4.5.2 UC-MIS-0005-2 MIS Driver Guidance
G.2.4.5.3 UC-MIS-0005-3 MIS Car Sharing
G.2.4.5.4 UC-MIS-0005-4 MIS Bicycle Sharing
G.2.4.5.5 UC-MIS-0005-5 MIS Demand Responsive Systems
G.2.4.6 .... UC-MIS-0006 MIS Information Structuring
G.2.4.7 .... UC-MIS-0007 MIS Information Dissemination
G.2.4.8 ....UC-MIS-0008 MIS Query Structuring
G.2.4.9 .... UC-MIS-0000 MIS User Support

G.2.4 MIS Use Cases

G.2.4.1 MIS-0001 MIS Planned Data Retrieval

CEN TC278 PT1701 Use Case		
M	**Use Case Name**	**MIS Planned Data Retrieval**
M	**Use Case reference /id**	**MIS-0001 v6 20151119**
M	Description	To collect data about the planned status of the transport service offer for use in 'Travel Information Provider' systems.
M	Scenario	This Use Case refers to step 1 in the MIS value chain. It should be considered as a consequence of a simple traveller/user query, or - in case of data exchanges between systems – as a consequence of the request of another system such as a 'Travel Information Provider'/ 'Other Travel Mode Provider', etc. This process draws data from multiple (possibly unknown) separate source systems which are procured, owned and operated by independent third parties.
M	Scope	This concerns the gathering of all multi-source and multimodal information, which is static in nature and based upon either longer term planned data (i.e. data valid until they enter in operation for a particular operating day) or data foreseen for particular operating days. Examples data: planned timetables, scheduled events, planned fares, planned road maintenance activities, expected car park occupancies, tolls and the network topology, points of interest, road/rail/waterways network, car-pooling areas, car sharing, bicycle sharing areas, cycling network, battery recharging areas (for electric vehicles), etc.
M	Actors Involved	Car park operators Public transport operators 'travel information provider's Freight shippers Other travel mode providers Geographic information providers Toll operators Road maintenance operators Road network operators Travellers
M	Stakeholders	EU and national governments Urban administrations Public transport authorities Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services, Urban Logistics (Parking)
M	Assumptions	Data is available – freely in most cases - and notification of changes given.

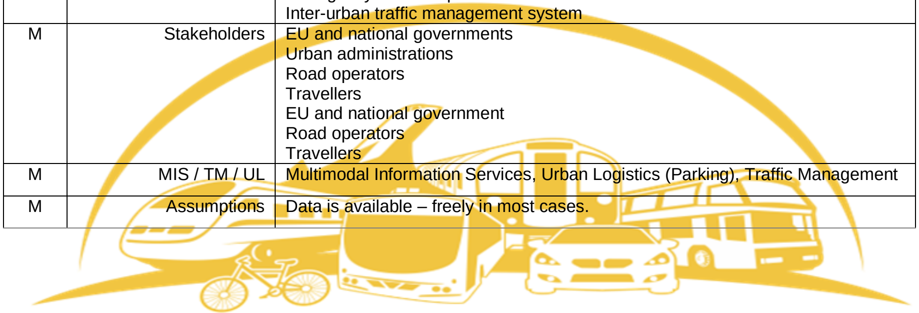


M	Identified standards (not exhaustive list)	*ITS Standards:* ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN12896 Transmodel v 5.1. CEN/TS 16614 Network and Timetable Exchange Part 1 to 3 (NeTEx) – for planned public transport data exchange. ISO 14825 Geographic Data Files 5.0. ISO 19147:2015 Geographic information -- Transfer Nodes. INSPIRE data models & associated data exchange formats (TN-ITS).
M	Standardisation gaps identified	1. No reference model for network topology for 'New Modes' (car/cycle sharing areas, car-pooling areas, battery recharging places). 2. No reference model for service description for 'New Modes' (booking, fares, etc.). 3. No reference model for cycling network. 4. No standard exchange format for 'New Modes' planned data (topology, service description and fares). 5a. Lack of coherence of Transmodel (fare collection part) and NeTEx – part 3 (NeTEx requires new types of public transport fares (pay-as-you go, etc. and more explicit parameters for fares description and usage)). 5b Transmodel v5.1 Fare Collection part (validation/control data) (being the basis for information concerning black lists, account status, etc.). is not coherent with the already issued Transmodel v6 Part 1-2-3. 6. No unique model for infrastructure description: there is an overlap GDF (guidance oriented) /INSPIRE (map oriented) in several areas: road, rail, waterway network, walking paths – to be checked the overlap other feature themes such as GDF administrative areas, named areas, etc.) 7. Lack of standard data exchange profiles for data retrieval (according to end-user (traveller/driver/travel information system) need): end-user queries may address specific types of data, e.g. stops in a certain zone, passing times at particular stop place or for a route, etc.; standard data exchange format is provided by standards like NeTEx, however, such data exchange formats define large data sets (e.g. the whole network topology). The definition of particular "generic" profiles for data retrieval (i.e. limiting the exchanges to some subsets of data to be exchanged, such as for example stop places) facilitates the usage of complex standards. 8. Precise parameters definition for data exchanges (i.a. for data retrieval), such as particular cardinalities or codes, often takes place between the partners involved in the exchanges. Publicly available parameters will ensure that data by a new user are accessible: such agreements are often not published.

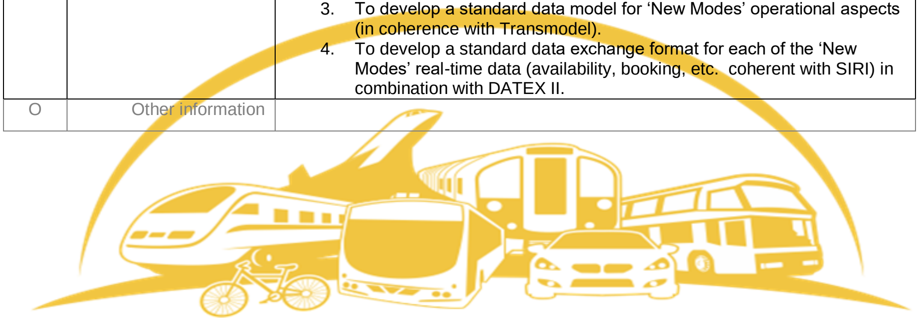
.	Recommended actions	1. To develop a standard reference data model for network topology for ‘New Modes’ (car/cycle sharing areas, car-pooling areas, battery recharging places) in coherence with Transmodel V6 and Part 7: Driver Management.. 2. To develop a standard reference data model for service description for ‘New Modes’ (incl. booking, fares, etc.) in coherence with Transmodel V6. 3. To develop a standard data model for cycling network in coherence with Transmodel V6 and GDF. 4. To develop a standard exchange format for ‘New Modes’ planned data (topology, service description and fares). 5. To develop Transmodel V6 – Part 5: Fare Management (incl. validation and control part). **6.** To specify a unique solution for the models as developed by GDF and INSPIRE in several overlapping areas: road, rail, waterway network, walking paths, administrative areas, named areas, etc.). **7.** To develop a standard method (and possibly tool) for the development of data exchange profiles based on NeTEx (e.g. stop place profile based on NeTEx) useful in the context of travel information and associated reference generic description for local agreements referring to the profiles. 8. To develop several of the most useful profiles based on NeTEx.
O	Other information	

G.2.4.2 MIS-0002 MIS Real-time Data Capture

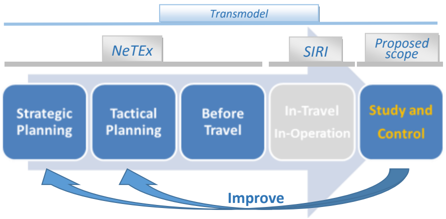
CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Real-time Data Capture**
M	**Use Case reference /id**	**MIS-0002 v6 20151119**
M	Description	To capture real-time data provided by public transport, road network operations and other mobility services for use in ‘Travel Information Provider’ systems.
M	Scenario	This Use Case refers to step 2 in the MIS value chain. This process draws data from multiple (possibly unknown) separate source systems which are procured, owned and operated by independent third parties. The data is likely to be in different time resolutions and have different business rules.
M	Scope	This concerns the capturing of raw real-time data from the different modes of transport and control in an urban area. Real-time data is intended as an input to ‘Travel Information Provider’ systems for the provision of actual information to the end-user (traveller, driver or other system) (i) either to express warnings (ii) or, in combination with planned data, to re-calculate trip plans, propagate changes in public transport offer, propose deviations to drivers in case of on-board route guidance, etc. Examples of data to be captured are: data from the road network and other modes, from vehicle embedded systems (cars, trams, buses, taxis, metro, trains etc.), status data from other modes, weather and road conditions, reports from travellers, the police etc., real-time passing times from various modes, car/cycle sharing availability, car-pooling availability, facilities’ availability at stops and stations, etc.
M	Actors Involved	Car park operators Public transport operators Public transport vehicle Road maintenance operators Road network operators Toll operators Travellers Freight shippers Other travel mode providers Probe vehicles Geographic information providers Location reference service Connected vehicles Emergency service operators Inter-urban traffic management system
M	Stakeholders	EU and national governments Urban administrations Road operators Travellers EU and national government Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services, Urban Logistics (Parking), Traffic Management
M	Assumptions	Data is available – freely in most cases.



M	Identified standards (not exhaustive list)	*ITS standards:* ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. CEN TS 16157 DATEX II Parts 1 to 6. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN12896 Transmodel v5.1. EN15531 Part 1 to 4 Service interface for real-time information (SIRI): real-time public transport data. CEN/TS15531 Part 5 Service interface for real-time information (SIRI-FM Facility Management). ISO 14827-1 Data interfaces between centres for transport information and control systems. ISO 15784 Data exchange involving roadside modules ISO communication. ISO 19147:2015 Geographic information -- Transfer Nodes. INSPIRE data models & associated data exchange formats (TN-ITS)
M	Standardisation gaps identified	1. Requirements for real time public transport data (from SIRI (mostly situation exchange and facility management) are not taken into account in the standard reference model for public transport (Transmodel v5.1). 2. EBSF requirements for detailed control actions are not taken into account the reference data model for public transport (Transmodel V5.1). 3. No standard physical UML model for Transmodel real-time data (SIRI standard concerns messaging and is an XML implementation): real-time data may be stored in a data base for use e.g. of verification routines and thus retrieved from a data repository. The existence of a physical data model for SIRI data facilitates specification and development of verification routines. 4. DATEX overlaps with parts of Transmodel V5.1 real-time data domain (events, messages). 5. No standard model exists for 'New Modes' real-time data (car/ bicycle sharing availability, car-pooling options, etc.). 6. No standard data exchange format for 'New Modes' real-time data.
	Recommended actions	1. To develop Transmodel v6 – Part 4: Operations Monitoring and Control, i.e. the update of Transmodel 'Operations Monitoring and Control 'with the requirements of SIRI standard, EBSF project & align with DATEX part 3 (Situation Publication). 2. To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files). 3. To develop a standard data model for 'New Modes' operational aspects (in coherence with Transmodel). 4. To develop a standard data exchange format for each of the 'New Modes' real-time data (availability, booking, etc. coherent with SIRI) in combination with DATEX II.
O	Other information	



G.2.4.2.1 MIS-0002-1 MIS Operational Raw Data Provision

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Operational Raw Data Provision**
M	**Use Case reference /id**	**MIS-0002-1 v3 20151220**
M	Description	To provide the necessary public transport raw data for the *Study and Control* stage. This stage follows the operations stage, i.e. it is the time when operators and authorities review the history of actual operations. This stage may lead to improvements through operational changes, or an optimization of strategic and tactical planning. The data concerned will only describe the recorded reality of operation, either through individual measurements at a given sampling interval, or through data aggregations (statistics). It concerns different kinds of information, based on the actual public transport service, for example: delays, cancelled vehicle journeys, passenger counts, but also data resulting from the control and validation of travel documents, origin/destination information, etc. The main stages of public transportation planning & operation are described below. From the authority and operator point of view, five main stages are to be considered to represent these activities as shown in the figure below. NeTEx and SIRI support the first four stages; the last stage is the additional scope to be covered by this Use Case.  Transmodel NeTEx SIRI Proposed scope Strategic Planning Tactical Planning Before Travel In-Travel In-Operation Study and Control Improve
M	Scenario	Different scenarios may be envisaged for further processing and exchange of this data: • Situation analysis. This Use Case group covers all the data exchange scenarios where the aim of the exchange is to provide data to examine and study the operating status (e.g. delays because of traffic lights, road construction, traffic jams, etc.). It requires some recording of aspects of the operational context and of events along with the real-time data performance. • Contractual reporting. This Use Case group covers data exchange where the actual service must be accounted towards the local, regional or national administration body responsible for providing public transportation. It requires some representation of the accounting of undertaken services. • Providing data for quality-of-service analyses and processes. Based on the planned timetables and the exchanged data, quality-of-service (QoS) analyses may take place, including delays and cancelled vehicle journeys. The purpose of the initial data exchange is not carrying the actual quality-of-service information, but only the input data from which such indicators can be computed.

·		• The above scenarios include data referring to driver performance on actual days of operation.
M	Scope	The focus of this Use Case is on actual and measured information, i.e. information that cannot be changed in the future. This information is mainly an output of the domain "*operations monitoring & control*" and of the domain *"driving personnel disposition"* as defined by Transmodel. The scope of this Use Case is to update the parts of Transmodel that refer to the provision of registered raw data for the study and control and to define a standard data exchange format.
M	Actors Involved	Public transport authority: to receive the data, either directly, either indirectly through service providers. Public transport operators: to provide the operational raw data as an output of their network monitoring. Software companies: to implement the data exchange.
M	Stakeholders	Any actor involved in public transport, from authority to the end user, up to consultancy companies, academic studies an urban planning. Indeed, possibly affected stakeholder are numerous, and proximity with contractual relation contained in quality-of-service requires a fine-tuning of the scope of a future Technical Specification. Furthermore, various existing studies on public transport QoS at the European and national work need to be taken into account in order to satisfy their data input needs.
M	MIS / TM / UL	Multimodal Information Services – Traffic Management (Public transport Operation)
M	Assumptions	The public transport network needs to be monitored (usually involves an AVMS, but dedicated system, like passenger counting, may also be required).
M	Identified standards (not exhaustive list)	EN 12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN 12896 Transmodel v5.1. CEN/TS 16614 Network & Timetable Exchange (NeTEx) Part 1-3. EN15531 Part 1 to 4 Service interface for real-time information (SIRI). CEN/TS15531 Part 5 Service interface for real-time information (SIRI-FM Facility Management).
M	Standardisation gaps identified	1. Transmodel v5.1 is to be updated with new requirements as regards raw data needs for the Study and Control. 2. No standard to support data exchange for the *Study and Control* stage.
	Recommended actions	1. To update Transmodel v6-Part 4: Operations Monitoring and Control Transmodel v6-Part 7: Driver Management, Transmodel v6- Part 8: Management Information. 2. To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw operational data needed for the 'Study and Control' stage.
O	Other information	The scope of this work is in a Work Item in CEN/TC278 WG3

G.2.4.3 MIS-0003 MIS Planned Data Processing

	CEN TC278 PT1701 USE CASE	
M	**Use Case Name**	**MIS Planned Data Processing**
M	**Use Case reference /id**	**MIS-0003 v4 20151118**
M	Description	To collate, convert to a common standard format planned data representing the transport service offer and provide this for use in 'Travel Information Provider' systems.
M	Scenario	This Use Case refers to step 3 in the MIS value chain. The data has originated from multiple (possibly unknown) separate source systems which are procured, owned and operated by independent third parties, and must be put in such a form that it can be combined to provide a more complete picture.
M	Scope	Multisource data as retrieved (cf. UC MIS-0001) is not necessarily free of errors, inconsistencies and duplications and needs to be checked and validated according to predetermined criteria. This concerns the structuring of information in an agreed format so that it can be combined with information from other sources to put the information into context to provide information services.
M	Actors Involved	'Travel information provider's Public transport operators Car park operators Road maintenance operators Road network operators Toll operators Geographic information providers
M	Stakeholders	EU and national governments Urban administrations road operators travellers
M	MIS / TM / UL	Multimodal Information Services –Urban Logistics (Parking)
M	Assumptions	Availability of planned data as described in UC MIS-0001. Existence of well-structured physical models that include versioning and standard data source description to identify and to store the planned data.
M	Identified standards (not exhaustive list)	ITS standards ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. CEN TS 16157 DATEX II Parts 1 to 6. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6 EN12896): as reference semantic model (for public transport network). CEN/TS 16614 Network and Timetable Exchange (NeTEx).
M	Standardisation gaps identified	1. Lack of standard and unambiguous IDs for multi-source data for use of 'Travel Information Provider' systems. This concerns data referring to the same concept (e.g. stops in one mobility area etc.) and has as consequence, in many situations, that when collated, data duplication or confusion occurs. 2. No standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence.

.	Recommended actions	1. To develop a standard stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner. 2. To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence.
O	Other information	

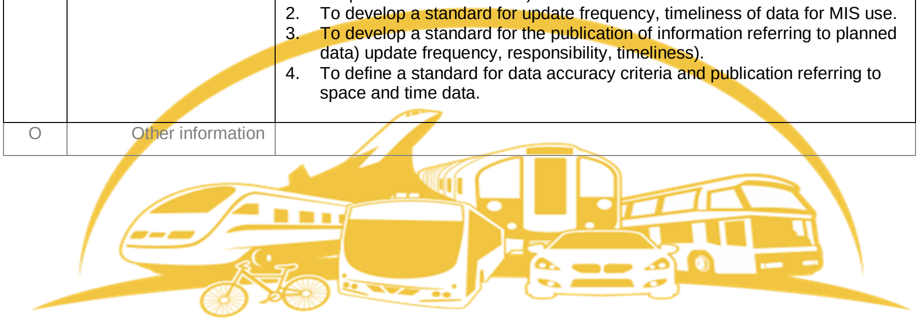
G.2.4.3.1 MIS-0003-1 MIS Scheduled Trip Plan Provision

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Scheduled Trip Plan Provision**
M	**Use Case reference /id**	**MIS-0003-1 v7 20151119**
M	Description	To compute trip plan options (i.e. spatial trip patterns and timing patterns) through the network, including detailed times and detailed guidance for making transfers between two services at an interchange.
M	Scenario	This Use Case refers to step 3 in the MIS value chain.
M	Scope	The trip planning algorithms use planned data only for this Use Case. The computation of trip plans takes into account end-user criteria that are part of end-user requests. For individual car drivers or freight shippers this Use Case concern park & ride scheduled options. Trip plans provided are composed (i) either by several alternative trip options (each option using a different mode) and/or (ii) by several inter-modal options. Optionally, trip patterns (i.e. the spatial component of a trip plan) are processed to be represented on maps.
M	Actors Involved	Traveller information providers Geographic information providers Travellers Drivers
M	Stakeholders	EU and national governments Urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services.
M	Assumptions	Availability of restructured planned data as described in UC MIS-0001 and UC MIS-0003: this means in particular: • the existence of well-structured physical models and associated standard data exchange formats that include versioning and standard data source descriptions to identify the planned data for use of trip planning applications. • the existence of standard and parameterised user queries that include criteria to be taken into account for journey planning algorithms.
M	Identified standards (not exhaustive list)	ITS standards None known
M	Standardisation gaps identified	1. This Use Case relies on UC MIS- 0001 & UC MIS-0003 and thus the gaps identified apply also here. 2. No standard end-user (traveller/driver/travel information system) query model for standard criteria for trip plan delivery. 3. When several trip planners have to be interconnected (this is the case, for instance, when the end-user query is beyond the boundary of a single trip planner), a standard interface for the interconnection of trip planners is missing: this facilitates extensions of such system composed of many multimodal information providers (e.g. interconnection of national trip planners to form a EU-wide trip planning system).

.	Recommended actions	*Same recommendations as for UC MIS- 0001, UC MIS-0003 & UC MIS-0003-2 apply, according to the modes taken into account by the Trip Planning function.* AND: 1. To develop Transmodel v6 – Part 6: Passenger Information: to model complex queries and filters as required by NeTEx-informative annex. (cf. UC MIS- 0008). 2. To develop standard APIs and/or query/ data exchange format for interconnection of journey planning systems in coherence with Transmodel v6 (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). 3. To develop a unique access point for urban data repositories, in particular an urban meta-data registry.
O	Other information	

G.2.4.3.2 MIS-0003-2 MIS Planned Data Updating

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**MIS Planned Data Updating**
M	**Use Case reference /id**	**MIS-0003-2 v3 20151119**
M	Description	To define planned data update procedures.
M	Scenario	This Use Case refers to step 3 in the MIS value chain.
M	Scope	Planned data needs to be updated with a certain frequency to be operational and meaningful, e.g. roadworks may generate the necessity to close certain roads, public transport stops may be displaced for some time, etc. The data for use for Multimodal Information Service has to be as timely as possible.
M	Actors Involved	Traveller information providers Geographic information providers Travellers Drivers
M	Stakeholders	EU and national governments Urban Administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	Data is publicly available.
M	Identified standards (not exhaustive list)	ISO/TR 21707:2008 Intelligent transport systems -- Integrated transport information, management and control -- Data quality in ITSs.
M	Standardisation gaps identified	Data as provided by different actors is often not actual or its validity is unknown. There is: 1. No standard for data update procedures. 2. No standard for publication of meta-data on data validity and refreshment data/period/frequency/responsibility/accuracy. This is particularly the case (and of importance) for open data and for a multi-operator environment.
	Recommended actions	1. To develop standard data update procedures (for planned data for the usage of MIS) to be adopted in accordance to the existing standard (and adapted to the MIS context). 2. To develop a standard for update frequency, timeliness of data for MIS use. 3. To develop a standard for the publication of information referring to planned data) update frequency, responsibility, timeliness). 4. To define a standard for data accuracy criteria and publication referring to space and time data.
O	Other information	



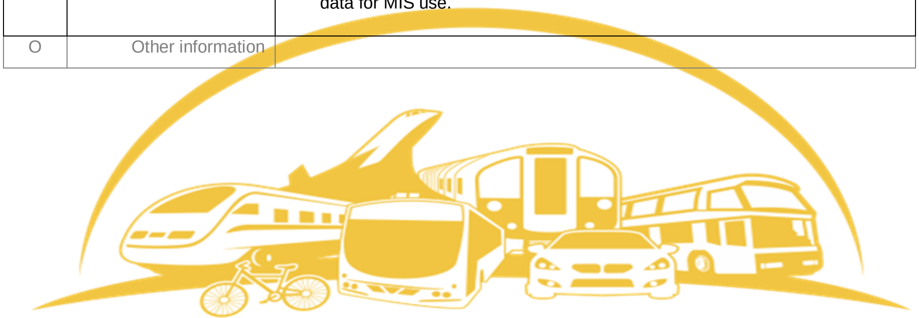
G.2.4.4 MIS-0004 MIS Real-time Data Processing

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Real-time Data Processing**
M	**Use Case reference /id**	**MIS-0004 v4 20151119**
M	Description	To collate, convert to a common standard format real-time data and provide this for use in 'Travel Information Provider' systems. Examples of data: road status, road works, weather conditions, incidents, alarms, etc.
M	Scenario	This Use Case refers to step 4 in the MIS value chain.
M	Scope	Multisource real-time data as collected (MIS-0002) is not necessarily free of errors, inconsistencies and duplications and needs to be checked and validated according to predetermined criteria. This Use Case concerns structuring of information in an agreed format so that it can be combined with information from other sources to put the information into context to provide information services.
M	Actors Involved	'Travel information provider's Public transport operators Car park operators Road maintenance operators Road network operators Toll operators Geographic information providers
M	Stakeholders	EU and national governments Urban Administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	Real-time data is available and its source and version is identified as described in UC MIS-0002. Existence of well-structured physical models is supposed, that include versioning and standard data source descriptions to identify the real-time data for use of travel information services and possibly to store it for statistical analysis.
M	Identified standards (not exhaustive list)	ITS standards ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. CEN EN 15531 SIRI Part 1 to 4: Service interface for real-time information for public transport operations. CEN TS15531 Part 5 Service interface for real-time information (SIRI-FM Facility Management). CEN TS 16157 DATEX II Parts 1 to 6. CEN EN12896 Public Transport Reference Data Model Part 1 to 3. (Transmodel v6) EN12896 Transmodel v5.1.
M	Standardisation gaps identified	1. Automated data validation routines verifying semantic conformity to data standards (e.g. to SIRI XML files) do not exist as a standard.

.	Recommended actions	*Same recommendations as for UC MIS-0002 apply* AND To develop standard validation procedures and routines for real–time data (for the usage of MIS) verification (completeness, coherence and compliance to standard formats where they exist).
O	Other information	

G.2.4.4.1 MIS-0004-1 MIS Real-time Data Updating

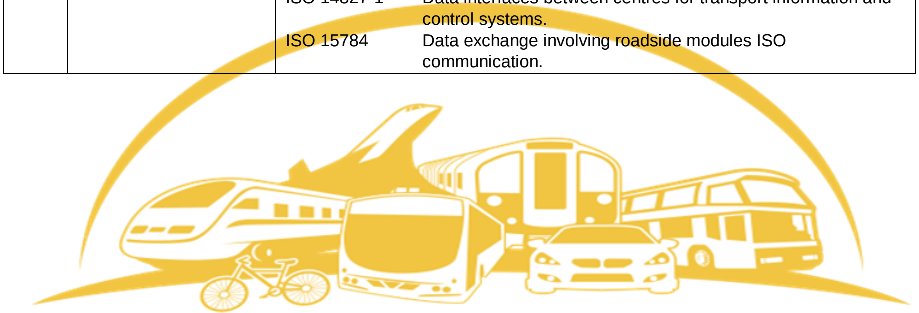
	CEN TC278 PT1701 USE CASE	
M	**Use Case Name**	**MIS Real-time Data Updating**
M	**Use Case reference /id**	**MIS-0004-1 v3 20151114**
M	Description	To determine the update frequency and validity for real-time data dedicated to be used by MIS.
M	Scenario	This Use Case refers to step 4 in the MIS value chain.
M	Scope	In general, real-time data is meant to be used as soon as delivered. However, in several domains, e.g. in public transport, real-time data refer to the operations on a particular operating day and thus several updates of real-time data are delivered for an operating day. MIS delivery has to take into account the latest possible version of available data, which will provide the most accurate information service. MIS have to be aware of the frequency of real-time data provision, i.e. frequency of the different versions.
M	Actors Involved	'Travel information provider's Public transport operators Car park operators Road maintenance operators Road network operators Toll operators Geographic information providers
M	Stakeholders	EU and national governments Urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services – Urban logistics (parking) – Traffic Management.
M	Assumptions	Availability of real –time data.. Expressed will to reach agreement between the different parties.
M	Identified standards (not exhaustive list)	None known.
M	Standardisation gaps identified	Standards for frequency of update and provision of real-time data.
	Recommended actions	To develop standards for frequency of update and provision of real-time data for MIS use.
O	Other information	



G.2.4.5 MIS-0005 MIS Actual Trip Plan Provision

	CEN TC278 PT1701 USE CASE	
M	**Use Case Name**	**MIS Actual Trip Plan Provision**
M	**Use Case reference /id**	**MIS-0005 v5 20151119**
M	Description	To compute trip plan options (i.e. spatial trip patterns and timing patterns) through the network, including detailed connection times and detailed guidance (i) either for making transfers between two services over a connection based on *actual information* *(ii)* (ii) or as navigation or modal change assistance *during the trip.* The trip planning action may take place before or during a trip. Guidance for travellers concerns the part from the origin to the first location of public transport (first mile), between two places of a connection or from the last point of public transport service to the destination (last mile). Navigation assistance for drivers is provided to give optimum routes, avoiding road incidents, find the best route according to weather conditions, find parking to continue the trip (P&R) using public transport (e.g. bus, coach, rail, etc.) or 'New Modes' (e.g. car /cycle sharing, etc.).
M	Scenario	This Use Case refers to step 5 in the MIS value chain.
M	Scope	Trip planning occurs as part of Travel Information provider system either on a request of a traveller/driver of another system (in the context of interconnected journey planning systems). Depending on the capabilities of the journey planning system, either: (iii) *actual data* may be the basis of trip plan calculation (real-time journey planning system), or *(iv) planned data accompanied by warnings/announcements of real-time events.* Trip plans provided are composed: (i) either by several alternative trip options (each option using a different mode) and/or (ii) by several inter-modal options. Optionally, trip patterns (i.e. the spatial component of a trip plan) can be represented on maps. *Guidance* may concern individuals transferring by foot or car drivers using on-board navigation systems during their trip. For car drivers this Use Case includes (see also UC MIS-0005-2): • information provision on the availability of P&R and on associated real time public transport (or interurban/long distance) options bringing him to his destination; • in the case of car-pooling services, the ability of a smartphone to communicate with the system on-board vehicle in order to continue driver guidance.
M	Actors Involved	'Travel information provider's Car park operators Road maintenance operators Road network operator Toll operators Geographic information providers

M	Stakeholders	EU and national governments Urban administrations Transport authorities Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services –Traffic Management – Urban Logistics
M	Assumptions	*For truly real-time journey planners (i.e. which take into account actual data regarding the transport service offer) it is assumed that the real-time events have been taken into account by the transport system and the actual transport offering has been re-calculated (real-time passing times, delays, deviations, etc.).* In planning a multi-leg journey plan through a network, a journey planning system takes into account the transfer time needed to interchange between services at an interchange point. Depending on the sophistication of the journey planning system and the availability of data: -the individual timings required for transfers between different stop areas or stop points within an interchange may be taken into account, *considering actual delays;* -the individual paths required for transfers within an interchange using specifically identified navigation paths and accessibility needs may be given, *taking into account real-time changes in the walking paths and accessibility (e.g. non availability of equipment);* -fare information may be provided for the different trip options. A successful outcome of the recommendations of UC MIS-0001, UC MIS-0002, UC MIS-0003-1, UC MIS-0003-2, UC MIS-0004-1.
M	Identified standards (not exhaustive list)	ITS standards ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. CEN TS 16157 DATEX II Parts 1 to 6. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). CEN TS 16614 Network and Timetable Exchange (NeTEx). EN12896 Transmodel v5.1. CEN EN15531 Part 1 to 4 Service interface for real-time information (SIRI) : real-time public transport data. CEN TS15531 Part 5 Service interface for real-time information (SIRI-FM). ISO 14827-1 Data interfaces between centres for transport information and control systems. ISO 15784 Data exchange involving roadside modules ISO communication.



M	Standardisation gaps identified	*Same lists as for UC MIS-0001, MIS-0002, MIS-0003, MIS-0003-1,MIS-0003-2, MIS-0004, MIS-0004-1, MIS-0005-1, MIS-0008 appl.y* **They are summarised below:** *Cf.*UC MIS-0001: 1. No reference model for network topology for 'New Modes' (car/cycle sharing areas, car-pooling areas, battery recharging places). 2. No reference model for service description for 'New Modes' (booking, fares, etc.). 3. No reference model for cycling network. 4. No standard exchange format for 'New Modes' planned data (topology, service description and fares). 5a. Lack of coherence of Transmodel (Fare Collection part) and NeTEx – part 3 (NeTEx requires new types of public transport fares (pay-as-you go, etc. and more explicit parameters for fares description and usage)). 5b Transmodel v5.1 Fare Collection part (validation/control data) (being the basis for information concerning black lists, account status, etc.). is not coherent with the already issued Transmodel v6 Part 1-2-3. 6. No unique model for infrastructure description, useful for instance for walking paths identification; there is an overlap GDF (guidance oriented) /INSPIRE (map oriented) in several areas: road, rail, waterway network, walking paths – to be checked the overlap other feature themes such as GDF administrative areas, named areas, etc.). 7. No unique model for parking places and parking fares (overlap DATEX/ Transmodel- NeTEx). 8. Lack of standard data exchange profiles for data retrieval (according to end-user (traveller/driver/travel information system) need. *Cf.*. UC MIS-0002: 9. New requirements for real time public transport data (from SIRI (mostly situation exchange and facility management) are not taken into account in the standard reference model for public transport (Transmodel v5). 10. EBSF requirements for detailed control actions are not taken into account the reference data model for public transport (Transmodel V5.1). 11. No standard physical UML model for Transmodel real-time data (SIRI standard concerns messaging and is an XML implementation). 12. DATEX overlaps with parts of Transmodel V5.1 real-time data domain (events, messages). 13. No standard model exists for 'New Modes' real-time data (place/vehicle availability, etc.). 14. No standard data exchange format for 'New Modes' real-time data Lack of standard continuous, multimodal and real-time location referencing in urban areas.

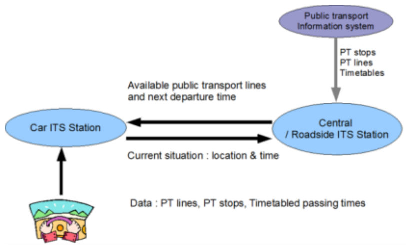
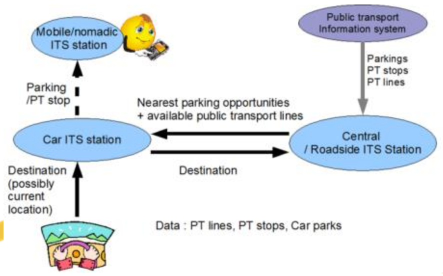
.	Standardisation gaps identified (continued)	*Cf.* UC MIS-0003: 15. Lack of standard and unambiguous IDs for multi-source data for use of 'Travel Information Provider' systems. This concerns data referring to the same concept (e.g. stops in one mobility area etc.) and has as consequence - in many situations - that when collated, data duplication occurs. 16. No standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence. *Cf.* UC MIS-0003-1: 17. No standard end-user (traveller/driver/travel information system) query model for standard criteria for trip plan delivery. 18. No standard APIs and/or query/ data exchange format for interconnection of Journey Planning Systems *in coherence with Transmodel* and NeTEx (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). *Cf.* UC MIS-0004: 19. No standard validation routines verifying conformity to data standards (e.g. to SIRI XML files), data completeness and coherence. and An additional gap (identified by the OPTICITIES project): 20. No standard for continuous, multimodal and real-time location referencing in urban areas. 21. No connection between GDF (infrastructure network data model) and Transmodel v6 (public transport network).
	Recommended actions	*Same recommendations as for UC MIS-0001, MIS-0002, MIS-0003, MIS-0003-1,,MIS-0003-2, MIS-0004, MIS-0004-1, MIS-0005-1, MIS-0008 apply* AND 1. To develop a standard for continuous, multimodal and real-time location referencing in urban areas. 2. To develop GDF 5.1 in order to connect and harmonise it with Transmodel V6 (Public Transport Network Topology).
O	Other information	

G.2.4.5.1 MIS-0005-1 MIS Dynamic Car-pooling

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Dynamic Car-pooling**
M	**Use Case reference /id**	**MIS-0005-1 v3 20151119**
M	Description	To bring in contact in real-time car drivers and travellers using a mobile phone and the on-board car system, in order to continue a common trip. Two main sub-Use Cases are to be considered: • to provide a car-pooling service to a traveller in real-time: the driver profile and related information is defined via a smartphone (or a computer) and this information is exchanged with the on board car system. When a possible traveller is identified, the information is displayed by the car system, the driver accepts (or refuses it) and then gets the corresponding routing information to pick-up the traveller and to carry him to the proper place. The exchange also says whether the vehicle is available, busy or full. • to address a request for a vehicle by a traveller for a specific destination: the traveller gets information whether a driver has accepted it and about the location and time he will be picked-up (and an estimated arrival time to destination).
M	Scenario	This Use Case refers to step 4 in the MIS value chain. It can also be part of a trip plan based on real-time information (MIS-0005).
M	Scope	Once the traveller is located, information between the traveller's mobile phone and the nearest available suitable car(s) their trip details are exchanged. This Use Case concerns mainly a common interface as regards: • information exchange between on-board units on individual cars and travellers' mobile phones; • information exchange between on-board units on individual cars and the car-pooling system (possibly through the mobile phone); • information exchange between the traveller's mobile phone and the car-pooling system; • information exchange between the driver's mobile phone (when not in the car) and the car-pooling system.
M	Actors Involved	Drivers Travellers 'Travel Information Provider's (for possible connexion with public transport and possible public transport leg in the traveller trip) Connected vehicles
M	Stakeholders	Automobile manufacturers Software suppliers Public transport authorities (for possible connexion with public transport and possible public transport leg in the traveller trip) EU and National governments Urban administrations Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	The car-pooling service is dedicated to be one part (leg) of the traveller's trip pattern (beginning, end or even middle). Therefore, all the public transport information (especially the real-time) is expected to be available on the

·		corresponding area. The car-pooling system is expected to be able to manage public transport data or to be connected to public transport services.
M	Identified standards (not exhaustive list)	ITS standards CEN TS 16157 DATEX II Parts 1 to 6. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN12896 Transmodel v5.1. CEN/TS 16614 Network and Timetable Exchange (NeTEx). CEN EN15531 Part 1 to 4 Service interface for real-time information (SIRI).
M	Standardisation gaps identified	1. Interfaces for car-pooling service.
	Recommended actions	1. To develop a standard interface between on-board equipment and mobile devices for dynamic car-pooling. 2. To develop a standard service interface between mobile devices and car-pooling back office system (neutral to the car-pooling algorithm itself).
O	Other information	

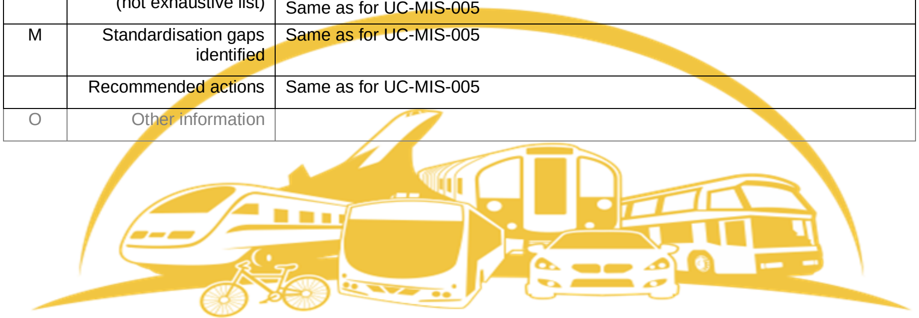
G.2.4.5.2 MIS-0005-2 **MIS Driver Guidance**

		CEN TC278 PT1701 USE CASE
M	**Use Case Name**	**MIS Driver Guidance**
M	**Use Case reference /id**	**MIS-0005-2 v3 20151124**
M	Description	To provide assistance regarding the optimal route and information on public transport availability in the driver's vicinity.
M	Scenario	This Use Case refers mainly to step 5 as the most successful information and guidance is provided using real-time data. If only planned data is taken into account, this may reduce the driver's confidence. This Use Case is particularly useful when there are incidents on the route. Scenario 1: Once a driver is located, passive information is provided on the availability of public transport services in the vicinity of the driver.  Public transport Information system PT stops PT lines Timetables Available public transport lines and next departure time Car ITS Station Central / Roadside ITS Station Current situation : location & time Data : PT lines, PT stops, Timetabled passing times Scenario 2: Once the driver is located, not only the availability of public transport to the driver's destination is provided (nearest stop, line(s) and next departure times to his destination), but also the possibility of using a park and ride service together with information on the availability of spaces. In this case, the driver is guided to the car park and from the car park to the public transport stop.  Mobile/nomadic ITS station Public transport Information system Parkings PT stops PT lines Parking /PT stop Nearest parking opportunities + available public transport lines Car ITS station Central / Roadside ITS Station Destination (possibly current location) Destination Data : PT lines, PT stops, Car parks
M	Scope	This Use Case is primarily aimed at private car drivers. It may be seen in connection to UC MIS-0003-1 "Scheduled Trip Plan Provision" or UC MIS-0005 "Actual Trip Plan Provision" (i.e. in cases when the origin and the destination of the trip is known) but such assistance may be provided to drivers at any point of the trip. If the final destination is known, scenario 2 is possible. For this Use Case the connection between the road network data and public transport network data is necessary in order to find the available public transport service and to visualise information on a map.

M	Actors Involved	'Travel Information Provider's, car park operators, road maintenance operators, road network operators, geographic information providers.
M	Stakeholders	Car and equipment manufacturers software suppliers public transport authorities (enabler of the connection between central/roadside station and the 'travel information provider's) EU and National governments Urban Administrations drivers.
M	MIS / TM / UL	MIS – TM (traffic and incidents) – UL (parking)
M	Assumptions	Availability of (real-time) public transport information and links to the road network data.
M	Identified standards (not exhaustive list)	EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN12896 Transmodel v5.1. CEN/TS 16614 Network and Timetable Exchange (NeTEx). CEN EN15531 Part 1 to 4 Service interface for real-time information (SIRI). ISO 14827-1 Data interfaces between centres for transport information and control systems. ISO 15784 Data exchange involving roadside modules ISO communication. ISO 14825 Geographic Data Files 5.0 (GDF). ISO/EN 14819-3 Traffic and travel information (TTI) TTI messages via traffic message coding - part 3 location referencing for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT C. ISO/TS 21219 Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) - part 21,22, 23. CEN/TS 16157-2 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing. CEN/TS 16157-3 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 3: Situation publication. CEN/TS 16157-6 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 6: Parking publication. ISO 17572-3 Intelligent transport systems (ITS) -- Location referencing for geographic databases – Parts 1,2 and 3. ISO 19147:2015 Geographic information -- Transfer Nodes. ISO 6709 Standard representation of geographic point location by coordinates. ISO/TS 1910XX Geographic information.
M	Standardisation gaps identified	1. GDF v5.0 is currently being extended to cover the connection between public transport reference data model (Transmodel v6) and GDF data model is drafted, not finalised. This is planned to be achieved in GDF 5.1. 2. GDF has not been updated as regards data exchange format for v5.1. 3. Links between road data exchanged with DATEX II and Transmodel have to be established.
	Recommended actions	1. To develop GDF 5.1 data model covering the connection between Transmodel and GDF 2. To develop the updated data exchange format aligned with GDF V5.1 data model. 3. To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4)
O	Other information	This UC concerns activities of ISO TC204 WG3 (Geographic Data Bases).

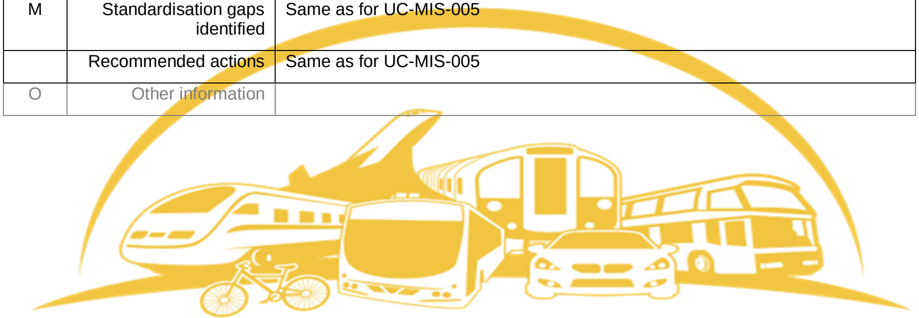
G.2.4.5.3 MIS-0005-3 MIS Car Sharing

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Car Sharing**
M	**Use Case reference /id**	**MIS-0005-3 v1 20151202**
M	Description	To inform travellers of the availability of car-pools and location of car-sharing locations. The location can be where the car was left after its previous location or in a designated area.
M	Scenario	This Use Case refers to step 4 in the MIS value chain. It can also be part of a trip plan based on real-time information (MIS UC-0005). A traveller arrives in an urban area by other modes or is already present in the urban area and wishes to use a car-pool. By request, Information of suitable vehicles and the nearest location to either the traveller's location or to an interchange will be given.
M	Scope	This UC is limited to the collection of car pool status data and providing it on request to travellers. The main impact of this new mode will be that provision must be made in the data models for the car-sharing data. This UC does not cover the contractual arrangements or financial transactions beyond the collection and storage of the arrangements to act as information to the traveller.
M	Actors Involved	Drivers Travellers 'Travel Information Provider's (for possible connexion with public transport and possible public transport leg in the traveller trip) Connected vehicles
M	Stakeholders	Car-pool suppliers Software suppliers Public transport authorities (for possible connexion with public transport and possible public transport leg in the traveller trip) EU and National Governments Urban administrations Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	The car sharing provider is prepared to share information into a MIS.
M	Identified standards (not exhaustive list)	ITS standards Same as for UC-MIS-005
M	Standardisation gaps identified	Same as for UC-MIS-005
	Recommended actions	Same as for UC-MIS-005
O	Other information	



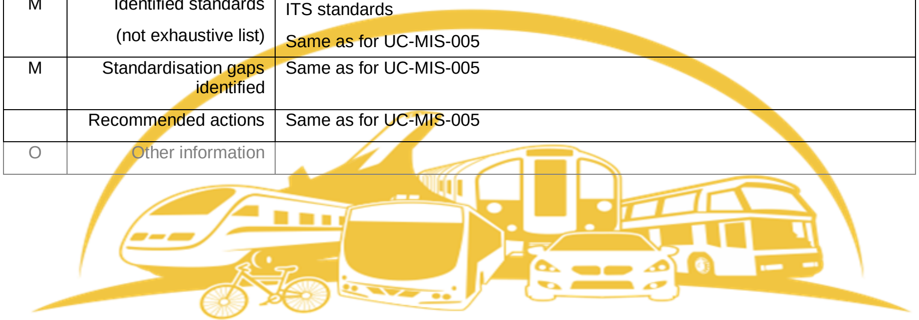
G.2.4.5.4 MIS-0005-4 MIS bicycle Sharing

	CEN TC278 PT1701 USE CASE	
M	**Use Case Name**	**MIS Bicycle Sharing**
M	**Use Case reference /id**	**MIS-0005-4 v1 20151202**
M	Description	To inform travellers of the availability of pooled bicycles and the location of bicycle-sharing locations. The location will be in a designated area.
M	Scenario	This Use Case refers to step 4 in the MIS value chain. It can also be part of a trip plan based on real-time information (MIS UC-0005). A traveller arrives in an urban area by other modes or is already present in the urban area and wishes to use a pooled bicycle. By request, Information of an available bicycles and the nearest location to either the traveller's location or to an interchange will be given.
M	Scope	This UC is limited to the collection of bicycle pool status data and providing it on request to travellers. The main impact of this new mode will be that provision must be made in the data models for the bicycle-sharing data. This UC does not cover the contractual arrangements or financial transactions beyond the collection and storage of the arrangements to act as information to the traveller.
M	Actors Involved	Drivers Travellers 'Travel Information Provider's (for possible connexion with public transport and possible public transport leg in the traveller trip) Connected vehicles
M	Stakeholders	Bicycle pool suppliers Software suppliers Public transport authorities (for possible connexion with public transport and possible public transport leg in the traveller trip) EU and National governments Urban administrations Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	The bicycle-sharing provider is prepared to share information into a MIS.
M	Identified standards (not exhaustive list)	ITS standards Same as for UC-MIS-005
M	Standardisation gaps identified	Same as for UC-MIS-005
	Recommended actions	Same as for UC-MIS-005
O	Other information	



G.2.4.5.5 MIS-0005-5 MIS Demand Responsive Systems

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Demand Responsive Systems**
M	**Use Case reference /id**	**MIS-0005-5 v1 20151202**
M	Description	To inform travellers of the availability of on-demand transport and their location. Additionally, the destination of available transport could be made available so that journeys could be shared for cost savings and environmental benefits.
M	Scenario	This Use Case refers to step 4 in the MIS value chain. It can also be part of a trip plan based on real-time information (MIS UC-0005). A traveller arrives in an urban area by other modes or is already present in the urban area and wishes to use an on-demand transport mode. By request, Information of suitable transport and the nearest pickup location to either the traveller's location or to an interchange will be given.
M	Scope	This UC is limited to the collection of on-demand transport status data and providing it on request to travellers. The main impact of this new mode will be that provision must be made in the data models for the on-demand transport data. On demand transport can be on a number of modes, buses, minibuses, taxis etc. This UC does not cover the contractual arrangements or financial transactions beyond the collection and storage of the arrangements to act as information to the traveller.
M	Actors Involved	Drivers Travellers 'Travel Information Provider's (for possible connexion with public transport and possible public transport leg in the traveller trip) Connected vehicles
M	Stakeholders	Car-pool suppliers Software suppliers public transport authorities (for possible connexion with public transport and possible public transport leg in the traveller trip) EU and National governments Urban administrations Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	The on-demand transport provider is prepared to share information into a MIS.
M	Identified standards (not exhaustive list)	ITS standards Same as for UC-MIS-005
M	Standardisation gaps identified	Same as for UC-MIS-005
	Recommended actions	Same as for UC-MIS-005
O	Other information	



G.2.4.6 MIS-0006 MIS Information Structuring

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Information Structuring**
M	**Use Case reference /id**	**MIS-0006 v4 20151119**
M	Description	To bring together all the information available and meld them into a value added service to the end-user.
M	Scenario	Refers to step 6 in the value chain: information provided by data processing becomes the basis for the dissemination to the end-user.
M	Scope	This concerns the assembly of information into a format which is suitable for dissemination via a number of media to a number of types of display devices. Information concerned is for example: trip plan (trip pattern and timing information, routing through the road network, stop-centric planned and real-time timetables, traveller messages on special events, etc. The scope includes pre-trip and on-trip messaging. In the context of public transport, this Use Case concerns the problem of how to avoid to provide to end-users biased ranked solutions (possibly eliminating some or giving to some of them a high priority).
M	Actors Involved	Freight shippers Geographic information providers Mobility service providers Public transport operators Traveller assistance providers 'travel information provider's Trip planning providers
M	Stakeholders	EU and National governments Urban Administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Travel Services
M	Assumptions	All the data is in a form where it can be amalgamated seamlessly.
M	Identified standards (not exhaustive list)	ISO EN 14819 RDS-ALERT C parts 1 -3. ISO TS 18234 -5 TPEG Public Transport Information (PTI) application . ISO TS 21219 TPEG2 Parts 1-25. CEN TS 16157 DATEX II Parts 1 to 6. EN 12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN 12896 Transmodel v5.1. CEN/TS 16614 Network and Timetable Exchange (NeTEx). EN15531 Part 1 to 4 Service interface for real-time information (SIRI) .
M	Standardisation gaps identified	Information provision referring to UC- MIS-0005-1 and UC- MIS-0005-1 does not have to be partial nor biased: there is no standard as regards the number of trip options to be provided, nor criteria as regards trip options' characteristics if competitive options are possible,
	Recommended actions	To develop a standard specification of the characteristics of trip options and modal choices to be provided by trip planners.
O	Other information	

G.2.4.7 MIS-0007 MIS Information Dissemination

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Information Dissemination**
M	**Use Case reference /id**	**MIS-0007 v3 20151118**
M	Description	To disseminate Urban Multimodal Traveller Information to a variety of media and locations.
M	Scenario	This Use Case refers to stage 7 in the MIS value chain.
M	Scope	This concerns the dissemination of structured urban multimodal traveller information to a variety of display media and locations. The information can be disseminated continuously or on demand. Output types may be metadata, text, speech, maps. The scope includes pre-trip and on-trip messaging.
M	Actors Involved	Telecoms providers Freight shippers Geographic information providers Mobility service providers Public transport operators Traveller assistance providers ‘travel information provider’s Trip planning providers Location reference service Vehicle Connected vehicle Driver Other travel providers Traveller
M	Stakeholders	EU and National governments Urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Travel Services
M	Assumptions	The location referencing at the originator can be understood at the receiving party.
M	Identified standards (not exhaustive list)	*ITS standards* CEN TS 16157 DATEX II Parts 1 to 6. CEN EN12896 Transmodel. CEN/TS 15531 SIRI -Service interface for real-time information relating to public transport operations. ISO 14827-1 Data interfaces between centres for transport information and control systems. ISO 15784 Data exchange involving roadside modules ISO communication. ISO EN 14819 RDS-ALERT C parts 1 -3. ISO TS 18234- TPEG1 – Public Transport Information. ISO TS 21219 TPEG2 Parts 1-25.
M	Standardisation gaps identified	No standard for continuous, multimodal and real-time location referencing in urban areas.
	Recommended actions	To develop a standard for continuous, multimodal and real-time location referencing in urban areas.
O	Other information	

G.2.4.8 MIS-0008 MIS Query Structuring

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Query Structuring**
M	**Use Case reference /id**	**MIS-0008 v3 20151118**
M	Description	Queries of end-users (drivers/travellers), Information providers are structured requests. Requests for multi-modal Information are based on several criteria that allow information processing activities to retrieve and/or process information so that the user gets the answer according to his expectations. The criteria may refer ➢ to topology-related concepts like ‘origin/destination’, a specific location (e.g. stop point), line, etc.; ➢ to time-related concepts, i.e. timetable, etc.; ➢ to information filtering criteria referring to fare, mode, etc. (such as: ‘lowest fare’, ‘only bus’, ‘shortest walking’, etc.). Different types of queries that are possible, each may be further characterised by a range of further parameters (to allow retrieval of the right information from data repositories or ask for information from other travel information systems).
M	Scenario	This Use Case refers to step 8 in the MIS value chain. It is assumed that a query is addressed explicitly or implicitly (for passive information provision).
M	Scope	The objective is to clearly structure possible queries to allow an automatic processing, e.g. for the specification/implementation of end-user HMI or in the case of the interconnection of Travel Information systems queries may be automatically coded by one system and decoded by another.
M	Actors Involved	Telecoms providers Freight shippers Geographic information providers Mobility service providers Public transport operators Traveller assistance providers ‘travel information provider’s Trip planning providers Location reference service Vehicle Connected vehicle Driver Other travel providers Traveller
M	Stakeholders	EU and National governments Urban Administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Travel Services
M	Assumptions	End-user addresses a query to a Multimodal Information system

M	Identified standards (not exhaustive list)	ITS standards EN12896 (Transmodel v5.1). CEN TS16614-3 (NeTEx –Part 3: Fare Exchange) / informative annex.
M	Standardisation gaps identified	1) No agreed profiles for formatting user queries to a trip planning and information service. 2) No agreed methodology for real-time location referencing in urban areas.
	Recommended actions	1. To develop Transmodel v6- Part 6: Passenger Information) to take into account more complex queries and filters as requested by NeTEx -informative annex. 2. To develop a standard for continuous, multimodal and real-time location referencing in urban areas.
O	Other information	

G.2.4.9 MIS-0000 User Support

CEN TC278 PT1701		
M	**Use Case Name**	**User Support**
M	**Use Case reference /id**	**MIS-0000 v2 20151125**
M	Description	CEN has developed NeTEx and SIRI, both based on Transmodel, to provide a standardised way of exchanging data between many of the information systems involved in public transport (passenger information, AVMS, scheduling, fare management and analysis and design systems), paving the way to cost effective, reusable, scalable, modularised and sustainable public transport systems in an approach that is compatible with continuing open competition and innovation in digital technology. NeTEx and SIRI specify communication protocols based on open technologies (XML, XSD, UML, SOAP and REST) and enable operators and organizing authorities to represent public transport data anywhere in Europe using common formats, standard rules, and uniform protocols. Transmodel provides a global data model, on which SIRI and NeTEx are based, covering all the business fields of public transport. CEN working groups (TC278-WG3-SG7 and SG9) developed NeTEx and SIRI, both based on the results of TC278-WG3-SG4; their work ends once the specification document for the standard is available. This is mainly the situation now as SIRI has been adopted as EN and NeTEx has just started its TS phase (for 3 to 6 years). However, NeTEx and SIRI comprise not only the standardisation document, but also a set of technical artefacts (mainly XSD, WSDL schema (for NeTEx and SIRI) and accompanying UML files for NeTEx, SIRI and Transmodel) that are required to implement the standard exchange protocol and which will be used by developers as software artefacts. Developers typically will need some support in using these products. Furthermore, since the standards cover a large and complex subject area, advice on best practice, available technologies and working examples are needed to facilitate uptake and reduce the costs to implementers. SIRI 1.0 was released as a TS in 2006, and the ten years of its widespread use have shown that the support of these technical files is essential and critical.
M	Scenario	
M	Scope	In order to support the deployment of standards and provide best practices to implement them, the following are the main aspects that are helpful for using the technical artefacts: ➢ Technical artefacts maintenance — To support the tuning of XSD and WSDL for specific tools (each technical operating system like Java, Ruby, .NET, Apple, IOS, Android, etc. may have some specific requirements requiring some tuning and optimisation of the XSD without changing the messages themselves); the bindings of a specific language can also be shared informally; — To update and possibly debug the technical artefacts when necessary (technical files can be updated or corrected without implying any change to the standard itself); ➢ Validation tools and test platform — To provide validation tools: validation of conformance is one of the biggest issues for developers (ensuring an implementation is inputting or outputting data in a standard format) and an open-source validation tool is probably the best way to solve such issues; users can then validate their product against a common benchmark, saving time and effort and ensuring consistency across different company offerings.

		— To provide validation platform hosting online the validation tools to allow an easy validation without the need to install any software; ➢ Technical expertise — To provide support for writing profiles: Implementations of standards typically implement only a subset of the standard to meet a particular business need and within a specific context of modes and region(s). A profile is used to define this subset, specifying which elements and name spaces are needed; such profiles need to be carefully defined; sharing profiles may also be a very good way to save time and money; — To share experience and best practices between developers and experts; — Provide teaching courses, training sessions and introductory material to help learn and using Transmodel, NeTEx and SIRI; — Initiate, maintain and publish possible updates of the standard to keep track of new needs, new requests, and possible corrections in order to facilitate the process of the renewal of the standards SIRI/NeTEx (or conversion to EN) and to guarantee coherence with other related standards (i.e. Transmodel – EN12896).
M	Actors Involved	See below
M	Stakeholders	UITP, CEN or the EU Commission, ERA - open to a wide range of stakeholders, such as authorities, software companies, start-ups, operators, consulting companies or educational institutions (universities, etc.).
M	MIS / TM / UL	Mainly MIS
M	Assumptions	-
M	Identified standards (not exhaustive list)	Mainly: NeTEx, SIRI, Transmodel
M	Standardisation gaps identified	No supporting organization for standards maintenance, dissemination, implementation.
	Recommended actions	To financially and institutionally support the creation and existence of an organisation (connected as much as possible to organisations such as UITP, CEN or the EU Commission, ERA, and open to a wide range of stakeholders, such as authorities, software companies, start-ups, operators, consulting companies or educational institutions (universities, etc.)) in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the deployment of these standards.
O	Other information	

G.3. MIS Gap and overlap analysis involving European and international SDOs and their relevant deliverables

G.3.1 MIS-0001 Gaps- MIS planned data retrieval

a) No reference model for network topology for 'New Modes' (car/cycle sharing areas, car-pooling areas, battery recharging places).

b) No reference model for service description for 'New Modes' (booking, fares, etc.).

c) No reference model for cycling network.

d) No standard exchange format for 'New Modes' planned data (topology, service description and fares).

e) Lack of coherence of Transmodel (Fare Collection part) and NeTEx – part 3 (NeTEx requires new types of public transport fares (pay-as-you go, etc. and more explicit parameters for fares description and usage)).

f) Transmodel v5.1 Fare Collection part (validation/control data) (being the basis for information concerning black lists, account status, etc.). is not coherent with the already issued Transmodel v6 Part 1-2-3.

g) No unique model for infrastructure description: there is an overlap - GDF (guidance oriented) /INSPIRE (map oriented) in several areas: road, rail, waterway network, walking paths – to be checked: the overlap other feature themes such as GDF administrative areas, named areas, etc.).

h) Lack of standard data exchange profiles for data retrieval (according to end-user (traveller/driver/travel information system) need): end-user queries may address specific types of data, e.g. stops in a certain zone, passing times at particular stop place or for a route, etc.; standard data exchange format is provided by standards like NeTEx, however, such data exchange formats define large data sets (e.g. the whole network topology).

i) The definition of particular "generic" profiles for data retrieval (i.e. limiting the exchanges to some subsets of data to be exchanged, such as for example stop places) facilitates the usage of complex standards.

j) Precise parameters definition for data exchanges (i.a. for data retrieval), such as particular cardinalities or codes, often takes place between the partners involved in the exchanges. Publicly available parameters will ensure that data by a new user are accessible: such agreements are often not published.

G.3.2 MIS-0002 Gaps - MIS real-time data capture

a) Requirements for real time public transport data (from SIRI (mostly situation exchange and facility management) are not taken into account in the standard reference model for public transport (Transmodel v5.1).

b) EBSF requirements for detailed control actions are not taken into account the reference data model for Public Transport (Transmodel V5.1).

c) No standard physical UML model for Transmodel real-time data (SIRI standard concerns messaging and is an XML implementation): real-time data may be stored in a data base for use e.g. of verification routines and thus retrieved from a data repository. The existence of a physical data model for SIRI data facilitates specification and development of verification routines.

d) DATEX II overlaps with parts of Transmodel V5.1 real-time data domain (events, messages).

e) No standard model exists for ‘New Modes’ real-time data (car/ bicycle sharing availability, car-pooling options, etc.).

f) No standard data exchange format for ‘New Modes’ real-time data.

G.3.2.1 MIS-0002-1 Gaps - MIS operational raw data provision

a) Transmodel v5.1 has yet to be updated with new requirements as regards raw data needs for the Study and Control.

b) No standard to support data exchange for the ‘study and control’ stage.

G.3.3 MIS-0003 Gaps - MIS planned data processing

a) Lack of standard and unambiguous IDs for multi-source data for use of ‘Travel Information Provider’ systems. This concerns data referring to the same concept (e.g. stops in one mobility area etc.) and has as consequence, in many situations, that when collated, data duplication or confusion occurs.

b) No standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence.

G.3.3.1 MIS-0003-1 Gaps - MIS scheduled trip plan provision

a) This Use Case relies on UC MIS- 0001 & UC MIS-0003 and thus has the same gaps (no reference models for some modes, lack of profiles, ambiguous IDs and no validation compliance.

b) No standard end-user (traveller/driver/travel information system) query model for standard criteria for trip plan delivery.

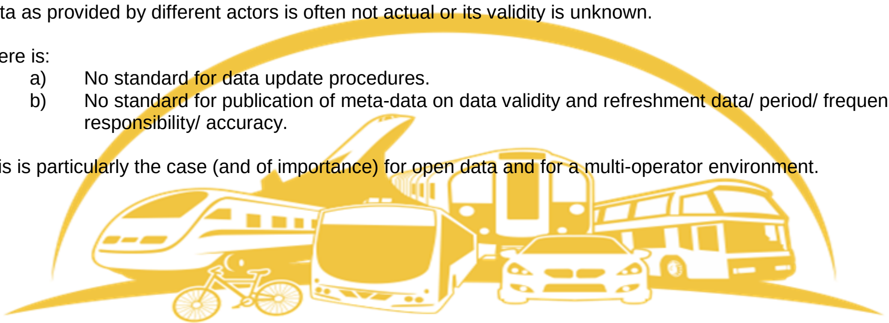
c) When several trip planners have to be interconnected (this is the case, for instance, when the end-user query is beyond the boundary of a single trip planner), a standard interface for the interconnection of trip planners is missing: this facilitates extensions of such system composed of many multimodal information providers.

G.3.3.2 MIS-0003-2 Gaps - MIS planned data updating

Data as provided by different actors is often not actual or its validity is unknown.

There is:
a) No standard for data update procedures.
b) No standard for publication of meta-data on data validity and refreshment data/ period/ frequency/ responsibility/ accuracy.

This is particularly the case (and of importance) for open data and for a multi-operator environment.



G.3.4 MIS-0004 - Gaps - MIS real-time data processing

Automated data validation routines verifying semantic conformity to data standards (e.g. to SIRI XML files) do not exist as a standard.

G.3.4.1 MIS-0004-1 GAPS - MIS real-time data updating

Standards for frequency of update and provision of real-time data.

G.3.5 MIS-0005 Gaps - MIS actual trip plan provision

Same lists as for UC MIS-0001, MIS-0002, MIS-0003, MIS-0003-1, MIS-0003-2, MIS-0004, MIS-0004-1, MIS-0005-1, MIS-0008 apply.

They are summarised below:

*Cf.*UC MIS-0001:

a) No reference model for network topology for ‘New Modes’ (car/cycle sharing areas, car-pooling areas, battery recharging places).

b) No reference model for service description for ‘New Modes’ (booking, fares, etc.).

c) No reference model for cycling network.

d) No standard exchange format for ‘New Modes’ planned data (topology, service description and fares).

e) Lack of coherence of Transmodel (Fare Collection part) and NeTEx – part 3 (NeTEx require new types of public transport fares (pay-as-you go, etc. and more explicit parameters for fares description and usage)).

f) Transmodel v5.1 ‘Fare Collection’ part (validation/control data) (being the basis for information concerning black lists, account status, etc.). is not coherent with the already issued Transmodel v6 Part 1-2-3.

g) No unique model for infrastructure description, useful for instance for walking paths identification; there is an overlap GDF (guidance oriented) /INSPIRE (map oriented) in several areas: road, rail, waterway network, walking paths – to be checked the overlap other feature themes such as GDF administrative areas, named areas, etc.).

h) No unique model for parking places and parking fares (overlap DATEX II/ Transmodel-NeTEx).

i) Lack of standard data exchange profiles for data retrieval (according to end-user (traveller/driver/travel information system) need.

Cf.. UC MIS-0002:

j) New requirements for real time public transport data (from SIRI (mostly situation exchange and facility management) are not taken into account in the standard reference model for public transport (Transmodel v5.).

k) EBSF requirements for detailed control actions are not taken into account the reference data model for public transport (Transmodel V5.1).

l) No standard physical UML model for Transmodel real-time data (SIRI standard concerns messaging and is an XML implementation).

m) DATEX overlaps with parts of Transmodel V5.1 real-time data domain (events, messages).

n) No standard model exists for ‘New Modes’ real-time data (place/vehicle availability, etc.).

o) No standard data exchange format for ‘New Modes’ real-time data.

b) Lack of standard continuous, multimodal and real-time location referencing in urban areas.

G.3.5.1 MIS-0005-1 Gaps - MIS dynamic car-pooling

Interfaces for car-pooling service.

G.3.5.2 MIS-0005-2 Gaps - MIS driver guidance

a) GDF v5.0 is currently being extended to cover the connection between the 'Public Transport Reference Data Model' (Transmodel v6) and GDF data model is drafted, not finalised. This is planned to be achieved in GDF 5.1.
b) GDF has not been updated as regards data exchange format for v5.1.
c) Links between road data exchanged with DATEX II and Transmodel have to be established.

G.3.6 MIS-0006 Gaps - MIS information structuring

Information provision referring to UC- MIS-0005-1 and UC- MIS-0005-1 has not to be partial nor biased: there is no standard as regards the number of trip options to be provided, nor criteria as regards trip options' characteristics if competitive options are possible.

G.3.7 MIS-0007 Gaps - MIS information dissemination

No standard for continuous, multimodal and real-time location referencing in urban areas.

G.3.8 MIS-0008 Gaps - MIS query structuring

a) No agreed profiles for formatting user queries to a trip planning and information service.
b) No agreed methodology for real-time location referencing in urban areas.

G.3.9 MIS-0000 Gaps - user support

No supporting organization for standards (in particular for MIS-related standards).

G.4 MIS Potential revision of existing standards, new standards development and international harmonisation tasks based on gap/overlap results

G.4.1 MIS planned data retrieval UC-MIS- 0001

To collect data about the planned status of the transport service offer for use in 'Travel Information Provider' systems.

Recommendations:

Rc_MI13- To develop a *standard reference data model* for network topology for 'New Modes' (car/cycle sharing areas, car-pooling areas, battery recharging places) in coherence with Transmodel V6 and GDF.

Rc_MI14- To develop a standard *reference data model* for service description for 'New Modes' (incl. booking, fares, etc.) in coherence with Transmodel V6.

Rc_MI15- To develop a *standard data model* for cycling network in coherence with Transmodel V6 and GDF.

Rc_MI16- To develop a *standard exchange format* for 'New Modes' planned data (topology, service description and fares).

Rc_MI03- *Standard update:* To develop Transmodel V6 – Part 5: 'Fare Management' (incl. validation and control part).

Rc_MI24- *Standard harmonisation:* To specify a unique solution for the models as developed by GDF and INSPIRE in overlapping areas: road, rail, waterway network, walking paths, administrative areas, named areas, etc.).

Rc_SM12- *Other action:* To develop a standard method (and possibly tool) for the development of data exchange profiles based on NeTEx (e.g. stop place profile based on NeTEx) useful in the context of travel information and associated *reference generic description* for local agreements referring to the profiles.

Rc_MI10- *Other action :* To develop several of the 25 most useful profiles based on NeTEx.

G.4.2 MIS real-time data capture UC-MIS- 0002

To capture real-time data provided by public transport, road network operations and other mobility services for use in 'Travel Information Provider' systems.

Recommendations:

Rc_MI02- *Standard update* To develop Transmodel v6 – Part 4: ''Operations Monitoring and Control', i.e. the update of Transmodel 'Operations Monitoring and Control' with the requirements of SIRI standard, EBSF project & align with DATEX II part 3 (situation: publication).

Rc_MI11- To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files).

Rc_MI17- *New standard development:* To develop a standard data model for 'New Modes' operational aspects (in coherence with Transmodel).

Rc_MI18- *New standard development:* To develop a standard data exchange format for each of the 'New Modes' real-time data (availability, booking etc.), coherent with SIRI in combination with DATEX II.

G.4.3 MIS operational raw data provision UC- MIS-0002-1

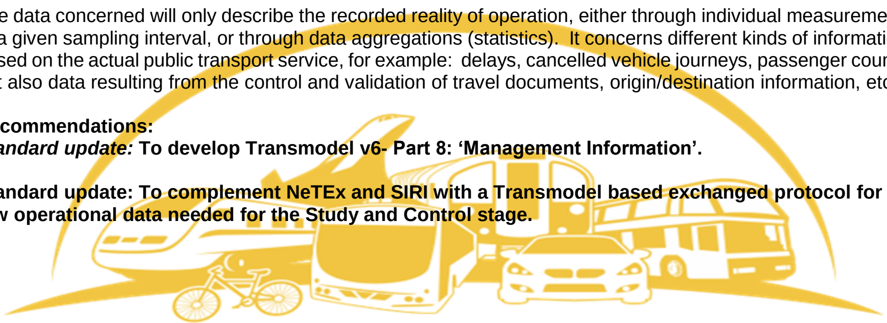
To provide the necessary public transport raw data for the *Study and Control* stage. This stage follows the operations stage, i.e. it is the time when operators and authorities review the history of actual operations. This stage may lead to improvements through operational changes, or an optimisation of strategic and tactical planning.

The data concerned will only describe the recorded reality of operation, either through individual measurements at a given sampling interval, or through data aggregations (statistics). It concerns different kinds of information, based on the actual public transport service, for example: delays, cancelled vehicle journeys, passenger counts, but also data resulting from the control and validation of travel documents, origin/destination information, etc.

Recommendations:

Rc_MI06- *Standard update:* To develop Transmodel v6- Part 8: 'Management Information'.

Rc_MI09- Standard update: To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw operational data needed for the Study and Control stage.



G.4.4 MIS planned data processing UC-MIS-0003

To collate, convert to a common standard format planned data representing the transport service offer and provide this for use in 'Travel Information Provider' systems. Multisource data as retrieved *(Cf.* UC MIS-0001) is not necessarily free of errors, inconsistencies and duplications and needs to be checked and validated according to predetermined criteria.

Recommendations:

Rc_MI21- ***New standard development:*** **To develop a standard specification for stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner or information service.**

Rc_MI26- ***New standard development:*** **To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence.**

G.4.5 MIS scheduled trip plan provision UC-MIS-0003-1

To compute trip plan options (i.e. spatial trip patterns and timing patterns) through the network, including detailed times and detailed guidance for making transfers between two services at an interchange.

Recommendations:

The same recommendations as for UC MIS- 0001, UC MIS-0003 & UC MIS-0003-2, UC MIS-0007, UC MIS-0008 apply, according to the modes taken into account by the Trip Planning function.

AND:

Rc_MI22- ***New standard development:*** **To develop standard APIs and/or query/ data exchange format for interconnection of journey planning systems in coherence with Transmodel v6 (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface).**

Rc_SM03- ***Other action:*** **To develop a unique access point for urban data repositories, in particular an urban meta-data registry.**

G.4.6 MIS planned data updating UC-MIS-0003-2

To define planned data update procedures. Planned data needs to be updated with a certain frequency to be operational and meaningful, e.g. roadworks may generate the necessity to close certain roads, public transport stops may be displaced for some time, etc. The data for use of multimodal information service has to be as timely as possible and the 'Travel Information Provider' system shall be provided with information about the update frequency and nature of the data.

Recommendations:

Rc_MI25- ***Standard update:*** **To develop standard data update procedures (for planned data for the usage of MIS) to be adopted in accordance to the existing standard (and adapted to the MIS context).**

Rc_MI28- ***New standard development:*** **To develop a standard for update frequency, timeliness of data for MIS use.**

Rc_MI29- ***New standard development:*** **To develop a standard for the publication of information referring to planned data (update frequency, responsibility, timeliness).**

Rc_MI30- ***New standard development*****: To define a standard for data accuracy criteria and publication referring to space and time data.**

G.4.7 MIS real-time data processing UC-MIS-0004

To collate, convert to a common standard format real-time data and provide this for use in ‘Travel Information Provider’ systems. Examples of data: road status, road works, weather conditions, incidents, alarms, etc.

Recommendations:
Same recommendations as for UC-MIS-0002 apply
AND
Rc_MI31- ***New standard development:*** **To develop standard validation procedures and routines for real–time data (for the usage of MIS) verification (completeness, coherence and compliance to standard formats where they exist).**

G.4.8 MIS real-time data updating UC-MIS-0004-1

To determine the update frequency and validity for real-time data dedicated to be used by MIS.

Recommendation:
Rc_MI32- ***New standard development:*** **To develop standards for frequency of update and provision of real-time data for MIS use.**

G.4.9 MIS Actual Trip Plan Provision UC-MIS-0005

To compute trip plan options (i.e. spatial trip patterns and timing patterns) through the network, including detailed *connection times* and detailed *guidance* .

(i) either for making transfers between two services over a connection based on *actual information;* or,

(ii) as navigation or modal change assistance *during the trip*. The trip planning action may take place before or during a trip.

Guidance for travellers concerns the part from the origin to the first location of public transport (first mile), between two places of a connection or from the last point of public transport service to the destination (last mile). Navigation assistance for drivers is provided to give optimum routes, avoiding road incidents, find the best route according to weather conditions, find parking to continue the trip (P&R) using public transport (e.g. bus, coach, rail, etc.) or ‘New Modes’ (e.g. car /cycle sharing, etc.).

Recommendation:
Same recommendations as for UC MIS-0001, UC-MIS-0002, UC-MIS-0003, UC-MIS-0003-1, UC-MIS-0003-2, UC-MIS-0004, UC-MIS-0004-1, UC-MIS-0005-1, UC-MIS-0005-2, UC-MIS-0007, UC-MIS-*0008 apply.*

G.4.10 MIS Dynamic Car-pooling UC- MIS-0005-1

To bring in contact in real-time car drivers and travellers using a mobile phone and the on-board car system, in order to continue a common trip.

Recommendations:
Rc_MI19- ***New standard development:*** **To develop a standard interface between on-board equipment and mobile devices for dynamic car-pooling.**

Rc_MI20- ***New standard development:* To develop a standard service interface between mobile devices and car-pooling back office system (neutral to the car-pooling algorithm itself).**

G.4.11 MIS Driver Guidance UC-MIS-0005-2

To provide assistance regarding the optimal route and information on public transport availability in the driver's vicinity.

Recommendations:

Rc_Gn02- ***Standard update:* To develop GDF 5.1 data model covering the connection between Transmodel and GDF.**

Rc_Gn02- ***Standard update:* To develop the updated data exchange format aligned with GDF V5.1 data model.**

Rc_MI08- **To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4) –*same as recommendation MI11-.***

G.4.12 MIS Information Structuring UC-MIS-0006

To bring together all the information available and meld them into a value added service to the end-user. This concerns the assembly of information into a format which is suitable for dissemination via a number of media to a number of types of display devices.

Information concerned is for example: trip plan (trip pattern and timing information, routing through the road network, stop-centric planned and real-time timetables, traveller messages on special events, etc.).

Recommendation:

Rc_MI23- ***New standard development:* To develop a standard a standard specification of the characteristics of trip options and modal choices to be provided by trip planners.**

G.4.12 MIS Information Dissemination UC-MIS-0007

To disseminate urban multimodal traveller information to a variety of media and locations.

Recommendation:

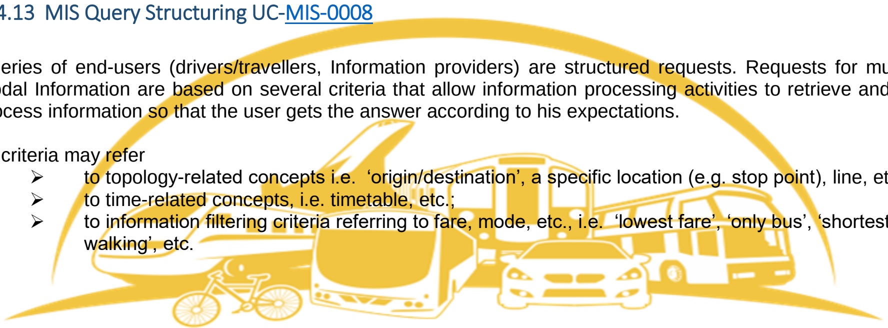
Rc_Gn12- ***Standard harmonisation:* To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards.**

G.4.13 MIS Query Structuring UC-MIS-0008

Queries of end-users (drivers/travellers, Information providers) are structured requests. Requests for multi-modal Information are based on several criteria that allow information processing activities to retrieve and/or process information so that the user gets the answer according to his expectations.

The criteria may refer

- to topology-related concepts i.e. 'origin/destination', a specific location (e.g. stop point), line, etc.;
- to time-related concepts, i.e. timetable, etc.;
- to information filtering criteria referring to fare, mode, etc., i.e. 'lowest fare', 'only bus', 'shortest walking', etc.



Different types of queries that are possible, each may be further characterised by a range of further parameters (to allow retrieval of the correct information from data repositories or to ask for information from other travel information systems.

Recommendations:
Same recommendations as for UC-MIS-0007 apply

Rc_MI04- ***Standard update:*** **To develop Transmodel v6- Part 6: 'Passenger Information', to take into account complex queries and filters as requested by NeTEx -informative annex.**

Rc_MI05- **To develop Transmodel v6-Part 7: Driver Management.**

G.4.14 User Support

To support the deployment of standards NeTEx/SIRI/Transmodel and to provide best practices to implement them (example, most commonly used tools, tools configuration, etc.), the following actions are necessary:

- technical artefacts maintenance;
- validation tools and test platform;
- technical expertise and teaching.

Recommendation:
Rc_SM13- ***Other actions :*** **To financially and institutionally support the creation and existence of an organisation (connected as much as possible to organisations such as UITP, CEN or the EU Commission, ERA, TISA, and open to a wide range of stakeholders, such as authorities, software companies, start-ups, operators, consulting companies or educational institutions (universities, etc.)) in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the deployment of these standards.**

G.5 MIS Roadmap with targeted deliverables and concrete actions to speed up deployment of Urban-ITS

See Annex P; Annex A, and 1.5 Executive Summary.

G.6 Funding issues

Without funding the extension of, and bringing up to date of Transmodel, will not proceed.

See Annex A.

Annex H Traffic Management (TM)

H.1 TM Objectives, summary and scope addressed

H.1.1 Traffic management: principles and historical evolvement

The traffic management discipline use systems and techniques in order to manage traffic behaviour (flows, speeds etc.). This involves an increasing range of on-street devices to detect real traffic conditions, a software based optimisation process (centralised or distributed) which may involve human interaction, and the distribution of control actions to signs, signals and barriers. The aim of the management process is to optimise a specific range of target performance criteria, which may be directly traffic related (e.g. delays) or indirect (e.g. air quality).

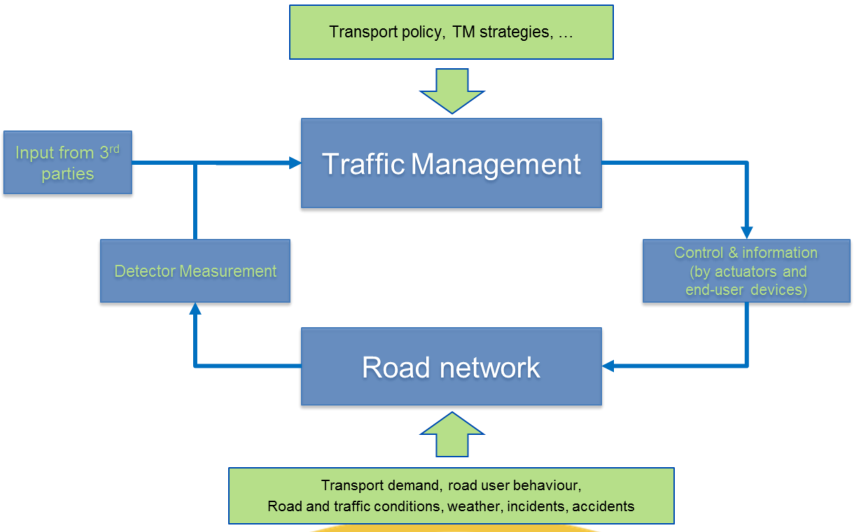

Transport policy, TM strategies, …
Input from 3rd parties
Traffic Management
Detector Measurement
Control & information (by actuators and end-user devices)
Road network
Transport demand, road user behaviour,
Road and traffic conditions, weather, incidents, accidents

Figure H–1: Traffic management control loop

Traffic Management (TM) as we know it today started with the advent of computers in the late 1960's and 1970's. It was one of original components of ITS, when this term was first used in the early 1990's. Since then developments in technology have enabled TM to evolve to include such things as alternative methods of road user detection, the provision of information to road users from devices at the roadside and better means of creating and implementing strategies to minimise traffic congestion, whilst giving priority to particular groups of road users such as public transport vehicles, emergency services vehicles, cyclists and pedestrians.

Under the pressure of steadily growing transport demand and traffic volume during this evolution, the main challenge was the need to integrate independent systems, for instance bus lane management using 'Selective Vehicle Detection' with traffic signals for access control.

Further integration challenges were:

- Integration of data and information of multiple data sources (i.e. different detection technologies and devices).
- Enhancement of originally rather simple traffic control methods to a comprehensive, powerful and (on the strategical and tactical level) working traffic management strategies using traffic control and traveller information to influence the road user in multiple ways,
- Exchange of data with external stakeholders, e.g. police, motorway operators, third party information service providers, public transport operators, or navigation systems providers
- Integration of upcoming new technologies like internet, GNSS, smart-phones and C-ITS.
- Integrating emerging technology developments (such as ANPR) into legacy proprietary TM systems.
- …..

H.1.2 Spheres of activities and problem scenarios

TM in urban areas is the responsibility of traffic management departments, as part of local authorities, responsible for the management of the urban road network in a safe, efficient and aligned with their local transport policies and priorities; — which is influenced by political and management decisions.

Typical overall goals are for example:

- Balance the needs of an urban multi-modal environment in real time and respond to high level policy decisions (as every urban environment will have differing political agendas on pedestrian/bicycle and bus priority, etc.);
- Development of an intelligent environment sensible network control as response to morning and evening peak congestions;
- Responding to traffic events and incidents in a managed and prepared way.

Typical overall TM objectives are for example:

- Safety objectives:
    - Enhance road safety;
    - Decrease of accidents by X% until XXXX;

- Efficiency objectives:
    - Reduce congestion by X% until XXXX;
    - Facilitate freight delivery and servicing;
    - Decrease parking pressure
    - Increase of public transport usage by X% until XXXX
    - …
- Environmental impact objectives:
    - Reduce energy consumption and traffic emissions
    - Decrease of car emissions by X% until XXXX
    - Increase attractiveness of public transport / Encourage modal shift
    - ....

Initial situations inducing and motivating traffic managers to act are so-called ‘problem’ scenarios. Three different spheres of activities can be distinguished: see Figure H–2.

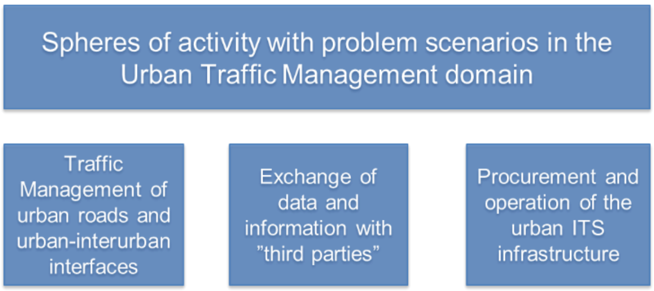

Spheres of activity with problem scenarios in the Urban Traffic Management domain
Traffic Management of urban roads and urban-interurban interfaces
Exchange of data and information with "third parties"
Procurement and operation of the urban ITS infrastructure

Figure H–2: Spheres of activities with standards related problems

Typical *traffic management oriented problem scenarios* are:

- **Efficiency problems** at traffic sensitive hot locations like urban-interurban interfaces, (signal-controlled) intersections, bridges, tunnels, central bus and railway stations … caused by
  - daily traffic congestion caused by commuter traffic (private cars and public transport vehicles) and indiscriminate HGV parking, bad weather conditions (rain, snow), etc.,
  - incidents/accidents (lane or road blockage/closures),
  - big events like soccer games, city marathons, concerts or other sports and entertainment events,
  - big business events like fairs, or political events like demonstrations
  - geographical/topology restrictions creating bottlenecks in the road network;
- **Daily safety problems** where vulnerable road users and vehicular traffic mix;
- **Emission problems** in part of the networks with high volumes of polluting vehicles and topological features that prevent proper air circulation in the atmosphere;
- ... .

A second sphere of activity, namely the obligation to provide traffic and traveller information to third parties (national access point) and many evolving developments (e.g. open data, C-ITS, sat-nav, pedestrian/cyclists detection) that are changing the nature of traditional traffic management and information, cause further *data and information provision problem scenarios*:

- **Obligation to develop and maintain the organisation to provide** traffic and traveller information (financial resources and processes) to cover the third parties and to be in compliance with the EU ITS directive (i.e. EU Directive: action a), b) and c)*).;

***** *It is important to mention, that currently the legal reach of actions B & C do not cover urban areas, even if it is expected that over time, cities will gradually move in their direction*

- **Demand to integrate TM-services** amongst themselves and with other mobility services (public transport, urban logistics…) and new fast evolving technologies (GNSS based navigation, smart phones, C-ITS, connected automated driving);
- ….. .

A third sphere of activity, namely the procurement and operation for the road and ITS infrastructure, causes additional *procurement and operational problem scenarios*:

- **Vendor lock-in** (big supplier companies aim to cover bigger parts of the ITS-portfolio of one customer completely by their own products. This situation leads to the effect of vendor lock-in when such logically independent subsystems of the IT-landscape are linked by proprietary communications interfaces). (See Annex C.7.6);
- **Supplier dependency**
  in terms of configuration and administration of field devices (intersection topology, signal plans, traffic adapted control algorithms…);

in terms of fault recovery and maintenance:

- **Procurement Specifications.** Unless there are very robust regional specifications, an Urban Administration, without detailed technical knowledge, may find it challenging to write procurement specifications for ITS, which in turn may result in vendor lock-in or systems which do not provide the intended benefit;
- …. .

H.1.3 Solution strategies and processes

To respond to the above mentioned problem scenarios, local authorities and traffic mangers provide a set of solution strategies and processes, which in general have been evolved and proven over years and which are based on local knowledge and experience, and based on policies and rules for road traffic and public (tax-financed) institutions (legislation affecting roads, bridges and road tunnels, public procurement law…).

Examples for such solution strategies and processes (high-level Use Cases) include:

- **Traffic management**
  - Management of day-to-day traffic flow (assuming no abnormal incidents),
  - Management of planned and unplanned events and incidents on the urban road network (including weather),
  - Operation of road tunnels safely (in line with legislation affecting road tunnels),
  - Access management (operation of an urban road charging scheme),
  - Management of impact of neighbouring traffic on urban road network (both urban and interurban),
  - …;
- **Data and information exchange and provision with external stakeholders**
  - Report on the performance of the road network (real time and non-real time),
  - Data, information and strategy exchange with external traffic management authorities i.e. police and motorway operators,
  - Data, information and strategy exchange with public and private service providers i.e. radio stations, public transport operators, navigation systems provider**s,**
  - **….;**
- **Procurement and maintenance of Traffic Management infrastructure**
  - consistent with open standards and non-vendor lock-in requirement)
- **… .**

H.2· TM Relevant business/service areas and applications identified with key stakeholders

H.2.1 Impact facilities of Traffic Management

Urban traffic management has largely evolved as a domain reserved for local authorities as the urban road operators to manage their urban road network.

With the benefit of modern ICT, primarily the internet and intelligent end-user devices, urban road operators have begun to additionally provide “traffic information services”, some of which has been instigated/developed in-house The evolving deregulation in public transport has stimulated additional contribution from the commercial sector.

Additionally, cooperation with neighbouring urban and interurban public road operators has become essential in the newly “connected” world where travellers expect their journey information to be seamless, and not have to worry about political boundaries.

Against this background, urban traffic management departments have two capabilities in order to manage their urban road network:

- act as self-determined road-operators exploiting their own facilities of control and route guidance; and,
- to be part of so-called ITS value chains in cooperation with external traffic management bodies and traveller information service providers.

The situation is depicted in the following Figure H–3.

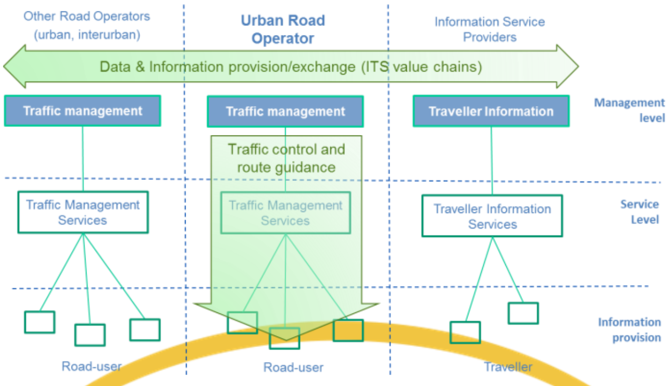

Other Road Operators
(urban, interurban)
Urban Road Operator
Information Service Providers
Data & Information provision/exchange (ITS value chains)
Traffic management
Traffic management
Traveller Information
Management level
Traffic control and route guidance
Traffic Management Services
Traffic Management Services
Traveller Information Services
Service Level
Information provision
Road-user
Road-user
Traveller

Figure H–3: Impact facilities of urban traffic management

H.2.2 TM infrastructure as a toolbox

Solution processes follow a similar course of actions, which roughly are:

- Problem recognition and analysis: measurement of traffic conditions, detection of events/incidents/accidents;
- Selection of an appropriate solution pattern (out of several): Scenario selection;
- Solution realization: Activation of measures and actions;
- Solution assessment and improvement: situation monitoring.

To support such solution processes, local authorities have developed and established an TM-infrastructure consisting logically of a bundle of so-called "*Instation*s", "*Outstation*s" and "*Controlled units*". The principle is shown in the following figure, H–4.

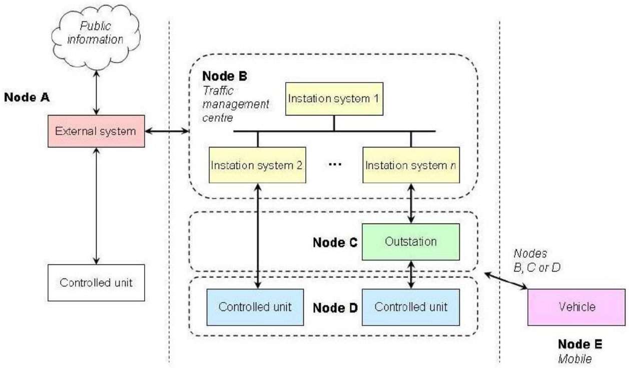

Public information
Node A
External system
Controlled unit
Node B
Traffic management centre
Instation system 1
Instation system 2
...
Instation system n
Node C
Outstation
Node D
Controlled unit
Controlled unit
Nodes B, C or D
Vehicle
Node E
Mobile

Figure H–4: Logical reference model for a TM-infrastructure (source: UTMC)

The following figure, H–5, shows the generalized OTS/OCIT-reference model as an example for such a logical reference model:

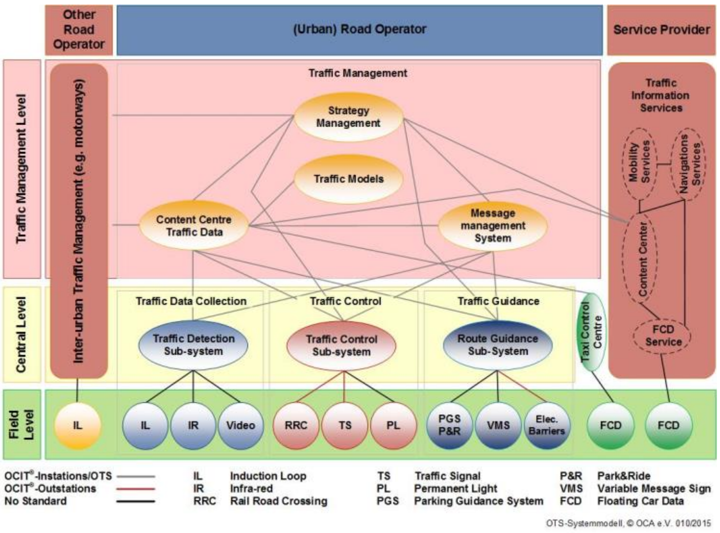

Other Road Operator
(Urban) Road Operator
Service Provider
Traffic Management Level
Central Level
Field Level
Inter-urban Traffic Management (e.g. motorways)
Traffic Management
Strategy Management
Traffic Models
Content Centre Traffic Data
Message management System
Traffic Information Services
Mobility Services
Navigations Services
Content Center
FCD Service
Traffic Data Collection
Traffic Control
Traffic Guidance
Traffic Detection Sub-system
Traffic Control Sub-system
Route Guidance Sub-System
Taxi Control Centre
IL
IL
IR
Video
RRC
TS
PL
PGS P&R
VMS
Elec. Barriers
FCD
FCD
OCIT®-Instations/OTS
OCIT®-Outstations
No Standard
IL Induction Loop
IR Infra-red
RRC Rail Road Crossing
TS Traffic Signal
PL Permanent Light
PGS Parking Guidance System
P&R Park&Ride
VMS Variable Message Sign
FCD Floating Car Data
OTS-Systemmodell, © OCA e.V. 010/2015

Figure H–5: The German OTS/OCIT-reference model for a TM-infrastructure (source: OCA)

The model divides the whole ITS-Traffic Management domain in three ITS-actor-domains:

- In the middle the “urban road operator” domain, which is depicted with a set of tools/functionalities that are used for the management of the urban domain;
- On the left side the domain of “Other Road Operators”, this can be other urban but also inter-urban road operators. Inter-urban road operators in Germany have their own ITS-reference model, (which is not depicted here);
- On the right side the domain of “service providers”, which can be many and different i.e. public transport-operators, public or private traveller information service providers, navigation system providers…. .

In addition, Information service providers have own ITS-reference models, (which are not depicted in the figure above).

From top to bottom the model shows three levels of functionalities:

- **Traffic Management** (*Top*) level:
  - **Strategy management**: Provision of core functions for the application of commonly agreed traffic management strategies with impact on the urban road network,
  - which is supported by:
    - **Content centre traffic data**: Acquisition, integration & fusion, processing, und storing (and if necessary archiving) of all traffic status describing data and information in a central database as well as quality assured provision of these information for the use by other services,
    - **Traffic models**: Determination of the current traffic state for all sections of the urban road network and provision of Information for other services of the urban traffic management, i.e. for the visualization of urban traffic conditions,

  - **Operational message management:** Acquisition, visualization, storing (if necessary also archiving) and documentation of technical error and operational system status messages at a central location/database of urban traffic management, provision of appropriate data services for other services and for a centrally organized fault clearance management,

    (and which provides interfaces to the inter-urban road operator and to public and private traffic and traveller information service providers,)
  - **Urban –** interurban **strategy management**: Provision of core functions for the application of commonly agreed traffic management strategies with impact on the urban-interurban interface road network,
  - **Urban road** operator **– private service providers interface**: Provision of information of traffic information and traffic management strategies for the use by private service and navigation system providers.

- **Traffic Monitoring and Control** level (*Centre*) which consists of sub-systems/applications for the following three standard application domains:
  - **Traffic detection sub-system:** Management and operation of traffic detection applications (based on different detection methods like loops, radar, infrared…) with the goal to collect and aggregate traffic data and information in order to provide data services for manifold data services,
  - **Traffic control sub-system:** Management and operation of the urban signal control system with the goal of monitoring and control of traffic light signals as well as the provision of traffic data and operational information,
  - **Route guidance sub-system:** Management and operation of variable message signs (parking, park & ride, route guidance) with the goal to influence the choice of route of private cars in the urban network.
- **Field** level (*Bottom*) which consists of field devices providing raw sensor data or using the outputs from the centre layer to control field devices (VMS, signals etc.);
  - *Instation* to roadside communications,
  - *Outstation* devices, to interface between the communications/*instation* and the field sensors/devices,
  - *Controlled units*: VMS, signal controllers, loop detectors etc.

H.2.3 Use Cases as a tool to describe the business in the TM-domain

Uses cases for the traffic management domain are provided below. These are used to identify problems in TM ITS and those especially caused by missing or incomplete Standards (standardisation gaps) and recommendations made to rectify the situation.

Use Cases can be defined on different levels and can be interlaced. In respect of TM use-cases in the pre-study two levels of Use Cases are considered~~:~~

- High level uses cases, which describe the course of action on traffic management level;
- Second level uses cases, which describe the course of action on the Traffic management service level.

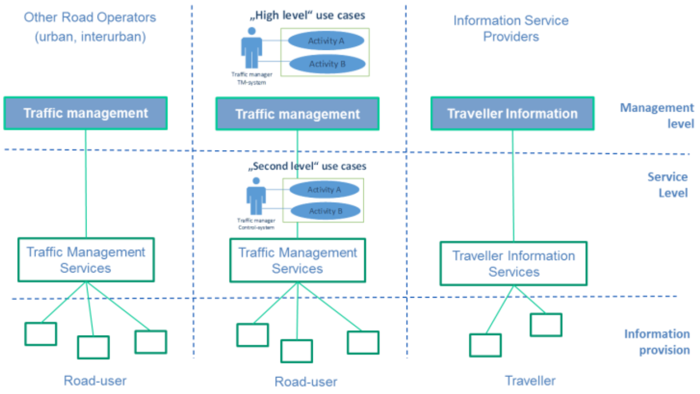

Other Road Operators
(urban, interurban)
„High level" use cases
Activity A
Activity B
Traffic manager
TM-system
Information Service
Providers
Traffic management
Traffic management
Traveller Information
Management
level
„Second level" use cases
Activity A
Activity B
Traffic manager
Control-system
Service
Level
Traffic Management
Services
Traffic Management
Services
Traveller Information
Services
Information
provision
Road-user
Road-user
Traveller

Figure H–6: Use Case levels in Traffic management

((Simplified) example**: TM-strategy -Traffic management plan (TMP) selection and deployment**

- Step 1: the traffic manager monitors the traffic conditions on an urban road network using the HMI of his traffic management system and which are based on three downstream second level Use Cases “Threshold monitoring (LoS monitoring)”, “Aggregation of traffic volume and speed” and “Aggregation of traffic volume and speed”;
- Step 2: the traffic management HMI indicates that the morning peak threshold has been exceeded on that link;
- Step 3: The traffic manager selects and activates the morning peak strategy which is automatically realized based on four downstream second level Use Cases “Change signal plans from ‘night program’ to ‘morning peak’”, “Change signal plan from 1 to 2” and “Change VMS indication from ‘void’ to ‘morning peak’”, “TMP dissemination to interurban traffic managers, public transport managers and private service providers”.

The Use Case (with second level Use Cases) described above is depicted below, but without the second level Use Cases for third party data exchanges (for clarity).

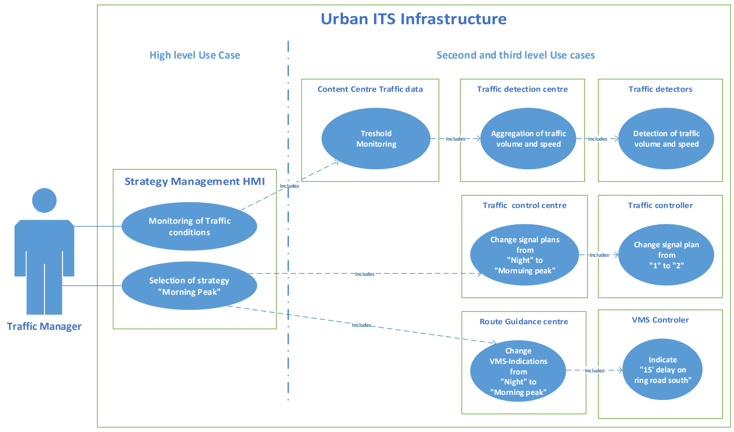

Urban ITS Infrastructure
High level Use Case
Seceond and third level Use cases
Content Centre Traffic data
Treshold Monitoring
Traffic detection centre
Aggregation of traffic volume and speed
Traffic detectors
Detection of traffic volume and speed
Includes
Includes
Strategy Management HMI
Includes
Monitoring of Traffic conditions
Selection of strategy "Morning Peak"
Traffic control centre
Change signal plans from "Night" to "Mornuing peak"
Traffic controller
Change signal plan from "1" to "2"
Includes
Includes
Traffic Manager
Includes
Route Guidance centre
Change VMS-Indications from "Night" to "Morning peak"
VMS Controler
Indicate "15' delay on ring road south"
Includes

Figure H–7: Use Case example: TM strategy (TMP) selection and deployment

H.2.4 TM process model as a reference model for TM Use Cases

The term “Intelligent Transport Systems” is defined as *“transport systems in which advanced information, communication, sensor and control technologies, including the Internet, are applied to increase safety, sustainability, efficiency, and comfort”* – meaning, in the context of TM, information and knowledge that has been gained by the collection, processing and exploitation of data. Hence a pivotal component for the exploitation of ITS benefits is an adequate information logistics, that means the organisation, management, deployment and optimisation of information flows along ITS process chains.

For the purpose of this pre-study, the following TM process chain reference model is proposed:

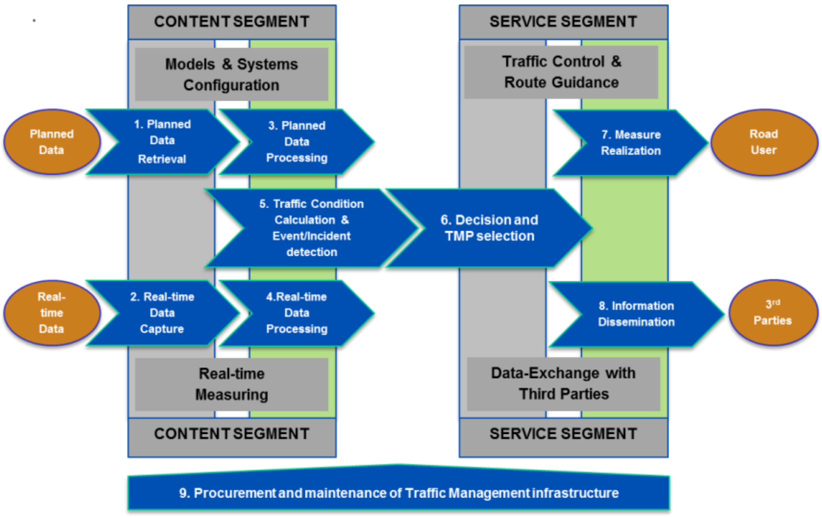

CONTENT SEGMENT
Models & Systems Configuration
Planned Data
1. Planned Data Retrieval
3. Planned Data Processing
5. Traffic Condition Calculation & Event/Incident detection
Real-time Data
2. Real-time Data Capture
4.Real-time Data Processing
Real-time Measuring
CONTENT SEGMENT
SERVICE SEGMENT
Traffic Control & Route Guidance
7. Measure Realization
Road User
6. Decision and TMP selection
8. Information Dissemination
3rd Parties
Data-Exchange with Third Parties
SERVICE SEGMENT
9. Procurement and maintenance of Traffic Management infrastructure

Figure H–8: TM process chain (Pre-study view)

This model consists of four major parts:

- On the left side the off- and on-line data capturing and processing is depicted. Common output and result of both planning data and in real-time measured/collected data is an image of current traffic conditions and planned and unplanned events and incidents;
- In the middle part of the picture a decision section is depicted - representative of a manual or automatic functionality which decides about what the reaction should be on the result of the left side process. This decision includes neighbouring authorities/bodies and their information about the current situation;
- On the right side of the picture, activities are shown which result of the decisions made (red arrow). One part of the results are measures in terms of traffic control and route guidance (parking guidance, re-rerouting, access control, …), the other part is in order to inform third public and private parties about the decisions and their consequences;
- The fourth part of the picture is depicted below the main process chain diagram and represents the special process of system procurement and maintenance.

Though Use Cases in the TM domain might have a different instantiation in different cities in Europe, in general the following high-level TM-oriented Use Cases correspond to figure H–8, and generally comprise the following elements:

a) Planning and system configuration - data retrieval;
b) Real-time data capture;
    — real-time *'field'* data capture &
    — *'external system'* real-time data capture);
c) Planned data processing & subsystem configuration;
d) Real-time data processing;
e) Traffic condition calculation and event/Incident detection;
f) TM decision and measure selection & structuring;

g) Measure realization;
h) Information dissemination.

In addition, another Use Case is important is that related to the system procurement (vendor lock-in problem):

i) Procurement and maintenance of TM infrastructure.

In the following Section, the Use Cases are described in detail.

H.2.5 TM Use Cases

H.2.5.1 TM Planning and system configuration data retrieval

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Planning and System Configuration data Retrieval**
M	**Use Case reference /id**	**TM-0001-v1-20151117**
M	Description	Collection and provision of planning and configuration data for the TM-subsystems on central level (*instations*; i.e. traffic engineer planning systems, traffic management and traffic control centres…) and on field level (*outstations*; i.e. traffic signal controllers, dynamic parking signs, Variable message signs…) with focus on route and intersection topography, topology and planning control data.
M	Scenario	This Use Case refers to step 1 in the TMS process chain. Distributed and mixed vendor TM system architectures require at any time and in all subsystems involved the availability of coherent, consistent and up-to-date planning and configuration data in order to realize a common and consistent traffic management and traffic control result for the road-user. Planning and configuration data path through a chain of different planning and configuration processes, in which the data - building up on each other – have to be enriched and distributed to the subsystems: • topological data and planning control data are necessary to cover requirement as well of safety as of macroscopic and microscopic control; • geographical data gain importance in the context of urban C-ITS (i.e. SPaT/MAP application).
M	Scope	Securing of system-connectivity and enabling of mixed vendor environments in the traffic management and traffic control domain. Provision of coherent, consistent and up-to-date planning and configuration data for all TM-subsystems on central and field level. Examples for traffic signal control: • Intersection topology (lanes including driving direction and turning possibilities, stop lines and their location, signal head positions …); • Equipment of a signal control (loops and other sensors, actuators, …, incl. the accurate location of all components); • *Outstations* detection and control properties (traffic data types, fixed time and traffic adapted signal plans, …);
M	Actors Involved	• Traffic planner and engineer • System architect • System configurator • System operator • Asset managers
M	Stakeholders	• Local authorities in the role of system architect (specification) and purchaser (procurement) • Engineering and consultant companies • Suppliers
M	MIS / TM / UL	TM, MIS and UL
M	Assumptions	Availability of a common agreed TM-system reference model

M	Identified standards (not exhaustive list)	- Regional: OCIT-*Instations*/OTS system model (architecture) - Regional: OCIT-*Instations* VD - OCIT-I_VD-DM-LSA - Regional: OCIT-C VD, intersection_config_data - Regional: UTMC objects registry Common IT/ICT standards (See D.1)
M	Standardisation gaps identified	- Comprehensive TM-system reference model (architecture). - Comprehensive geographical (route and intersection) and topological European data model for all TM-subsystems on central and field level (*instation*s and *outstation*s). - Comprehensive, consistent, bidirectional (centre to field, field to centre) and supplier independent European configuration data model for all TM-subsystems and configuration methods.
	Recommended actions	- Development of a common agreed European TM-system reference model (architecture). - Development and provision of a comprehensive topographical (route and intersection) and topological European data standard for all TM-subsystems on central and field level (*instation*s and *outstation*s). - Development and provision of a comprehensive, consistent, bidirectional (centre to field, field to centre) and supplier independent European configuration data model for all TM-subsystems.
O	Other information	

H.2.5.2 TM Real-time Field Data Capture

CEN TC278 PT1701 USE CASE TEMPLATE		
M	Use Case Name	**TM Real-time Field Data Capture**
M	Use Case reference /id	**TM-0002a v1 20151118**
M	Description	Field level subsystems (*outstations*) collect raw data (traffic data, operational data and messages, …) in real-time.
M	Scenario	This Use Case refers to step 2 in the TMS process chain. Day-to-day and event/incident responding traffic management and control require permanent collection and aggregation as well of traffic data as of operational data and messages. These data are a crucial basis to • enable the calculation of the actual traffic states and conditions; • forecast traffic states and conditions; • realize traffic management and control strategies both manually and automatically; • guarantee a high degree of infrastructure availability and a quick and effective fault recovery. In addition, these data are the basis for planning and quality assurance.
M	Scope	Field level subsystems (*outstations*) collect and aggregate raw data and provide them to TM-subsystems on central level (*instations*). *Outstations* must be able to collect data dependant on the traffic management and control up-to-dateness requirements including the capabilities of the transmission infrastructure. Real-time traffic data are i.e.: • raw data motor car traffic: occupancy, speed, vehicle length, FCD…; • raw data public transport vehicles (bus and tram priority); • signal control raw data (red, green, amber). In addition to traffic data, operational data and status change and fault messages are collected in order to monitor the infrastructure (operational status of subsystem, i.e. on-off, operational messages, i.e. system fault information).
M	Actors Involved	• Traffic planner and engineer • System architect • System configurator • System operator
M	Stakeholders	• Local authorities in the role of system architect (specification), purchaser (procurement) and road operator (traffic control and management) • Engineering and consultant companies • Suppliers
M	MIS / TM / UL	TM, MIS and UL
M	Assumptions	Availability of a common agreed TM-system reference model (architecture) • definition of the requirements with respect to the data to be collected;

		• definition of the relevant and required subsystems and their system borders; • sensor systems for the collection of the required data equipped with required capabilities (properties);
M	Identified standards (not exhaustive list)	• Regional: OCIT-*Instations*/OTS system model (architecture) • Regional: OCIT-*Instations*/OTS PD - OCIT-I_PD-DM-LSA • Regional: OCIT-C, intersection_raw_data, traffic_data, detector_ext, publictransport_data, CCTV, environment_sensor, infopoint_data, parking, … • Regional: OCIT-*Outstations* • Related DATEX II profiles, if applicable Common IT/ICT standards (See D.1)
M	Standardisation gaps identified	• Comprehensive TM-system reference model (architecture). • Comprehensive traffic data standard for urban traffic control & management and TM quality assurance. • Comprehensive system status and fault messages standard for urban TM infrastructure (preferable subsystems in the field level.
	Recommended actions	• Development of a common agreed European system reference model (architecture) for urban TM. • Development and provision of a comprehensive European traffic data standard for urban traffic control & management and TM quality assurance. • Development and provision of a comprehensive European system status and fault messages standard for urban TM infrastructure (particularly for the subsystems in the field level). • Development of suitable and affordable migration paths as part of the standardisation process for the vast bulk of legacy TM systems in the field.
O	Other information	

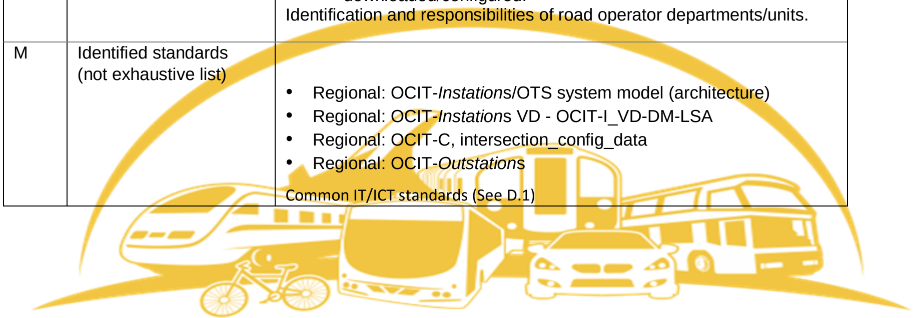
H.2.5.3 TM External System Real Time Data Capture

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM External System Real-time Data Capture**
M	**Use Case reference /id**	**TM-0002b v1 20151118**
M	Description	Traffic Management *Instation* systems collect real time data from other sources to help with both automated and manual tactical decision-making.
M	Scenario	This Use Case refers to step 2 in the TMS process chain. Day-to-day and event/incident responding traffic management and control require permanent collection and aggregation of external data. These data are a crucial basis to: • enable the third party reporting of incidents; • input other factors into incident responses; • have an awareness of traffic incidents and flow on other administrations road networks (urban or interurban).
M	Scope	Traffic management data sources come from wider than their own sensor network, and other real-time data is used in decision making such as: • Weather • Pollution (link to UC in UL) • Emergency services incident reports • Social media incident reports • Interurban or adjacent administration data • Floating car data feeds • CCTV • Media/news
M	Actors Involved	• Traffic planner and engineer • System architect • System configurator • System operator • Third party system suppliers • Adjacent traffic management centres • Emergency services
M	Stakeholders	• Local authorities in the role of system architect (specification), purchaser (procurement) and road operator (traffic control and management). • Engineering and consultant companies. • Suppliers.
M	MIS / TM / UL	TM, MIS and UL
M	Assumptions	• Availability of a common agreed TM-system reference model (architecture). • definition of the requirements with respect to the data to be collected. • definition of the relevant and required subsystems and their system borders . • Standards would be adopted by other third parties (e.g. emergency services) for interoperability.

M .	Identified standards (not exhaustive list)	• DATEX II profiles • Regional - UTMC object registry Common IT/ICT standards (See D.1)
M	Standardisation gaps identified	• Comprehensive TM-system reference model (architecture). • Messaging standards for provision of external data into traffic management.
	Recommended actions	• Identification of key external data needed for the operation of traffic management. • Engagement with third party systems to understand what open message standards exist in their industry (e.g. emergency services command & control). • Develop messaging protocols for key areas.
O	Other information	

H.2.5.4 TM Planned Data Processing & Subsystem Configuration

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Planned Data Processing & Subsystem Configuration**
M	**Use Case reference /id**	**TM-0003 v1 20151118**
M	Description	Compilation of planning and configuration data and provision for the download/configuration of all relevant subsystems.
M	Scenario	This Use Case refers to step 3 in the TMS process chain. Planning and configuration data which were gained in the frame of the Use Case “Planning and System Configuration Data Retrieval” are provided to different administration units. These units adapt and complement the data in accordance to the requirement of the target systems they are responsible for and finally download data to subsystems respectively use them for purpose of subsystem configuration. The activation of the data is coordinated, partly timely synchronized by automated or half-automated processes.
M	Scope	In order to function and interwork properly in the frame of a distributed organised urban TM-systems both *instation*s and *outstation*s require: • commonly used planning and configuration data; and • in addition, always the contribution of logical supplier independent objects and interfaces to physical, supplier and operating system dependant hardware-/firmware-objects and interfaces.
M	Actors Involved	• System configurator • System operator
M	Stakeholders	• Local authorities in the role of road operator (traffic control and management) • System supplier
M	MIS / TM / UL	TM, MIS and UL
M	Assumptions	Use Case TM planned data and system configuration data retrieval. Availability of a common agreed TM-system reference model (architecture): • definition of all relevant and required subsystems and their system borders • definition of requirements with respect to the data to be downloaded/configured. Identification and responsibilities of road operator departments/units.
M	Identified standards (not exhaustive list)	• Regional: OCIT-*Instations*/OTS system model (architecture) • Regional: OCIT-*Instations* VD - OCIT-I_VD-DM-LSA • Regional: OCIT-C, intersection_config_data • Regional: OCIT-*Outstations* Common IT/ICT standards (See D.1)



M .	Standardisation gaps identified	• Property describing system reference model (architecture) for *outstation*s data objects (sensors, actuators, typical functionalities…). • System reference model (architecture) for traffic signal controllers and their configuration (in order to reduce the amount of supplier specific configuration data and parameter and to prove configuration consistency). • Standards (incl. standards for quality assurance) for an automatable configuration of all subsystems, which use an identical data pool in the frame of an interconnected TM-assemblage of TM-subsystems. • Signal controller functionality standard to guarantee consistent behaviour of signal controllers of different suppliers in mixed vendor environments. • Signal controller interface standard to integrate widely used traffic adapted control and data processing methods for a vendor independent use in mixed vendor environments.
	Recommended actions	• Development and provision of Common agreed European property describing system reference model (architecture) for *outstation*s data objects (sensors, actuators, typical *outstation*s functionalities, particularly for signal controllers) and their configuration (in order to reduce the amount of supplier specific configuration data and parameter and to prove configuration consistency). • Common agreed European standards (incl. standards for quality assurance) for an automatable configuration of all subsystems, which use an identical data pool in the frame of an interconnected TM-assemblage of TM-subsystems. • Common agreed European signal controller interface standard to integrate widely used traffic adapted control and data processing methods for a vendor independent use in mixed vendor environments.
O	Other information	

H.2.5.5 TM Real-time Data Processing

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Real-time Data Processing**
M	**Use Case reference /id**	**TM-0004 v1 20151118**
M	Description	Validation and fusion of raw data and further processing to high value and map related traffic data. Aggregation of operational data (operational status of subsystem, i.e. on-off, operational messages, i.e. system fault information) of all subsystems. Provision and dissemination of high value traffic information and operational data to cover the demand of other TM-subsystems.
M	Scenario	This Use Case refers to step 4 in the TMS process chain. Raw traffic and operational data and messages, gained from subsystems on field level and from external sources, are aggregated and archived in dependence of their nature and purpose and are provided as well as real-time information as historical data in a manner which is required by other TM-subsystems.
M	Scope	TM-subsystems on control and traffic management level require in dependence of their functionality high level real-time and historical traffic data. Raw data of the filed level are to be processed in a way that they fulfil these requirements. Typical information on that level are: ➢ Aggregated and vehicle type classified data • traffic volume, • occupancy rates, • average speed • pedestrian and bicycle density • … ➢ Operational data and information In addition to traffic data, operational data and status change and fault messages are to be aggregated and provided to enable to monitor the infrastructure (operational status of subsystem, i.e. on-off, operational messages, i.e. system fault information).
M	Actors Involved	• System operators • Traffic managers
M	Stakeholders	Road operators
M	MIS / TM / UL	TM MIS / UL
M	Assumptions	Use Case TM Real-time Data Capture Availability of a common agreed TM-system reference model (architecture) • definition of all relevant and required subsystems and their system borders • definition of traffic condition and event information
M	Identified standards (not exhaustive list)	• Regional OCIT-*Instations*/OTS system model (architecture Regional: OCIT-*Instations* VD - OCIT-I_PD-DM-LSA • Regional: OCIT-C • Regional: OCIT-*Outstations* • DATEX II profiles, if applicable Common IT/ICT standards (See D.1)

M .	Standardisation gaps identified	• Standards (incl. standards for quality assurance) for aggregated and vehicle type classified data: ○ traffic volume, ○ occupancy rates, ○ average speed ○ … . • Standards (incl. standards for quality assurance) for operational data and information.
	Recommended actions	Development and provision of agreed European standards (incl. standards for quality assurance) for: ➢ Aggregated and vehicle type classified data • traffic volume, • occupancy rates, • average speed • … . ➢ Operational data and information.
O	Other information	

H.2.5.6 TM Traffic Condition calculation and Event/Incident detection

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Traffic Condition calculation and Event/Incident detection**
M	**Use Case reference /id**	**TM-0005 v1 20151118**
M	Description	Validation and fusion of high value traffic data and further processing traffic status and traffic condition information (i.e. current and forecasted LoS & travel times…). Aggregation of operational data (operational status of subsystem, i.e. on-off, operational messages;. system fault information) of all subsystems, including data from external systems and sources. Provision and dissemination of high value traffic information and operational data to cover the demand of other TM-subsystems and for feedback for traffic signal timings.
M	Scenario	This Use Case refers to step 5 in the TMS process chain. High value traffic operational data and messages, gained from Use Case real-time data processing further processed in dependence of their nature and purpose and are provided as well as real-time information as historical information in a manner which is required by other TM-subsystems.
M	Scope	TM-subsystems on control and traffic management level require in dependence of their functionality high level real-time and forecasted traffic and traveller information. Typical information on that level are: ➢ *Traffic condition (LoS) Information* Merging and aggregating data from different sources (data-fusion) is the basis of LoS calculation. Within Europe different methodologies and traffic models exist to aggregate the real-time and predictive traffic condition and travel time information.; The result is the so called Level of Service, which consists of different traffic states and which usually is depicted in a map by colouring route segments or links; ➢ *Travel time Information* Travel time information is easy to understand but it is more complex to calculate. Indeed, various algorithms are commonly used in the process of travel time calculation. Travel times have to be consolidated before use by other systems and dissemination to ensure information consistency for the end user. Final information consistency is both conditioned by the reliability of the input raw data and the accuracy of the calculation model; ➢ *Events* Expected and unexpected event information (estimated impact on traffic situation, start and estimated end, position (location code) and estimated spatial dimension, type, cause, information source where this is being calculated from sensor data as opposed to explicit information from third parties; ➢ *Operational data and information* In addition to traffic data, operational data and status change and fault messages are to be aggregated and provided to enable to monitor the infrastructure (operational status of subsystem, i.e. on-off, operational messages, i.e. system fault information).
M	Actors Involved	• System operators • Traffic managers

M	Stakeholders	Road operators
M	MIS / TM / UL	TM MIS / UL
M	Assumptions	Use Case TM 'Real-time Data Capture' Availability of a common agreed TM-system reference model (architecture) • definition of all relevant and required subsystems and their system borders • definition of traffic condition and event information
M	Identified standards (not exhaustive list)	• Regional: OCIT-*Instations*/OTS system model (architecture) • Regional: OCIT-*Instations* VD - OCIT-I_PD-DM-LSA • Regional: OCIT-C • Regional: OCIT-*Outstations* • DATEX II profiles Common IT/ICT standards (See D.1)
M	Standardisation gaps identified	• Standards (incl. standards for quality assurance) for traffic condition (los), travel times and events.
	Recommended actions	Development and provision of agreed European standards (incl. standards for quality assurance) for: • Traffic condition (LoS) • Travel times • Events
O	Other information	

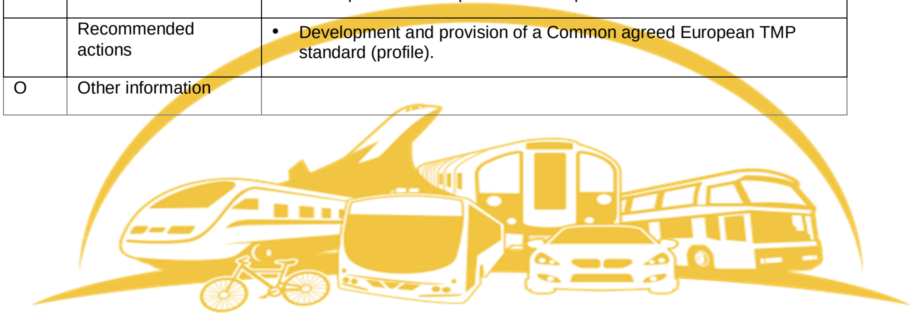
H.2.5.7 TM Decision and Measure Selection & Structuring

CEN TC278 PT1701 USE CASE TEMPLATE		
M	Use Case Name	**TM Decision and Measure Selection & Structuring**
M	Use Case reference /id	**TM-0006 v1 20151118**
M	Description	Decision about the appropriate traffic management strategy (TMP – Traffic management plan) as response to current traffic conditions (i.e. peak hours) or an upcoming planned or unplanned event/incident. A TMP is based and contains a set of appropriate traffic control and route guidance measures to be realised and to be deployed on the urban road network (including interfaces to the motorway and to neighbouring cities) by the interconnected downstream systems and to be disseminated as information to third parties.
M	Scenario	This Use Case refers to step 6 in the TMS process chain and includes the following permanent tasks: • Management of day-to-day traffic flow (assuming no abnormal incidents); • Management of planned and unplanned events and incidents on the urban road network (including weather); • Links to neighbours (including interurban) and to third parties.
M	Scope	A TMP is the pre-defined allocation or by a higher level intelligent *instation* on demand generated set of measures to a specific situation in order to control and guide traffic flows as well as to inform road-users in real-time and provide a consistent and timely service to the road user. Initial situations can be unforeseeable (incidents, accidents) or predictable (recurrent or non-recurrent events. The measures are always applied on a temporary basis. TMPs can be based upon the full range of feasible traffic control, route guidance and traveller information measures, not only depending on the initial situation but also on available facilities. TMPs are typically profiled as follows: • List of incidents/events • Incident/event name • Incident/event type • Incident/event location (section, direction) • Expected duration, traffic impact or congestion length if available • Spatial dimension (area and network affected by) • List of measures • Name of measure • Implementing organisation(s) • List of actions (Name of action, definition of action) • List of scenarios (to respond) • Scenario name • Spatial application (area and network) • Thresholds for activation/deactivation • List of associated measures • Expected maximum response times • Organisational chain (list of involved organisations and competences) • Prioritization
M	Actors Involved	Urban and interurban traffic managers

M	Stakeholders	Urban and interurban road operators
M	MIS / TM / UL	TM / MIS / UL
M	Assumptions	• Common agreed European TMP Standard (profile). • Predefined TMPs are agreed with neighboured road operators and public and private traveller information service providers.
M	Identified standards (not exhaustive list)	Common IT/ICT standards (See D.1)
M	Standardisation gaps identified	TMP standard (profile) consistent as well to urban and inter-urban road operators as to private service providers.
	Recommended actions	Development and provision of a common agreed European TMP standard (profile).
O	Other information	

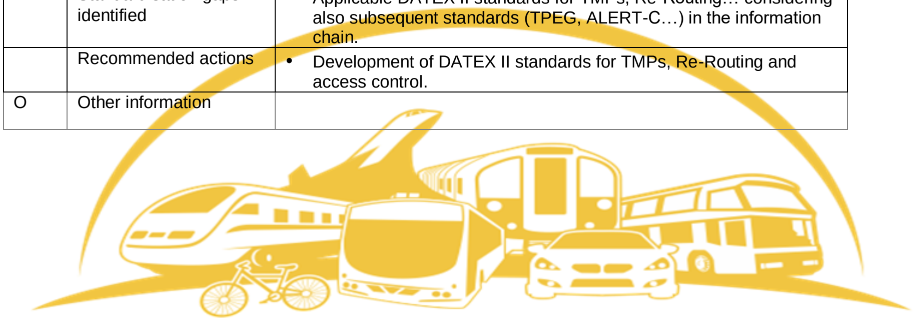
H.2.5.8 TM Measure realization

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Measure realization**
M	**Use Case reference /id**	**TM-0007 v1 20151118**
M	Description	As result of the selected TMP the according traffic control and route guidance measures are realised and deployed on the urban road network (including interfaces to the motorway and to neighbouring cities) by the interconnected downstream systems.
M	Scenario	This Use Case refers to step 6 in the TMS process chain. As such independent traffic signal control, route guidance systems and access control systems are used to realize a selected TMP by for example following measures: • signal plan selection • re-routing • access control plan selection • …
M	Scope	The following control and route guidance systems are in scope of these uses case: • traffic signal control • Parking-guidance • Route guidance system (by VMS) • Access control system • …
M	Actors Involved	• System operators • Traffic managers
M	Stakeholders	• Road operators • End-users
M	MIS / TM / UL	TM / MIS / UL
M	Assumptions	Traffic signal control, parking and route guidance systems and access control systems are available and in operation.
M	Identified standards (not exhaustive list)	Common IT/ICT standards (See D.1)
M	Standardisation gaps identified	• TMP standard (profile) consistent as well to urban and inter-urban road operators as to private service providers.
	Recommended actions	• Development and provision of a Common agreed European TMP standard (profile).
O	Other information	



H.2.5.9 TM Information dissemination

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Information dissemination**
M	**Use Case reference /id**	**TM-0008 v1 20151118**
M	Description	As result of the TMP decision the information about the selected measures and their consequences are published to third parties.
M	Scenario	This Use Case refers to step 6 in the TMS process chain. To support the selected TMP the following information is circulated to third parties: • re-routing plans • access restrictions • Incident Information • Planned event information (inc. roadworks) • Traffic congestion/journey time information • …
M	Scope	Traffic and traveller information services which compile the provided information within their own scope.
M	Actors Involved	• Road operator • Service operators and providers • Other urban travel management systems • Public transport operators • Road maintenance operators • 'Travel Information Provider's
M	Stakeholders	• Road operators • Traveller
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	Appropriate interfaces/platforms to third parties are available (National access points)
M	Identified standards (not exhaustive list)	• Partly applicable DATEX II standards (i.e. for parking). • TPEG. Common IT/ICT standards (See D.1)
M	Standardisation gaps identified	• Applicable DATEX II standards for TMPs, Re-Routing… considering also subsequent standards (TPEG, ALERT-C…) in the information chain.
	Recommended actions	• Development of DATEX II standards for TMPs, Re-Routing and access control.
O	Other information	



H.2.5.10 TM Procurement and maintenance of Traffic Management infrastructure

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Procurement and maintenance of Traffic Management infrastructure**
M	**Use Case reference /id**	**TM-0009 v1 20151118**
M	Description	Beneath the actual operational traffic management, the procurement and maintenance of an appropriate traffic management infrastructure is second main task of local authorities. As today urban traffic management systems cannot any more regarded as a “single monolithic system” but have grown over years and have evolved along long lasting integration and migration paths to more or less distributed system landscapes the renewal of exiting parts or the integration of new parts is a major challenge for local authorities.
M	Scenario	Mixed-vendor system environments Urban public bodies, which finance their systems or system parts by public money, in the end must ensure that they tender and procure those parts according to the regulations of public procurement law. This requirement can lead to a split of the tender into various lots, to achieve the best price/performance ratio and results finally over years in a mixed-vendor system environment. Hence, for public systems operators a mixed vendor environment results primarily out of the obligation to comply with public law, which requires for and the introduction of competition, or through the Urban Administrators choice. Separate lots must be specified in a way that potential suppliers are enabled to offer a solution independently, even if the lot has a functional dependence on other lots or to existing systems. This becomes only possible if standards, mainly communication standards, are available to cut a whole system into subsystems which then can become the issue of a lot and which can be tendered separately.
M	Scope	Integrating disparate ITS products will become essential for future Urban-ITS. The availability, and market adoption, of standards is crucial to enable public sector organisations to procure interoperable ITS in accordance with the Procurement Directive. They are necessary to enable incremental procurement of systems, systems migration, and component replacement. This is particularly challenging where there is significant deployment of legacy systems which are 10 or even 20 years old, alongside newer systems. ➢ *System procurement* By the availability of standards, procurement processes are simplified and shortened significantly and the creation of mixed-vendor environments (with other words prevention from vendor lock-in) is fostered. ➢ *System maintenance* Interface standards lead to the development of test- and measure-utilities, which support effective maintenance. Thus maintenance processes become more effective and maintenance quality increases. ➢ *Asset management system* Many Urban Administrators have a desire to operate a single ‘Asset Management System’ to monitor and manage all their assets (e.g. structures, street lamps, VMS signs, ducting) and therefore it is more common for such as asset management system to sit outside of the TM area, but must communicate and exchange data with the TM systems, including both static data and dynamic data.

M	Actors Involved	• System architect • Procurement unit • System configurator • System operator • System maintenance • System suppliers
M	Stakeholders	• Local authorities – procurement unit • System supplier
M	MIS / TM / UL	TM / MIS / TL
M	Assumptions	• Availability of a common agreed TM-system reference model (architecture) • Availability of common agreed interface standards
M	Identified standards (not exhaustive list)	• regional OTS/OCIT system reference model • regional OCIT/OTS interface standards • regional UTMC Common IT/ICT standards (See D.1)
M	Standardisation gaps identified	• TM-system reference model (architecture). • Interface standards. • Certification standards. • TM-system procurement standards. • Maintenance standards.
	Recommended actions	• Development of common agreed European TM-system reference model (architecture). • Development of Common agreed European interface standards. • Development of Common agreed certification standards. • Development of Common agreed TM-system procurement standards. • Development of Common agreed maintenance standards.
O	Other information	

H.3 TM Gap and overlap analysis involving European and international SDOs and their relevant deliverables

H.3.1 Problems in the TM domain related to the lack of standards

As shown above, the traffic management infrastructure in many European countries is well explored, developed and successfully applied since many, many years. However, with respect to:

- ➢ operational use and application and
- ➢ procurement and maintenance,

the infrastructure is not without problems and suffers from missing or insufficiently available respectively applied standards.

Against this background two larger, and partly overlapping, problems are highlighted:

- ➢ **Lack of ITS-information continuity** → need for common, ITS-domain overarching data models:
  - — the demand for a common understanding of data and information, which are used in several ITS domains, is constantly growing,
    (For example: “Parking” is not only part of both traffic management and urban logistic application areas but also an important pillar of multi-model traveller information services. Hence common agreed {or at least mapped to each other} parking data models are required);
  - — the EU ITS Directive (i.e. EU Regulations action a), b) and c)) obliges public authorities to publish their data in machine readable form in compliance to European standards (i.e. DATEX II, Inspire);

- ➢ **Lack of ITS-services and ITSs connectivity (interoperability)** → need for ITS-service/ITS overarching communication interface standards:
  - — the demand to integrate TM-services amongst themselves and with other mobility services (public transport, urban logistics…) and new fast evolving technologies (GNSS based navigation, smart phones, C-ITS, connected automated driving) is still growing;
  - — Large supplier companies aim to cover bigger parts of the ITS portfolio of one customer completely by own products. This situation leads to the effect of ***vendor lock-in*** when as such logically independent subsystems of the IT-landscape are linked by proprietary communications interfaces and the lack of competition and high prices in ITS procurement (preferable for the connection between field and control level).

It is important do understand, that the lack of standards in fact does not block the capability of local authorities to act. As a consequence, the political and decision-making level has not the awareness and understanding of the impact and benefit of standards. However, responsible persons on the operational level suffer under the lack of standards as following examples show:

- ➢ Links to neighbours (including interurban):
  - — *“I'd like to use your data (and send you our data) but I can't because we have neither common traffic data and TMP models nor a suitable process model for data exchange.*”
- ➢ Intra-authority institutional barriers:
  - — *“I'd like to exchange data with my colleagues in traffic/highways/public transport/transport planning/air quality/emergency planning/etc. but I can't because we have neither a commonly agreed information semantic and data model nor an appropriate exchange platform.”*

- Vendor lock-in:
  - “*I'd like to compete this procurement but I can't because we have no interoperability standards which allow to build appropriate lots and to integrate the new systems into our legacy environment”;*
  - *“I'd like to come away from all these expensive, complex and time-consuming supplier specific tools for the administration and configuration of my signal controllers. But I can't because we have no common configuration and signal plan standard for signals control which would allow me to download new signal plan changes from on single workstation in my office immediately”.*

H.3.2 Interoperability requirements in the TM-domain

H.3.2.1 Interface requirements

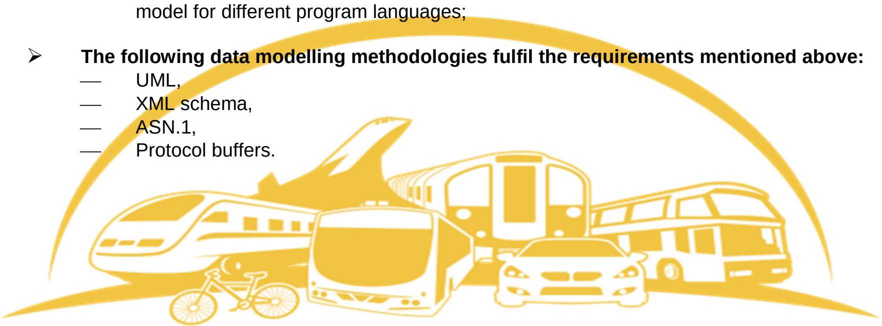
Interoperability is a key term and prerequisite for both continuity and connectivity of ITS-services/systems and for competition in public procurement and requires the availability and application of standardized communication interfaces. In general, with respect to TM-services operation and TM-infrastructure procurement communication interfaces consist of two separate parts, the protocol stack and the data model, with the following requirements:

- **Overall requirements are:**
  - the protocol stack shall be independent from the data model,
  - standards must be used for both, the protocol stack and the data model;

- **Requirements on the protocol stack are**
  - standard protocols must be used,
  - program language libraries implementing the protocol stack must be available for different program languages,
  - protocol stack must be internet compatible (firewall-friendly),
  - protocol must be (full-duplex) bidirectional and asynchronous,
  - it shall be possible to secure the protocol stack by standard mechanisms The following protocol stacks fulfil all requirements mentioned above:
    - messaging protocol (e.g. STOMP, AMQP or MQTT) using web sockets (optional secure web sockets) on top of TCP/IP;

- **Requirements on the data model are:**
  - a standard data modelling language must be used,
  - it must be possible to automatically generate program language constructs from the data model for different program languages;

- **The following data modelling methodologies fulfil the requirements mentioned above:**
  - UML,
  - XML schema,
  - ASN.1,
  - Protocol buffers.



H.3.2.2 Data model requirements

Crucial for interoperability in the TM-domain (and not easy to standardize) are domain specific data models. (Though the protocol stack is in general an important part of every communication interface and thus for interoperability, as long the above mentioned principles and requirements are met, it is not the critical part from the perspective of an application domain like TM).

In the urban traffic management area, the following data categories build the backbone of the TM-application landscape as a whole and particularly of the data exchange between single applications:

- **Traffic messages**
  This communication component is used for the transmission of messages about roadwork, events and faults with the attributes: Location, period of time, daily validity, status, classification, effect, e.g. capacity reduction, restrictions, e.g. speed or weight, reference to interfering messages, type of the detection (manual or automatic) and free text.

- **Traffic data**
  This communication component is used for the transmission of measurement values or derived values of different detection equipment.

- **Parking data**
  This communication component is used for the transmission of data of parking equipment: Name, location, short-term and long-term parkers, occupancy, free places, predicted values (trends) and status of the park equipment.

- **Weather and environment data**
  This communication component is used for the transmission of data of corresponding detection equipment:
  - Sensor type with the attributes location, point-related or route-related measurement values,
  - Data in accordance with for example: TLS (German motorway standard): precipitation (intensity, probability), temperature (air, ground), wind, humidity, air pressure, visibility range, condition of roadway surface, sunrise, sunset, brightness,
  - Supplementary data: radiation balance, cloudage, ozone, sulphur dioxide, benzene, soot, carbon monoxide, dust, weather forecast.
- **Cameras**
  This communication component is used for the transmission of data for controlling monitoring cameras and for the transmission of images.

- **Situations and strategies**
  This communication component is used for the transmission of descriptions of traffic situations or control strategies and specifications of measures for strategic traffic control.

- **Operating messages**
  This communication component is used for the transmission of operating messages of traffic equipment, e.g. those of traffic signal systems.

- **Signs (VMS)**
  This communication component is used for the transmission of data for controlling segment signs and full-array signs. Feedback from the sign (status, time stamp, temperature and contents), commands for the sign (contents). The contents are distinguished according to: prism signs, full-array signs, display cross-sections and their individual displays. Transmitted for full-array displays is: complete layout (text positions and image positions, colours, font, etc.) and the contents of the layout elements.

- **public transport passenger information**
  This communication component is used for the transmission of route, line or stop-related data of the local public transportation network: positioning, public transport passenger information, stop and line, type of public transport vehicle (bus, tram, etc.), target arrival, actual arrival at stop, status of the public transport vehicle.

- **Traffic signal systems (TSS)**
  This communication component is used for the transmission of data as a specification for the control of traffic signal systems: description, actual status, predefined switching operations, parameters for traffic-related and bicycle-related signalling.

- **Traffic signal systems raw data**
  This communication component is used for the efficient transmission of large quantities of discrete values of traffic signal systems: detector edges, signal group statuses, digital outputs, user program value, public transport data (extended R09 telegram), single detector data.

- **Traffic signal systems configuration data**
  This communication component is used for the data configuration of traffic signal systems.

- **Binary container**
  This communication component is used for the transmission of data encoded in binary. The description (type designation) included in transmission identifies the type of data in the container and thereby makes it possible for the recipient to process them.

H.3.3 Use Case based gap and overlap analysis

H.3.3.1 TM-0001 Gaps – TM planning and system configuration data retrieval

- Comprehensive TM-system reference model (architecture).
- Comprehensive geographical (route and intersection) and topological European data model for all TM-subsystems on central and field level (*instations* and *outstations*).
- Comprehensive, consistent, bidirectional (centre to field, field to centre) and supplier independent European configuration data model for all TM-subsystems and configuration methods.

H.3.3.2 TM-0002a Gaps – TM real-time field data capture

- Comprehensive TM-system reference model (architecture).
- Comprehensive traffic data standard for urban traffic control & management and TM quality assurance.
- Comprehensive system status and fault messages standard for urban TM infrastructure (preferable subsystems in the field level).

H.3.3.3 TM-0002b Gaps – TM external system real time data capture

- Comprehensive TM-system reference model (architecture).
- Messaging standards for provision of external data into TM.

H.3.3.4 TM-0003 Gaps – TM planned data processing & subsystem configuration

- Property describing system reference model (architecture) for *outstations* data objects (sensors, actuators, typical functionalities…).
- System reference model (architecture) for traffic signal controllers and their configuration (in order to reduce the amount of supplier specific configuration data and parameter and to prove configuration consistency).

- Standards (incl. standards for quality assurance) for an automatable configuration of all subsystems, which use an identical data pool in the frame of an interconnected TM-assemblage of TM-subsystems.
- Signal controller functionality standard to guarantee consistent behaviour of signal controllers of different suppliers in mixed vendor environments.
- Signal controller interface standard to integrate widely used traffic adapted control and data processing methods for a vendor independent use in mixed vendor environments.

H.3.5.5 TM-0004 Gaps – TM Real-time Data Processing

- Standards (incl. standards for quality assurance) for aggregated and vehicle type classified data
    - traffic volume,
    - occupancy rates,
    - average speed
    - …
- Standards (incl. standards for quality assurance) for operational data and information.

H.3.3.6 TM-0005 Gaps – TM Traffic Condition calculation and Event/Incident detection

- Standards (incl. standards for quality assurance) for traffic condition (LoS), travel times and events.

H.3.3.7 TM-0006 Gaps – TM decision and measure selection & structuring

- TMP standard (profile) consistent as well to urban and inter-urban road operators as to private service providers.

H.3.3.8 TM-0007 Gaps – TM measure realization

- TMP standard (profile) consistent as well to urban and inter-urban road operators as to private service providers.

H.3.3.9 TM-0008 Gaps – TM Information dissemination

- Applicable DATEX II standards for TMPs, re-routing… considering also subsequent standards (TPEG, ALERT-C…) in the information chain.

H.3.3.10 TM-0009 Gaps – TM procurement and maintenance of traffic management infrastructure

- TM-system reference model (architecture).
- Interface standards.
- Certification standards.
- TM-system procurement standards .
- Maintenance standards.

H.4 TM Potential revision of existing standards, new standards development and international harmonisation tasks based on gap/overlap results

H.4.1 Preliminary observation

Standards are developed by SDO member countries to meet a requirement defined in a new work item. They are developed by experts from five or more countries, and approved by ballot by a significant number of SDO member counties. However, a standard does not necessarily provide a migration path from legacy systems, and may not even consider legacy systems. This seems to be the case for Urban-ITS TM, where regional standards for interoperability on important interfaces (e.g. OCIT in the German speaking part of Europe, UTMC in the UK and IVERA in the Netherlands) have existed for some considerable time. However, no member countries have initiated (or have failed to interest an adequate number of countries) to elevate these regional standards to

European or International Standards. Such regional standards are maintained either by a single country SDO or by trade associations or similar organisations.

Quite a few actors in the TM have a feeling that it may be time now to harmonise and actually take such types of specification to a European and more formal level. Nevertheless, it must be stated clearly that the success of such an approach would heavily depend on suitable and affordable migration paths for the vast bulk of legacy systems in the field being. Such action will firstly require 5 member states to support such a development, and must provide experts to undertake the development. It the case of CEN, it must then achieve the approval consensus, or a large majority of CEN member countries. In practical terms, in the case of TM, migration capability has to be actively designed into such standards, relevant domain standards need to be referenced and make their text available to CEN to use.

H.4.2 TM Architecture recommendations

H.4.2.1 Background

The provision of user-oriented seamless and continuous ITS-solutions/services for TM requires cross-organisational links/cooperation of all bodies involved. This often proves difficult not due to technical challenges but because of lack of:

- ➢ political will (no willingness to adjust traditional roles and responsibilities; missing appreciation of the added value achievable only in cooperation);
- ➢ understanding of the real application and potential of new technologies (locating facilities, mobile communication and the pervasive facilities of information processing);
- ➢ the difficulty in providing a quantifiable business case;
- ➢ clarity in the operational implications (missing conceptual basis for thinking in processes, roles and business models and appropriate standards).

Partnerships of different stakeholder types need a common understanding of relevant aspects and also of obligations, risks and indeterminacies which are relevant for cooperation in the context of cross-organisational Urban-ITS.

In the light of these conditions, appropriate reference models for the business case as well as for system specifications may be needed.

H.4.3 Traffic management domain specific recommendations

H.4.3.1 Background

The traffic management infrastructure in many European countries is well explored, developed, applied and evolved over many years. However, there remain three main challenges where the support from appropriate standards is needed, particularly to ease:

- ➢ integration of subs-systems of different suppliers to a mixed vendor system environment (the availability of interoperability standards can prevent vendor lock-in in the context of system procurement and maintenance);
- ➢ better levels of integration (the availability of data and information standards enable/ensure information continuity in the context of operational use and application of sub-systems;
- ➢ To give Urban Administrations a choice between TMS ownership and “Traffic Management as a Service” while enabling migration paths between the two.

It is important do make the point that the lack of standards does not, of itself, block the capability of local authorities to act in these areas: it merely makes it riskier, and potentially more expensive.

H.4.3.2 Recommendations

Formal TM standards (CEN, CENELEC, ETSI, ISO) do not currently exist in many specific areas. The list of recommendations below provides a schedule of areas in which such standards may be beneficial.

It may be beneficial for the EC to support the development of appropriate standards for:

Traffic control and management

Rc_TM03- A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP).

Rc_TM06- Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems.

Rc_TM02- A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs).

Rc_TM07- A control interface standard to link roadside devices such as signal controllers to an *instation* system, to support multi-vendor integration.

Rc_TM05- An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in mixed vendor environments.

Rc_TM04- A quality or performance criteria standard (SLAs in terms of ITS performance e.g. availability, timeliness of data transactions or KPIs in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers.

Rc_TM01- A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II.

TM Infrastructure monitoring, fault clearance and maintenance

Rc_TM08- System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance.

TM Infrastructure procurement

Rc_TM10- The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined.

Rc_SM08- In addition to the technical standards defined by the ESOs, the EC should sponsor the creation, management and support of an open repository of practical profiles of those standards, which are suitable for both system developers and Urban Administrations during procurement.

Rc_TM09- Common agreed certification standards to support EC-type examination in the TM domain.

H.5 TM Roadmap with targeted deliverables and concrete actions to speed up deployment of Urban-ITS

See Annex P; Annex A, and 1.5 Executive Summary.

H.6 TM Funding issues

See Annex A.

ANNEX I Urban Logistics (UL)

I.1.1 General

Urban logistics primarily concern the efficient movement of freight and commercial traffic within the urban domain; but also involve other vehicle related movements, such as parking management. (Parking management could also be defined as a multimodal information system issue that involves urban logistics, rather than vice versa, but the remit to this pre-study elects that 'parking' primarily lies within the domain of urban logistics.).

The shape form and scope of urban logistics as a domain of Urban-ITS will vary from city to city. But in general, the principal Urban-ITS services that lie within urban logistics are identified as:

- Freight movement within the urban domain:
  - Management of freight vehicles within the urban zone,
  - Management of vehicle generated pollution within the urban domain,
  - Loading bays information and reservation services for logistical efficiency,
  - Loading bays information and reservation services for specific freight vehicles,
  - Cargo identification (Where relevant to movements inside the urban domain);

- Use of alternatively fuelled vehicles for urban logistics:
  - Charging alternatively fuelled vehicles,
  - Charging (e.g. during loading/unloading at the specific bays);

- Intelligent parking:
  - Intelligent parking for light vehicles;
  - intelligent parking for light commercial vehicles;
  - Intelligent parking for heavy goods vehicles.

I.1.2 Stakeholder engagement

Within the limited time available for the pre-study, principal outreach has been:

- Opticities Project
- IRU
- POLIS
- CEN TC278 WG2 Freight and Fleet
- ISO TC204 WG7 General fleet management and commercial/freight
- The Commission Implementing Decision
- FRAME
- Netherlands, National Data Warehouse for Traffic Information
- CO-GISTICS Project

And in respect of parking and electric vehicles:

- CEN TC301
- ISO TC22
- ETSI TC-ITS
- TFL
- Netherlands, National Data Warehouse for Traffic Information.

At a late stage of the project, PT1701 engaged with the CO-GISTICS project, and has added five Use Cases as a result. However, it should be noted that these Use Cases were received only after the outreach consultation had ended, so are not directly considered by outreach review. A sixth Use Case from CO-GISTICS “Cargo transport optimisation” is considered as an instantiation of the current Use Case UL-0101.

The additional Use Cases are:

- Intelligent Truck Parking and Delivery Areas Management (ITP/DAM)
- Priority and Speed Advice Service
- Priority and Speed Advice Service (Macro Approach)
- Eco-drive Support Service
- CO2 Footprint Monitoring and Estimation.

I.1.3 Common/Interoperable data

See F.1.5.

I.1.4 Multimodality

See E.3.4 and F.1.6

I.1.5 Creation of (multimodal) transport datasets

Is considered on a use-case by Use Case basis. See use cases.

I.1.6 Multiple means of communication

See F.1.8

I.1.7 Creation of urban-interurban interfaces

Almost by definition, most aspects of freight logistics concern the urban-interurban interface. Only the so called ‘last mile’ may be considered to be unique to the urban logistic. Most of the Use Cases in this section are therefore appropriate in both the urban and inter-urban context. In the commercial sector, the major issue of concern is safe and secure parking. While urban administrations see last mile parking and delivery points as a major issue, commercial operators, while bemoaning the lack of parking spaces, do not share the same concerns.

While urban administrations have trialled “Urban Consolidation Centres" (see I.2.1 and the Use Case UL 0213 (I.2.3.2.13)), the commercial sector believes that this issue is already commercially dealt with by a combination of in-house distribution depots, parcel delivery services, and the National post offices of Europe.

Electric vehicle issues are, by contrast, largely seen as “urban” issues (because of the range limitation of electric vehicles), and also issues for light vehicles (because of the non-availability of commercially viable load carrying electric vehicles suitable for last mile delivery). Trials using electric vehicles for last mile delivery have generally be regarded as a failure because of the very limited load carrying capability, limited range, and limited speed of commercial electric vehicles).

So electric vehicle issues are seen as not relevant at this point in time (within the timespan of the CID) for commercial vehicles (therefore there is no issue regarding urban-interurban interface) and in respect of light vehicles, is an entirely urban issue. (Note the CO-GISTICS Project continues to examine these aspects).

Technology change (improvements in battery technology, availability of hydrogen or some as yet undiscovered means to enable commercial last mile deliveries) may change this situation in the future, but is not considered relevant, so therefore not a priority within the timeframe of the CID.

I.1.8 Use of open standards, architectures and specifications

See F.1.10.

I.1.9 Enable rather than prescribe or proscribe

See F.1.11.

I.2 UL Relevant business/service areas and applications identified with key stakeholders

I.2.1 Urban freight consolidation centres

I.2.1.1 UCC Concept

European urban administrations are committed (by European and National Regulation) to cut pollution in cities. Emissions in cities have become a major cause of ill-health and death, now perhaps surpassing deaths caused by cigarette smoking in many countries (albeit part of this comparator is caused by the reduction of the number of persons smoking), e.g. COMEAP reports 9,500 deaths each year in the UK alone due to exposure to poor air quality. The World Health Organisation has classified diesel emissions as being carcinogenic to humans. In 2012, Kings College London reported drivers as being the most exposed to pollutants whilst driving their vehicles. (specific data can be found in the 'UK Environmental Audit Committee report on Air Quality'). The greatest contributors to urban pollution are emissions from diesel engines. The most significant contributors to diesel engine emissions in most cities are commercial vehicles, and almost commercial vehicles all are powered by diesel. It is postulated that most commercial vehicles in cities are making deliveries or collections. It is contended that most of these vehicles spend a significant part of their time only partially loaded. Reducing the number of commercial vehicle deliveries and collections made by diesel powered vehicles would therefore contribute significantly to the reduction of pollution in cities.

Every delivery/collection requires the vehicle to be parked while the collection/delivery is made. Delivery vehicles frequently find parking difficult, especially to /from smaller enterprises. On-road parking frequently causes congestion, and congested vehicles emit pollution from all vehicles that are delayed by the congestion (not just the loading/unloading vehicle). Given that most delivery/collection vehicles spend much of their time only partially loaded, more efficient delivery/collection would both reduce pollution and reduce congestion delays for other road users.

If low emission vehicles, such as electric vehicles, possibly hybrid vehicles, could be used for last mile delivery/collection, pollution at tailpipe could be further and significantly reduced, or at least moved to a generating power station, and therefore away from the city.

The Urban Consolidation Centre (UCC) concept is therefore that interurban movements of product are channelled to a UCC, consolidated, and driven 'the last mile' in a low emission vehicle mode, properly loaded to maximise delivery efficiency, and the same vehicles could effect collection rounds, delivering the collected items to the UCC from where they can make a modal shift to other transport means for the next stage of their journey.

Electric vehicles are much quieter than diesel fuelled vehicles. This can help operators to undertake deliveries out of hours in densely populated urban areas.

The CO-GISTICS project sees the need for standards that help to optimise last mile deliveries. Topics to be covered include delivery parking spaces management, congestions, noise, pollution, night delivery, trans-boarding from big trucks to small electric vehicles, development of economic models and dynamic schedules and definition of KPIs for last mile delivery.

I.2.1.2 Bundled consolidation

UCC's are able to support efficient, environmentally friendly, goods distribution within an urban domain. In order to be efficient, such centres serve multiple clients, and bring together flows of goods for an entire city or region. These flows will then be consolidated (bundled) and distributed throughout the city. It is contended that automated freight handling, along with flexible IT systems, will enable faster, customer-specific movement of goods.

Consolidation activities take place at the UCC. Long haul transportation means (vehicles or trains) dock at the UCC to unload their cargo. Loads are then sorted and consolidated into smaller vehicles for distribution. UCCs may be stand-alone facilities situated close to the city access or ring highways, or may be part of air, rail, or navigation terminals. UCCs may then be viewed as intermodal nodes or freight villages with enhanced functionality to provide coordinated and efficient freight movements within the urban zone.

I.2.1.3 Bundled relief

Within the UCC concept, different suppliers – most of whom are in competition with one another – will have to cooperate and ship their products together via the UCC service provider. Route consolidation will reduce transports, save money, and decrease both the number of delivery vehicles in the urban domain, along with the total number of delivery vehicle kilometres travelled.

A UCC system would also address the reverse movements, from origins within the city to destinations outside, as well as movements among origins and destinations within the city.

I.2.1.4 Advantages and disadvantages of UCC

M. Browne and colleagues from the University of Westminster compiled the following table of advantages and disadvantages of UCCs.(2005) [72]

Main advantages	Main disadvantages
• Environmental and social benefits resulting from more efficient and less intrusive transport operations within urban areas • Better planning and implementation of logistics operation, with opportunity to introduce new information systems at same time as consolidation centre • Better inventory control, product availability and customer service • Can facilitate a switch from push to pull logistics through better control and visibility of the supply chain • Potential to link in with wider policy and regulatory initiatives • Theoretical cost benefits from contracting out "last mile" • Public relations benefits for participants • Potential to allow better use of resources at delivery locations • Specific transport advantages • Opportunity for carrying out value-added activities	• Potentially high set up costs (and sometimes high operating costs) • Much urban freight is already consolidated at the intra-company level or by parcels carriers, so limited benefits (or even negative consequences) for trying to channel these flows through a consolidation centre. The potential scope for UCCs may therefore be limited • Difficult for a single centre to be able to handle the wide range of goods moving in and out of an urban area, for example due to different handling and storage requirements • Most studies report an increase in delivery costs due to an additional stage in supply chain which imposes a cost (and often a time) penalty, though this clearly depends on how well the centre is integrated into the supply chain and the extent to which all costs and benefits are considered • A single consolidation centre for an urban area is unlikely to be attractive for many suppliers' flows due to the degree of diversion required from normal route (and may therefore negate transport savings for onward distribution) • Lack of enforcement of regulations for vehicles not included in the consolidation scheme • Organisational and contractual problems often limit effectiveness • Potential to create monopolistic situations, thus eliminating competition and perhaps leading to legal issues • Loss of the direct interface between suppliers and customers

I.2.1.5 Examples of urban consolidation centres

(examples courtesy http://wiki4city.ieis.tue.nl/index.php?title=Urban_consolidation_centre) [73]

During the last 25 years in Europe more than 150 UCC projects were started, but only 5 projects survived (Sugar 2009, p. 249).[87]

- Monaco [74][75]

The Monaco government initiated a UCC in 1989 in combination with strict truck regulations and the provision of large subsidies. To the extent that the governmental subsidy per delivery exceeded the price customers pay per delivery. Monaco's typical characteristics add to the initiative's success, but make the results hardly transferable to other cities. Monaco, in addition to being a city, is also a sovereign state, which enables the complete insertion of the urban consolidation centre concept in Monaco's state policy.

- La Rochelle [76]

In La Rochelle an UCC was established in 2001 with a considerable starting subsidy. From the UCC, electric vehicles supply the historical city centre of La Rochelle. Some problems occurred in the initiative, i.e. although regulation forbids heavy vehicles to enter, the enforcement is lacking. Secondly, the capacity and speed of the electric vehicles were limited, resulting in more vehicle trips and an increase in urban congestion. Furthermore, it turned out to be legally not allowed to deny access for non-UCC users, as long as they satisfy the vehicle restrictions and time windows. And finally, no one responded to the tendering for the UCC management.

- Leiden, The Netherlands [78][79]

A comparable initiative failed in Leiden. The urban consolidation centre opened in 1997 to improve the quality of life in the historical centre of Leiden. Eventually, the number of customers for Leiden's UCC was by no means sufficient to reach the break-even volume, even after the surrounding cities were added to the working area of the UCC. Parcel delivery companies decided not to join the initiative, basically because they were not willing to collaborate with their competitors. The project ended in 2000.

- Germany [72][81]

After some initial successes, many German cooperation and city distribution centre initiatives were terminated after the first phase or even earlier. Browne et al. (2005) found that of the approximately 200 planned or realized schemes in Germany at most five were actually operating in 2005. In search for cooperation and city distribution centre initiative's success factors, Koehler (2004) found two successful initiatives that had a freight traffic centre incorporated: Nürnberg city logistics initiative, *Isolde*, and Regensburg city logistics project, *Reglog.* These initiatives have the following success factors in common (Koehler, 2004): restricted traffic conditions in the cities, mediator, scientific support in initial phase, integration of a freight traffic centre in the initiative, enforcement of regulations by local authorities, early involvement of all actors and collection of waste to utilize vehicles better by including the loads for the return trips to the freight centre.

- Nijmegen, The Netherlands (see [76])

Binnenstadservice.nl (BSS) in Nijmegen distinguishes itself from other UCC initiatives by its focus on receivers rather than on carriers. This concept is a technical success; in its first year operating 98 stores participated, Financially, there are still deficits for the second year without local authorities' subsidies. The number of trucks and also the number of kilometres in the city centre decreased. The effects on inconvenience for residents, traffic safety and shopping environment are locally well received. The effects on local air quality and noise nuisance are limited, due to the amount of remaining passenger and bus traffic and the high natural background concentration of PM_{10} and NO_2.

- London. (Source TFL)

The London Boroughs Consolidation Centre (LBCC) opened in January 2014, this is a partnership between the London Boroughs of Camden, Islington and Enfield. Initially stationery and cleaning supplies were delivered to the LBCC and a 3rd party logistics company delivers all items using two vehicles to all of the boroughs. A number of other suppliers have now been included therefore further reducing the number of vehicles on local roads. The initial cost for the running of the centre was derived from European grant funding and Camden Council. Going forward the partners are negotiating rebates from suppliers for reduced delivery costs. The centre is also available for use by private sector organisations who are expected to pay a fee to use the centre, this again can be offset by savings made through joint procurement and reduced delivery costs from suppliers.

A change in service and expectation has been necessary for the success of this project; previously the boroughs had next day, desk to desk delivery. This is considered to be a high standard service and unnecessary for most stock items; deliveries are now made on set days (2 or 3 times per week) which also allows operational staff to manage their time and workload more effectively.

These experiences are not recounted in order to evaluate the worth of UCC's, but to identify any characteristics that would cause an Urban Administration to require standards

I.2.1.6 Success and failure factors

Similarly, looking at success and failure factors, not from the point of justification for UCC's, but to identify potential standardisation issues, identified during these and other studies, come up with reasons, such as:

a) Research shows that many urban consolidation centres are only granted a short lifespan. Several reasons can be identified. First of all, because the cost of the additional trans-shipment often prevents them of being cost-effective. Therefore, they are dependent on governments willing to subsidize them because of their positive impact on congestion, emissions and the shopping climate. In addition, urban retailers do not always see their added value and therefore often opt out as soon they are expected to pay for the service.[82]

b) Carrier-willingness to cooperate in an urban consolidation centre is high at the start of an initiative and the fact that deliveries are already efficiently organized from a carrier-perspective is neglected. A problem in practice is that the number of participating carriers is usually far lower than expected, which implies less scale advantages and less bundling possibilities resulting in higher cost per delivery.[76] Ambrosini et al. (2004) and Regan and Golob (2005) estimate that only about 20% of the carriers are willing to use a urban consolidation centre. [82][83]

c) Many carriers still prefer directly supplying the stores without using the urban consolidation centre, even if policy restrictions are in place. [77][78] Although local authorities usually aim at offering consolidation centres as a means to deal with restricting policies, carriers perceive the regulations as a way to force them to use this unprofitable centre, although it raises their costs. Reluctance in the transport industry to use the UCC; e.g. already thin margins on transport, for complex goods using the UCC was legally not allowed and insurance companies did not allow valuable goods to be trans-shipped through the UCC. [78]

d) Another lesson from the initiatives for authorities is not to be over ambitious; for example, in case electric vehicles are used for the final deliveries in the city and these vehicles hinder traffic, social acceptance of the consolidation centre that uses these vehicles is probably very low. [78][79]

e) Consolidation centres might not have positive results for all type of deliveries; for example, one full truckload delivery for a store in the city centre is more efficient than several small vehicles. For example, food retail operations are already very efficient. For example a distinction can be made between full truckload and less than truckload deliveries to prevent the possible undesired side effects of a decrease in efficiency and an increase in the number of vehicles.[84]

f) From a logistical view, the major potential beneficiaries of an UCC are independent and small retailers as well as operators making small multi-drop deliveries in especially areas in which constraints on delivery conditions exists (e.g. restricting regulations or congestion.[72]). But this view is not generally shared by many of these so called 'beneficiary' small businesses. [78]

g) Urban consolidation centres have the most potential if there is enough external funding, as self-financing UCCs do not occur in practice yet. Another way to compensate for these extra costs might be by offering extra services, e.g. pick-up points for customers or storage facilities.[72]

h) Dablanc (2007)[85] notices a higher rate of "success", defined as systems still in existence after certain number of years, for small to medium-sized cities than for large ones. The reason for this is that the controlled zone is relatively small and close to the outskirts of the city where the UCC is located.[86]

i) The UCC was located too far away from the highway and from the city centre. Schoemaker (2002)[78]

j) The relation *supplier – carrier – shop* the owners regard as confidential. With special offers drawn from special sources the shops can differentiate their position to competitors. In a coordination project as an UCC the information could trickle to competitors. From which suppliers they get an order is a trade secret of the forwarders which in an UCC cooperation could be revealed to competitors. [78]

k) The transport companies believe that UCC-trans-shipment involves extra costs, risks and delays in delivery. So shop owners and forwarders are reluctant to cooperate. In addition, the transports that are performed by suppliers or shop owners on own account cannot be included in an UCC solution, because they do not want to carry over their transports to forwarders. [78]

l) The share of traffic an UCC solution can catch is only small. The grocery chains, the chains of department stores, the chains of restaurants, as e.g. McDonalds, and the parcel services have already optimized delivery systems and do not see gains in cooperation. A study of the German retail association showed that 64 % of the deliveries (measured in tons) to shops went to department stores (Hallier 1993, p. 12). The freight study of the city of Reading in 2003 revealed that a large amount of deliveries were performed by trucks owned by the retail chains (Browne et al. 2010, p. 5961). Deliveries of heating oil that are already optimized by the supplier to full truck loads by software of vehicle routing. Then there are many trips of delivery vans for service activities, as cleaning and repair which are not suitable to consolidation. [78]

m) Another large part of freight transport in the city is made by deliveries to construction sites that cannot be consolidated across different sites, because their constructions are built independently. Only in special cases a consolidation succeeds. In London, the delivery to four concurrent major construction sites were consolidated and savings in delivery times and delivery cost could be realized. But the after the finish of the constructions the consolidation centre was closed (Sugar 2009, case 11) . [78]

The CO-GISTIC project continues to explore these areas in the hope that it may find the solution that has eluded these many others, and are exploring the need for standards that help to optimise last mile deliveries. Topics to be covered include delivery parking spaces management, congestions, noise, pollution, night delivery, trans-boarding from big trucks to small electric vehicles, development of economic models and dynamic schedules and definition of KPIs for last mile delivery. This project will therefore provide better definition for many of the urban logistics Use Cases elaborated below in this section of the report. However, to the opinion of PT1701, based on the conclusions already extensively reached above, are unlikely to find any generally applicable solution until the motive power issues for commercial vehicles evolves sufficiently for zero tail-pipe commercial deliveries in urban zones; and the UCC concepts, except in very special cases, is unlikely to ever be competitive against existing commercial services. is never likely

One major factor that the public transport could not find in all of these references is that postal services, and delivery services already, in effect, provide UCCs. The studies generally recognised that large deliveries are made by major retailers using out of town consolidation services, and their own transport fleets, which effectively and commercially efficiently provide UCC consolidation for major deliveries. (It should be noted that most of these deliveries are made to premises purpose designed to accommodate the deliveries using private delivery bays) but substantively failed to recognise that smaller deliveries are already substantively made via national postal services and parcel delivery / courier services, consolidating their van-loads in in-town or out-of-town consolidation depots /sorting centres – effectively providing the UCC functions that the sustainable environment theorists espouse, albeit from commercial activities or a state postal service monopoly, rather than the administration-controlled or sub-contracted facilities envisaged; or are made by the transport of the shopkeeper/factory owner.

Unfortunately, while these ‘alternative’ UCCs offer the consolidation services, they generally use diesel vehicles to effect last mile deliveries.

I.2.1.7 Urban administration role in UCCs

What then is the role of the Urban administration in the provision or support of UCCs, and what standards to they require for that role?

On the basis of the results above it would appear that in general, UCC activities are already provided by other means than an administration-managed entity. However, in historical or otherwise limited access, or controlled access situations, where an urban administration is offering consolidation centres as a means to deal with restricting policies, an urban administration based service may be required/viable/ politically desirable. Other socio-political objectives may also require the provision and use of UCCs.

I.2.1.5 and I.2.1.6 are considered in depth, not to prove or disprove the need for UCCs (that is a political or societal decision), but to establish the role of urban administrations in any UCC provision, and identify any standards needed to support that role where it is chosen.

In these circumstances, what standards will assist the urban administration to fulfil its obligations?

It has been suggested that with the understanding the receiver of the item, UCCs and deliveries can be coordinated to reduce incomplete deliveries thus keeping, this can be achieved through real time updates of receivers’ location and ability to receive the item; and that sharing the data around location of the delivery can also prevent incomplete delivers, additionally many telematics providers can now record data on the emissions produced by the vehicle and the driving habits of the driver this data can then be collected and analysed to demonstrate the potential environmental benefits of using UCCs. It can also contribute to streamlining activity to increase the environmental benefits of UCCs. The experiences of actual trials lead to scepticism that end-users will be prepared to share such data, but it is possible that an administration-based database might be acceptable, and, if so, would need a standard, and would require the maintenance of a dynamic database. Because of commercial sensitivity and risk, it is unlikely that such a database could be hosted generally with other MIS data and access would have to be very controlled.

This would require UL-0111 Customer/Receiver databases. See Use Case UL-0111 (Customer/Receiver databases) below.

It has been suggested that sharing data about ordering and supply chain habits, can aid in consolidating procurement to use the UCC to maximum potential. However, see above for the results of studies into UCC trials, which indicate significant reticence in this respect. The risk of assisting preplanning for theft has also to be taken into account. However, UL-0111 could be used to satiate this possibility.

I.2.1.8 ISO Standards for operating UCC systems

ISO 26683-2, application interface profiles for land cargo transport data agglomeration and transfer (within the context and architecture described in ISO 26683 Part 1), using one or more of the reference list of International Standards defined in Annex A of ISO 26683-1.

Part 2 of ISO 26683 defines a number of application interface profiles for land cargo transport data to provide more land cargo transport visibility by using current technical standards, specifications and technologies related to cargo transport. FLC-CIC Profile No. L3-3 provides Item data agglomeration to vehicle OBE using short range RFID and/or bar-code where the tractor/truck does not have fixed OBE.

In this scenario, which is common in express parcel and postal delivery systems, and in supermarket/store, depot-store deliveries, fulfilment centres etc., the land conveyances do not have fixed OBE capability, but utilise driver operated portable equipment that communicates to the back-office system either by physical docking or by GSM/UMTS/LTE/ or similar wireless communications. Figure H-1 shows a typical example.

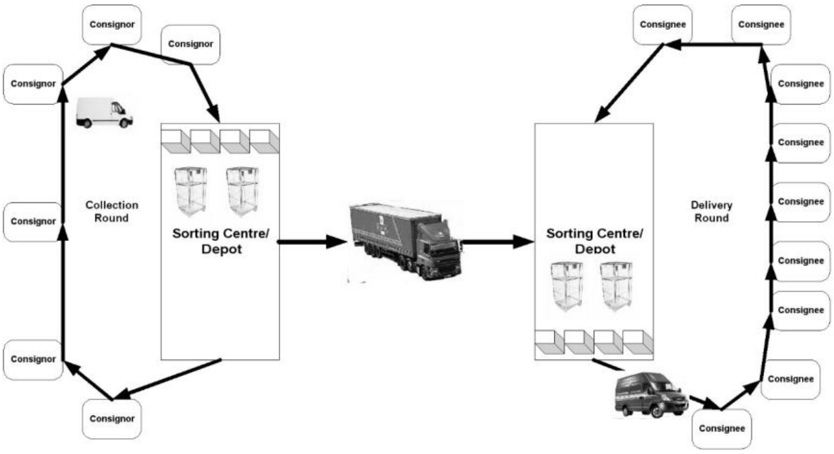


Figure I-1: Example of make and break bulk- Express packet service

Real time information is only possible if the portable equipment used is connected by GSM/UMTS/LTE/IMS/PDC/PHS or similar wireless communications technology. The actual wireless communications technology used by the portable equipment is not standardised and is a matter for local commercial decision.

- FLC-CIC - Profile No.L3-3: Interchange reference points are
  - Consignor item to collection land conveyance
  - Collection land conveyance to sorting centre/depot
  - Item to rollercage (or similar)
  - Rollercage (or similar) to bulk land conveyance
  - Bulk land conveyance to sorting centre/depot
  - Sorting centre/depot to delivery land conveyance
  - Delivery land conveyance to consignee.
- FLC-CIC - Profile No.L3-3: References the following identification standards:
  - ISO/IEC 15418 Information technology -- Automatic identification and data capture techniques -- GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance

- ISO/IEC 15420 Information technology -- Automatic identification and data capture techniques -- EAN/UPC bar code symbology specification.
- ISO/IEC 15394 Packaging -- Bar code and two-dimensional symbols for shipping, transport and receiving labels
- ISO/IEC 15424 Information technology -- Automatic identification and data capture techniques -- Data Carrier Identifiers (including Symbology Identifiers)
- ISO/IEC 15438 Information technology -- Automatic identification and data capture techniques -- PDF417 bar code symbology specification
- ISO 15394 Packaging -- Bar code and two-dimensional symbols for shipping, transport and receiving labels
- ISO/IEC15459-1 Information technology -- Unique identifiers -- Part 1: Unique identifiers for transport units
- ISO/IEC 15459-4 Information technology -- Unique identifiers -- Part 4: Individual items
- ISO/IEC 15459-5 Information technology -- Unique identifiers -- Part 5: Unique identifier for returnable transport items (RTIs)
- ISO 15961 Information technology -- Radio frequency identification (RFID) for item management -- Data protocol: application interface
- ISO 15962 Information technology -- Radio frequency identification (RFID) for item management -- Data protocol: data encoding rules and logical memory functions
- ISO/IEC 16022 Information technology -- Automatic identification and data capture techniques -- Data Matrix bar code symbology specification
- ISO/IEC 16023 Information technology -- International symbology specification -- MaxiCode
- ISO/IEC 16388 Information technology -- Automatic identification and data capture techniques -- Code 39 bar code symbology specification
- ISO 17363 Supply chain applications of RFID -- Freight containers
- ISO 17364 Supply chain applications of RFID -- Returnable transport items (RTIs)
- ISO 17365 Supply chain applications of RFID -- Transport units
- ISO 17366 Supply chain applications of RFID -- Product packaging
- ISO 17367 Supply chain applications of RFID -- Product tagging
- ISO 17687 Transport Information and Control Systems (TICS) -- General fleet management and commercial freight operations -- Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation
- ISO/IEC 18004 Information technology -- Automatic identification and data capture techniques -- QR Code 2005 bar code symbology specification
- ISO/IEC/IEEE 21450 Information technology -- Smart transducer interface for sensors and actuators -- Common functions, communication protocols, and Transducer Electronic Data Sheet (TEDS) formats
- ISO/IEC 21451-2 Information technology -- Smart transducer interface for sensors and actuators -- Part 2: Transducer to microprocessor communication protocols and Transducer Electronic Data Sheet (TEDS) formats

- ISO/IEC 21451-4 Information technology -- Smart transducer interface for sensors and actuators -- Part 4: Mixed-mode communication protocols and Transducer Electronic Data Sheet (TEDS) formats
- ISO 22742 Packaging -- Linear bar code and two-dimensional symbols for product packaging
- ISO 24533 Intelligent Transport Systems — Data dictionary and message set to facilitate the movement of freight and its intermodal transfer — Road transport information exchanges
- ISO 28219 Packaging -- Labelling and direct product marking with linear bar code and two-dimensional symbols

ISO 26683-2, FLC-CIC - Profile No.L3-3 specifies a system where, on commencing a collection round, the collector reads the identification data (RFID/bar-code/OCR) permanently attached to the collection conveyance. This data and is normally timestamped and is transmitted by the portable data collection equipment (PDE) to the back office via a wireless telecommunications link, (The type of wireless communication link is not specified and is a commercial operating decision.)

When the collector loads the consignor item on-board the collection conveyance he uses the PDE to register the item into the collection conveyance. That data is transmitted by the PDE to the back-office at intervals determined by the operator. When the collection round is complete and the collector arrives at the sorting office or depot, the collected items are registered into the depot as they are handed over from the collection conveyance to sorting centre/depot. This may be done using the PDE, but is more commonly achieved by automatic reading equipment in the sorting centre depot. (The type of reading equipment is not specified and is a commercial operating decision.)

The items are then consolidated by the sorting process, which will vary from instantiation to instantiation, but typically consolidate the collected items to rollercages (or similar) for onward shipment to a receiving sorting centre/depot. The items are normally registered into the rollercage (or similar) and the identification of the rollercage (or similar) added/associated to the collected data of the items inside (by reading its RFID tag/bar-code /OCR). The rollercage (or similar) is registered onto the bulk land conveyance as it is loaded, and the data uploaded to the back office. This may be done using PDE, but is more commonly achieved by automatic reading equipment in the sorting centre depot. The exit gate is often also registered for quality control purposes, but is not required. The data is associated with the bulk land conveyance identity, usually within the back office system. An electronic manifest may be uploaded to PDE in the bulk land conveyance but this is often not the case. The bulk land conveyance then transports its load to the receiving sorting centre/depot, where its cargo is unloaded and the rollercages (or similar) registered into the sorting centre/depot.

If the rollercages (or similar) are to be distributed directly to the consignee (as in the case for example of deliveries to a supermarket), they are transferred directly into the delivery conveyance and logged into it using most commonly PDE carried by the driver.

If the items are to be delivered individually or in small groups, they are unpacked from the rollercage (or similar), and are normally registered into the sorting centre at that stage as an audit step. They then pass through the sortation system and are either placed to warehouse store where they are registered into the warehouse, or are sorted directly to a delivery holding point.

On commencing a delivery round sequence, the deliverer reads the identification data (RFID/bar-code/OCR) permanently attached to the delivery conveyance. This data and is normally timestamped and is transmitted by the PDE to the back office via a wireless telecommunications link. The items are transferred from the holding point into the delivery conveyance and logged into it, most commonly using a PDE carried by the deliverer, but may be by other means. The delivery round conveyance then takes the items individually to the consignee, where the item is unloaded and, using the PDE, the driver logs out the item to the consignee, usually collecting a signature, bullet bar-code or similar to register delivery/receipt. The PDE then updates the back office system using the wireless link at intervals determined by the operator.

I.2.1.9 International Post Corporation Standards

In respect of suitable standardised delivery data, the International Post Corporation has provided letter, packet, parcel, rollercage etc. standards for postal corporations around the world for more than a quarter of a century.

I.2.1.9.1 IPC Symbology standards

a) **Barcode symbology for postal items**
A postal item is an individual mail piece. Barcode symbology Code 39 is the standard symbology for barcodes used on postal items.

b) **Barcode symbology for postal receptacles**
A postal receptacle is a uniquely identifiable collection of one or more letters, packets, empty bags, or items being transported together as part or all of a despatch. Barcode symbology Code 128 is the standard symbology for barcodes used on postal receptacles in conjunction with the. 29- character dynamic receptacle identifier.

c) **Communication of postal information using two-dimensional symbols**
This standard describes the use of two-dimensional digital indicia or array codes to convey postal information in the form of symbols printed on postal items, on item or receptacle labels and on accompanying documentation. The standard is intended for application in all cases in which postal information and identifiers are encoded, using two dimensional symbols, on postal items, receptacles, labels and forms which are exchanged between postal administrations. It may also beneficially be applied in cases in which only a single postal administration is involved.

d) **Data presentation in ASN.1**
This standard is part of a series of standards defining identification/codification standards for the UPU/IPC, for use in automatic data capture techniques (such as RFID and digital indicia). The document specifies the general presentation rules for transfer of ASN.1 data schemes between UPU members.

I.2.1.9.2 IPC Identification/codification standards

a) **Air carriers. identification/codification of**
The standard IATA 2-character air carrier codes are used to identify air carriers for postal purposes.

b) **Airports. identification/codification of**
The standard IATA 3-character airport codes are used to identify airports for postal purposes.

c) **Countries. identification/codification of**
The standard ISO Alpha 2-country codes are used to identify countries for postal purposes.

d) **Data constructs for the communication of information on postal items, batches and receptacles**

This standard provides a dictionary of data constructs for use in the communication of information about postal items and batches. It contains both simple data constructs, which correspond to elementary items of information about an item or group of items, and compound data constructs, which are built up from a series of simple constructs.

e) **FACT-Based licence plates for parcels**
This standard defines a UPU implementation of the CEN licence plate and associated label for the identification of parcels. It provides an open international standards-based identification for parcels and allows all parties (e.g. customers, customs, private transport providers) which handle a particular parcel

- to use the same identifier for automatic reading and tracking purposes. This common identity is useful as an alternative to a more limited identifier assigned by a postal enterprise.

f) FACT-Based representation of postal information and identifiers
This standard defines an architecture for the construction of data constructs which may be used to represent postal information and identifiers. The standard is consistent with FACT data identifiers as defined in ANSI standard MHl0.82-1995 and addresses the definition of licence plates while defining a means of structuring them consistent with CEN standards for them. The standard is applicable to post-specific data constructs which relate to data exchanged between postal enterprises, and/or between postal enterprises and third parties, based on the use of FACT data identifiers.

g) Framework for communication of information about postal items. batches and receptacles
This standard defines a reference framework for the communication of data concerning both individual and batches of postal items. It supports the integration of such data, with data stored in postal processing systems and databases, for the purpose of postal process and enterprise management. The standard applies to the communication of all data, exchanged between postal administrations, in a form which is, or is intended to be, directly captured and interpreted by postal information technology systems. Its application in other situations requiring the communication of postal data in process-able form is strongly encouraged.

h) Communication of postal information using two-dimensional symbols ID-Tagging of letter mail items
This standard defines the information content, structure, and representation of the UPU ID-tag for letter mail items up to and including C5 size items. ID-tags are placed on the reverse side of international mail items for identification purposes and can be used to measure transit times.

i) Placement area definitions; UPU EDI Message Development Guide
Guide to EDI message development.

j) RFID and RDC - Air interfaces: Communications and interfaces Part A: Parameters
This is one of a series of standards defining identification/codification standards for the UPU, for use in RFID and RDC systems. This standard provides a framework to define common communications protocols for each frequency, and, where possible, to determine the use of the same protocols for ALL frequencies such that the problems of migrating from one to another are diminished; to minimise software and implementation costs; and to enable system management and control and information exchange to be common as far as is possible. This standard (Part A: parameters), identifies which parameters must be determined in order to establish interoperability, and provides common methods of determination and description.

k) RFID- Reference architecture and terminology
This is the first of four standards dealing with RFID systems, which can be used to automatically identify postal items. This standard provides a reference structure to allow interoperability between different commercial systems so that there is unambiguous identification of messages from tagged postal items.

l) RFID - System requirements and test procedures
This is the second of four standards dealing with RFID systems, which can be used to automatically identify postal items. This standard provides a number of definitions, categorisations, and tests in order to enable users and suppliers of UPU RFID systems to specify system requirements that guarantee interoperability.

m) Item tracking events, identification/codification of
It is becoming increasingly important to track various events for particular postal products as they move through the postal system from posting to delivery. These item tracking events were originally designed for EMS (express recorded mail) items but can be used to track other items as well.

n) Office of exchange, identification/codification of
Offices of exchange are the originating or destination locations for a postal despatch. Offices of exchange are identified by a 6- character alpha code assigned by the International Bureau using a coding system based on UN/LOCODE location codes, and a subsidiary location code.

o) Postal consignments, identification/codification of
A postal consignment is a collection of mail - normally in bags or other receptacles - that is being transported as a whole from one location to another. A consignment is identified by a 12- character code consisting of the ISO country code and a unique alphanumeric identifier.

p) Postal despatches, identification/codification of
A postal despatch is a collection of mail - normally in bags or other receptacles - that is being transported from one exchange office to another. A despatch is identified by a unique 20-character dynamic identifier which contains information about the despatch.

q) Postal items, identification/codification of
It is sometimes necessary to be able to identify individual mail items, usually for tracking purposes. A unique 13-character identifier is used for individual items and its structure depends on the type of item, ie EMS, registered, insured, etc.

r) Postal receptacles. identification/codification of
A postal receptacle is a uniquely identifiable collection of one or more letters, packets, empty bags, or items being transported together as part or all of a despatch. It is identified by a unique 29-character dynamic identifier which contains information about the receptacle. This identifier fulfils various objectives relating to operations, quality of service, security, and accounting.

I.2.1.9.3 IPC EDI Messages standards

a) Format of message exchanges
UPU EDI messages follow the rules specified by UN EDIFACT. These rules comprise a set of internationally agreed standards and guidelines for the electronic interchange of structured data related to trade in goods and services. This standard contains a total overview of currently recognized UPU EDI messages and their interaction.

b) Standard messages for consignments
Contains a summary of the standard messages related to consignments and a complete description of each one can be found in the 'Message Development Guide', in documents (message standards) MlO, Ml2, and M21.

c) Standard messages for despatches
Contains a summary of the standard messages related to despatches and a complete description of each one can be found in the 'Message Development Guide', in documents (message standards) Mll, Ml3, Ml4, and M21.

d) Standard messages for items
Contains a summary of the standard messages related to postal items and a complete description of each one can be found in the 'Message Development Guide', in documents (message standards) Ml5, Ml6, Ml 7, and Ml 9.

e) Standard messages for transport
Contains a summary of the standard messages related to transport and a complete description of each one can be found in the 'Message Development Guide', in documents (message standards) M18, M20, and M22.

I.2.1.9.4 IPC Standards for word processing and document exchange

If word processing documents need to be exchanged via electronic mail between postal enterprises, Rich Text Format RTF) should be used as an intermediate file format for importing and exporting the files. This is recommended because word processing programs have different file formats which can cause problems.

I.2.1.10 Conclusions in respect of UCCs

I.2.1.10.1 Provides a standard for designing a standardised and interoperable system for a distribution/collection system such as that needed for a UCC operation.

I.2.1.10.2 Shows that the IPC has designed interoperable codification and message standards for every likely operational scenario that a UCC is likely to face. Although designed for national postal sorting and delivery organisations, by substituting the word ‘collection/delivery’, in place of ‘postal’, they meet all the requirements that a UCC is likely to face in its operations in respect of identification and messaging. They have been proven in use by the international postal community over a quarter of a century, in some cases since the end of WW2.

It should be pointed out that IPC also work closely with the Universal Postal Union (UPU), and largely have common standards, so the UPU can also be a source for postal delivery/ end to end delivery standards.

It may therefore be concluded that:

Rc_UL06- There are already adequate standards available to enable a fully interoperable UCC operation (and one that could co-exist interoperably with the international postal sector). However, guidelines on the operation of such UCCs (probably in the form of a Technical Specification, could be beneficial in finding and interpreting such available standards).

I.2.1.11 Full and partially laden trucks

One of the factors summarised above was, for example “a distinction can be made between full truckload and less than truckload deliveries to prevent the possible undesired side effects of a decrease in efficiency and an increase in the number of vehicles.”

Could standards provide assistance to the urban administration here?? It is generally felt that general commercial pressures will resolve these issues better than standardisation or regulation.

I.2.1.12 Pick-up points and storage facilities

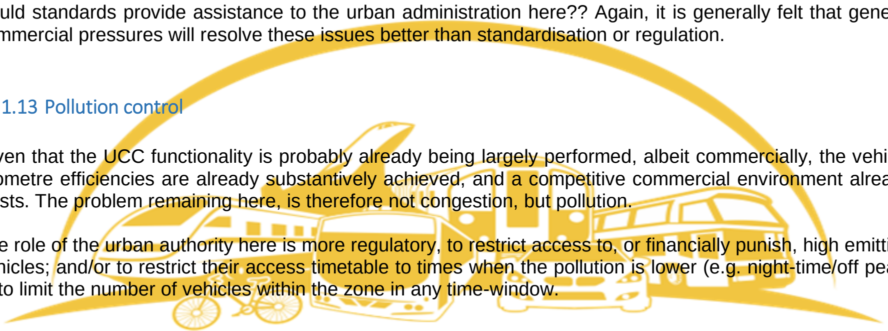
Another factor identified was “Another way to compensate for these extra costs might be by offering extra services, e.g. pick-up points for customers or storage facilities”

Could standards provide assistance to the urban administration here?? Again, it is generally felt that general commercial pressures will resolve these issues better than standardisation or regulation.

I.2.1.13 Pollution control

Given that the UCC functionality is probably already being largely performed, albeit commercially, the vehicle kilometre efficiencies are already substantively achieved, and a competitive commercial environment already exists. The problem remaining here, is therefore not congestion, but pollution.

The role of the urban authority here is more regulatory, to restrict access to, or financially punish, high emitting vehicles; and/or to restrict their access timetable to times when the pollution is lower (e.g. night-time/off peak) or to limit the number of vehicles within the zone in any time-window.



Regulation is outside the scope of this pre-study, but standards to support that regulation, collect emission data end enforce, may benefit from the support of or reference to standards.

Data about high emissions area, ULEZ and other environmental data can be shared which can improve the overall environmental strategy of UCCs. See UL 0219 Urban Low Emission Zone Management below.

I.2.2 UL Business service area

The FRAME Architecture identifies ITS in the following statement:

A Cooperative ITS is a subset of the overall ITS that:

- communicates and shares information between ITS-stations to give advice or facilitate actions
- with the objective of improving safety, sustainability, efficiency and comfort beyond the scope of stand-alone systems.

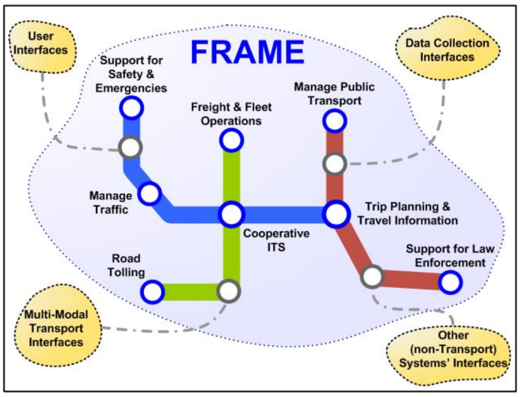

User Interfaces
FRAME
Data Collection Interfaces
Support for Safety & Emergencies
Freight & Fleet Operations
Manage Public Transport
Manage Traffic
Trip Planning & Travel Information
Cooperative ITS
Road Tolling
Support for Law Enforcement
Multi-Modal Transport Interfaces
Other (non-Transport) Systems' Interfaces

Figure I-2: The FRAME Overview Architecture

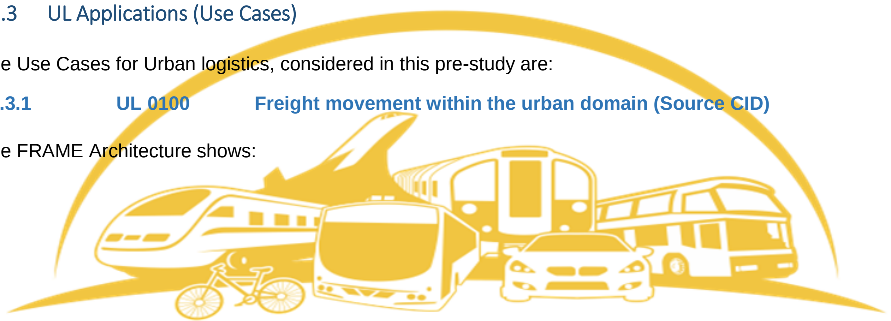
Loosely, the domain of Urban logistics falls in the area FRAME defines as “Freight and Fleet operations” More detailed FRAME architecture diagrams are reproduced against the appropriate category of Use Case, or particular Use Case, below. However, parking and alternative fuel distribution are, for convenience, included in this sector.

I.2.3 UL Applications (Use Cases)

The Use Cases for Urban logistics, considered in this pre-study are:

I.2.3.1 UL 0100 Freight movement within the urban domain (Source CID)

The FRAME Architecture shows:



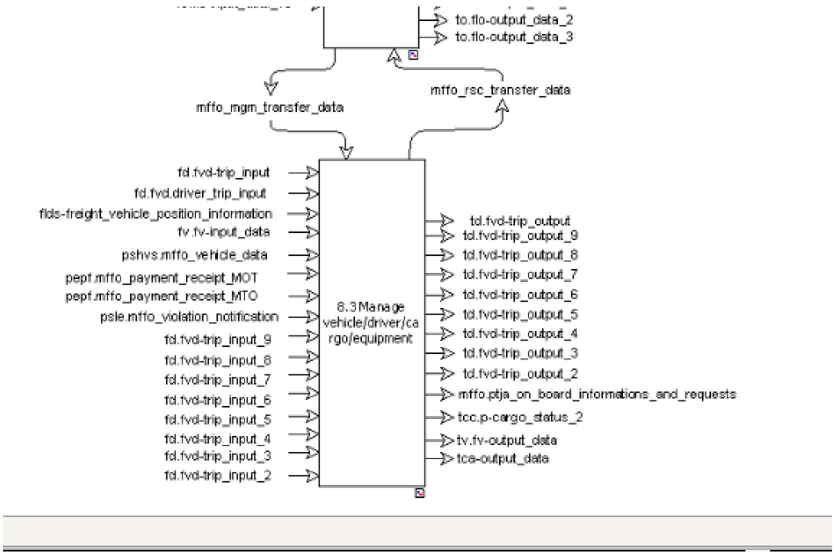

to.flo-output_data_2
to.flo-output_data_3
mffo_mgm_transfer_data
mffo_rsc_transfer_data
fd.fvd-trip_input
fd.fvd.driver_trip_input
flds-freight_vehicle_position_information
fv.fv-input_data
pshvs.mffo_vehicle_data
pepf.mffo_payment_receipt_MOT
pepf.mffo_payment_receipt_MTO
psle.mffo_violation_notification
fd.fvd-trip_input_9
fd.fvd-trip_input_8
fd.fvd-trip_input_7
fd.fvd-trip_input_6
fd.fvd-trip_input_5
fd.fvd-trip_input_4
fd.fvd-trip_input_3
fd.fvd-trip_input_2
8.3 Manage vehicle/driver/cargo/equipment
td.fvd-trip_output
td.fvd-trip_output_9
td.fvd-trip_output_8
td.fvd-trip_output_7
td.fvd-trip_output_6
td.fvd-trip_output_5
td.fvd-trip_output_4
td.fvd-trip_output_3
td.fvd-trip_output_2
mffo.ptja_on_board_informations_and_requests
tcc.p-cargo_status_2
tv.fv-output_data
tca-output_data

Figure I-3: Manage vehicle/driver/cargo/equipment

See Use Cases UL102, UL108, UL112, UL 201-212 (in respect of tools for complying with regulations, UL217, below.

.

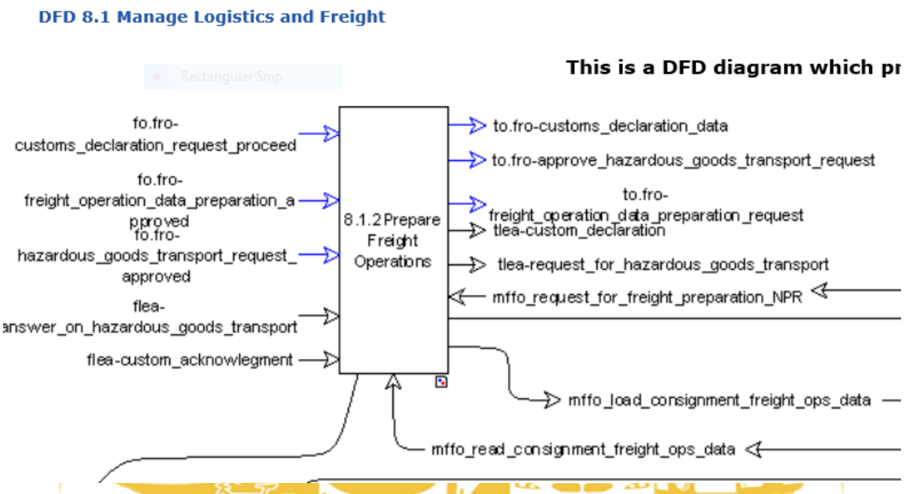

DFD 8.1 Manage Logistics and Freight
This is a DFD diagram which pr
Rectangular Snip
fo.fro-customs_declaration_request_proceed
fo.fro-freight_operation_data_preparation_approved
fo.fro-hazardous_goods_transport_request_approved
flea-answer_on_hazardous_goods_transport
flea-custom_acknowlegment
8.1.2 Prepare Freight Operations
to.fro-customs_declaration_data
to.fro-approve_hazardous_goods_transport_request
to.fro-freight_operation_data_preparation_request
tlea-custom_declaration
tlea-request_for_hazardous_goods_transport
mffo_request_for_freight_preparation_NPR
mffo_load_consignment_freight_ops_data
mffo_read_consignment_freight_ops_data

Figure I-4 : FRAME Architecture Prepare Freight Operations

See Use Cases UL-0101, UL-0105, UL-0106, UL-0107, UL-0108, UL-0109, UL-0213, UL-0214, UL-0215, UL-0218, UL-0221, UL-0401, UL-0501.

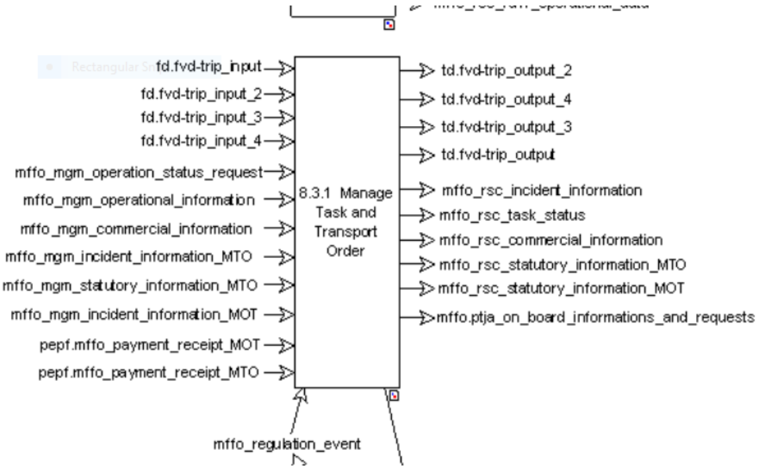

fd.fvd-trip_input
fd.fvd-trip_input_2
fd.fvd-trip_input_3
fd.fvd-trip_input_4
mffo_mgm_operation_status_request
mffo_mgm_operational_information
mffo_mgm_commercial_information
mffo_mgm_incident_information_MTO
mffo_mgm_statutory_information_MTO
mffo_mgm_incident_information_MOT
pepf.mffo_payment_receipt_MOT
pepf.mffo_payment_receipt_MTO
8.3.1 Manage Task and Transport Order
td.fvd-trip_output_2
td.fvd-trip_output_4
td.fvd-trip_output_3
td.fvd-trip_output
mffo_rsc_incident_information
mffo_rsc_task_status
mffo_rsc_commercial_information
mffo_rsc_statutory_information_MTO
mffo_rsc_statutory_information_MOT
mffo.ptja_on_board_informations_and_requests
mffo_regulation_event

Figure I-5: FRAME Architecture – Manage task and transport order

See Use Cases UL-0102 and UL-0108 below.

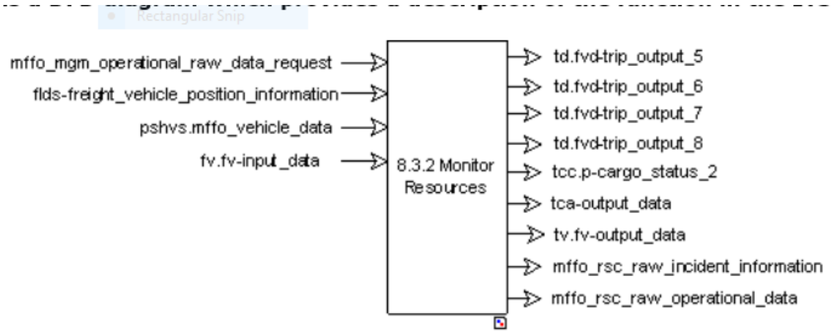

mffo_mgm_operational_raw_data_request
flds-freight_vehicle_position_information
pshvs.mffo_vehicle_data
fv.fv-input_data
8.3.2 Monitor Resources
td.fvd-trip_output_5
td.fvd-trip_output_6
td.fvd-trip_output_7
td.fvd-trip_output_8
tcc.p-cargo_status_2
tca-output_data
tv.fv-output_data
mffo_rsc_raw_incident_information
mffo_rsc_raw_operational_data

Figure I-6: FRAME Architecture – Monitor resources

There are no Use Cases associated with this item as PT1701, while recognising the need for this task, cannot find a case for standardisation of this activity.

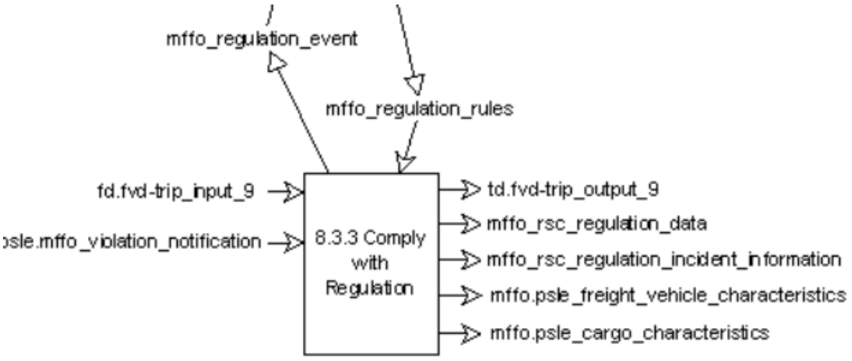
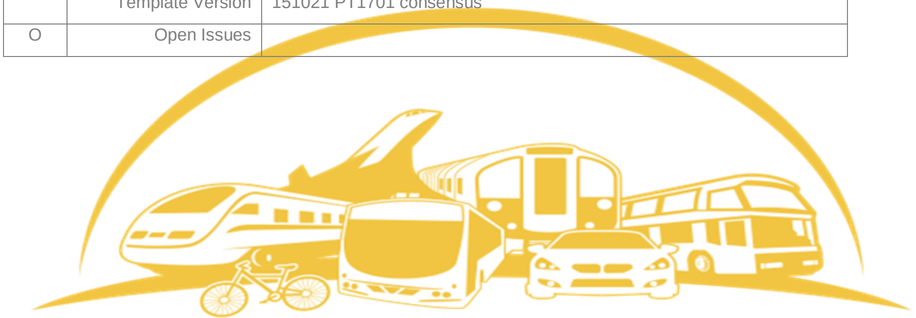

mffo_regulation_event
mffo_regulation_rules
fd.fvd-trip_input_9
sle.mffo_violation_notification
8.3.3 Comply with Regulation
td.fvd-trip_output_9
mffo_rsc_regulation_data
mffo_rsc_regulation_incident_information
mffo.psle_freight_vehicle_characteristics
mffo.psle_cargo_characteristics

Figure I-7: FRAME Architecture - Comply with Regulation

See Use Cases UL-0112, UL-0201-0212 (in respect of tools for complying with regulations, UL-0217, below.

I.2.3.1.1 UL 0101Optimising Modal Choice (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Optimising Modal Choice**
M	**Use Case reference /id**	**UL-0101 v1 20151120**
M	Description	Optimising Modal Choice for last mile freight movements/deliveries
M	Scope	?more input from opticities and CO-GISTICS needed. Identifying and codifying option parameters and assessment criteria; codifying available information and identifying and specifying information sources.
M	Scenario	There may exist a range of options for delivery of freight within cities. These modal choices are based on different criteria than those made for passenger journey modal choices. They are dependent on services available (own delivery, own consolidation, shared consolidation, courier delivery, postal delivery), fulfilment centre, access constraints (type of vehicle, time of access, etc.) etc.
M	Actors Involved	Freight carriers, urban administrations, recipients/despatchers, drivers
M	Stakeholders	Recipients/despatchers, urban administrations, freight operator
M	MIS / TM / UL	UL and probably MIS
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified.
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Recommended Actions	Adequate standards already exist. No new requirements identified.
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



I.2.3.1.2 UL 0102Providing Delivery Service (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Providing Delivery Service**
M	**Use Case reference /id**	**UL-0102 v2 20150416**
M	Description	Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	Organising and providing commercial deliveries in urban areas (Project Co-Logistics) The freight transportation industry must achieve high performance levels in terms of economic efficiency and quality of service to optimise and increase the efficiency of the cargo transport operations (minimizing costs, times and use of resources like space and equipment) taking advantage of the data visibility from the logistic services (e.g. proof of delivery, route planning, track and trace...) and cooperative systems. The last mile of the cargo transportation process (cargo delivery) is a crucial step in the overall process and its proper monitoring can guarantee increased quality of service and improvements on exception handling or avoidance of possible errors on deliveries. See also UL-0213
M	Actors Involved	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	MIS / TM / UL	UL and possibly MIS
M	Assumptions	Closely related to interurban movements of product are channelled to a UCC, consolidated, and driven ‘the last mile’ in a low emission vehicle, properly loaded to maximise delivery efficiency, and the same vehicles could effect collection rounds, delivering the collected items to the UCC from where they can make a modal shift to other transport means for the next stage of their journey.
M	Stakeholders	Urban administration Freight centre manager Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL

M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	*ISO 26683-1 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 1: Context, architecture and referenced standards* *ISO 26683-2 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 2: Application interface profiles* **Universal Post Corporation Standards** a) Barcode symbology for postal items b) Barcode symbology for postal receptacles c) Communication of postal information using two-dimensional symbols d) Data presentation in ASN.1 **IPC Identification/codification standards** a) Air carriers. identification/codification of b) Airports. identification/codification of c) Countries. identification/codification of d) Data constructs for the communication of information on postal items, batches and receptacles e) FACT-Based licence plates for parcels f) FACT-Based representation of postal information and identifiers g) Framework for communication of information about postal items. batches and receptacles h) Communication of postal information using two-dimensional symbols ID-Tagging of letter mail items i) Placement area definitions; UPU EDI Message Development Guide j) RFID and RDC - Air interfaces: Communications and interfaces Part A: Parameters k) RFID- Reference architecture and terminology l) RFID - System requirements and test procedures n) Item tracking events, identification/codification of n) Office of exchange, identification/codification of o) Postal consignments, identification/codification of p) Postal despatches, identification/codification of q) Postal items, identification/codification of r) Postal receptacles. identification/codification of IPC EDI Messages standards a) Format of message exchanges b) Standard messages for consignments c) Standard messages for despatches d) Standard messages for items e) Standard messages for transport
O	Relationships to other "Use Case(s)"	(A subset of UL 0213)
	Standardisation gaps identified	IPC has designed interoperable codification and message standards for every likely operational scenario that a UCC is likely to face. Although designed for national postal sorting and delivery organisations, by substituting the word 'collection/delivery', in place of 'postal', they meet all the requirements that a UCC is likely to face in its operations in respect of identification and messaging. They have been proven in use by the international postal community over a quarter of a century, in some cases since the end of WW2. ISO 26683 provides methodology for the UCC consolidation and final round process.

•		**It may therefore be concluded that:** **There are already adequate standards available to enable a fully interoperable UCC operation (and solutions that can co-exist interoperably with the international postal sector).**
	Recommended Actions	No further actions recommended at this point in time
	Template Version	151021 PT1701 consensus
O	Open Issues	

Extract from ISO 26683-2,

FLC-CIC Profile No.L3-3: Item data agglomeration to vehicle OBE using short range RFID and/or bar-code where the tractor/truck does not have fixed OBE (OPTIONAL)

FLC-CIC - Profile No.L3-3: scenario illustration

In this scenario, which is common in express parcel and postal delivery systems, fulfilment centres, and in supermarket/store depot-store deliveries, etc., fulfilment centres (e.g. Amazon), the land conveyances do not have fixed OBE capability that can communicate in the manner described in Profiles 1 – 7, but utilise driver operated portable equipment that communicates to the back-office system either by physical docking or by GSM/UMTS/LTE/IMS/PDC/PHS or similar wireless communications. See Figure I.1 above.

Real time information is only possible if the portable equipment used is connected by GSM/UMTS/LTE/IMS/PDC/PHS or similar wireless communications technology. The actual wireless communications technology used by the portable equipment is not standardised and is a matter for local commercial decision.

FLC-CIC - Profile No.L3-3: Interchange reference points

Consignor item to collection land conveyance

Collection land conveyance to sorting centre/depot

Item to rollercage (or similar)

Rollercage (or similar) to bulk land conveyance

Bulk land conveyance to sorting centre/depot

Sorting centre/depot to delivery land conveyance

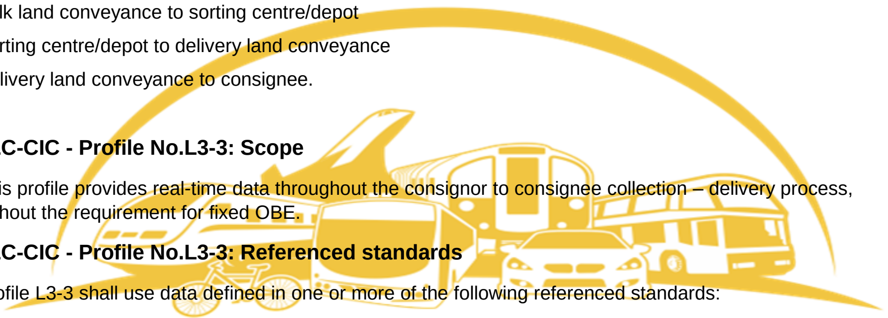
Delivery land conveyance to consignee.

FLC-CIC - Profile No.L3-3: Scope

This profile provides real-time data throughout the consignor to consignee collection – delivery process, without the requirement for fixed OBE.

FLC-CIC - Profile No.L3-3: Referenced standards

Profile L3-3 shall use data defined in one or more of the following referenced standards:



ISO/IEC 15418	Information technology -- Automatic identification and data capture techniques -- GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance
ISO/IEC 15420	Information technology -- Automatic identification and data capture techniques -- EAN/UPC bar code symbology specification.
ISO/IEC 15394	Packaging -- Bar code and two-dimensional symbols for shipping, transport and receiving labels
ISO/IEC 15424	Information technology -- Automatic identification and data capture techniques -- Data Carrier Identifiers (including Symbology Identifiers)
ISO/IEC 15438	Information technology -- Automatic identification and data capture techniques -- PDF417 bar code symbology specification
ISO 15394	Packaging -- Bar code and two-dimensional symbols for shipping, transport and receiving labels
ISO/IEC15459-1	Information technology -- Unique identifiers -- Part 1: Unique identifiers for transport units
ISO/IEC 15459-4	Information technology -- Unique identifiers -- Part 4: Individual items
ISO/IEC 15459-5	Information technology -- Unique identifiers -- Part 5: Unique identifier for returnable transport items (RTIs)
ISO 15961	Information technology -- Radio frequency identification (RFID) for item management -- Data protocol: application interface
ISO 15962	Information technology -- Radio frequency identification (RFID) for item management -- Data protocol: data encoding rules and logical memory functions
ISO/IEC 16022	Information technology -- Automatic identification and data capture techniques -- Data Matrix bar code symbology specification
ISO/IEC 16023	Information technology -- International symbology specification -- MaxiCode
ISO/IEC 16388	Information technology -- Automatic identification and data capture techniques -- Code 39 bar code symbology specification
ISO 17363	Supply chain applications of RFID -- Freight containers
ISO 17364	Supply chain applications of RFID -- Returnable transport items (RTIs)
ISO 17365	Supply chain applications of RFID -- Transport units
ISO 17366	Supply chain applications of RFID -- Product packaging
ISO 17367	Supply chain applications of RFID -- Product tagging
ISO 17687	Transport Information and Control Systems (TICS) -- General fleet management and commercial freight operations -- Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation

ISO/IEC 18004	Information technology -- Automatic identification and data capture techniques -- QR Code 2005 bar code symbology specification
ISO/IEC/IEEE 21450	Information technology -- Smart transducer interface for sensors and actuators -- Common functions, communication protocols, and Transducer Electronic Data Sheet (TEDS) formats
ISO/IEC 21451-2	Information technology -- Smart transducer interface for sensors and actuators -- Part 2: Transducer to microprocessor communication protocols and Transducer Electronic Data Sheet (TEDS) formats
ISO/IEC 21451-4	Information technology -- Smart transducer interface for sensors and actuators -- Part 4: Mixed-mode communication protocols and Transducer Electronic Data Sheet (TEDS) formats
ISO 22742	Packaging -- Linear bar code and two-dimensional symbols for product packaging
ISO 24533	Intelligent Transport Systems — Data dictionary and message set to facilitate the movement of freight and its intermodal transfer — Road transport information exchanges
ISO 28219	Packaging -- Labelling and direct product marking with linear bar code and two-dimensional symbols

ISO 26683-2 FLC-CIC - Profile No.L3-3: Requirements

On commencing a collection round, the collector shall read the identification data (RFID/bar-code/OCR) permanently attached to the collection conveyance. This data and is normally time-stamped and is transmitted by the portable data collection equipment (PDE) to the back office via a wireless telecommunications link.

The type of wireless communication link is not specified and is a commercial operating decision.

When the collector loads the consignor item on-board the collection conveyance he uses the PDE to register the item into the collection conveyance. That data is transmitted by the PDE to the back-office at intervals determined by the operator.

NOTE: It may be for example, every time that an item is physically collected from a consignor, or every x minutes, etc.

When the collection round is complete and the collector arrives at the sorting office or depot, the collected items shall be registered into the depot as they are handed over from the collection conveyance to sorting centre/depot. This may be done using the PDE, but is more commonly achieved by automatic reading equipment in the sorting centre depot.

The type of reading equipment is not specified and is a commercial operating decision.

The items are then consolidated by the sorting process, which will vary from instantiation to instantiation, but typically consolidate the collected items to rollercages (or similar) for onward shipment to a receiving sorting centre/depot. The items are normally registered into the rollercage (or similar) and the identification of the rollercage (or similar) added/associated to the collected data of the items inside (by reading its RFID tag/bar-code /OCR).

The rollercage (or similar) is registered onto the bulk land conveyance as it is loaded, and the data uploaded to the back office. This may be done using PDE, but is more commonly achieved by automatic reading equipment in the sorting centre depot. The exit gate is often also registered for quality control purposes, but is not required. The data is associated with the bulk land conveyance identity, usually within the back office system. An electronic manifest may be uploaded to PDE in the bulk land conveyance but this is often not the case.

The bulk land conveyance shall then transport its load to the receiving sorting centre/depot, where its cargo is unloaded and the rollercages (or similar) registered into the sorting centre/depot.

If the rollercages (or similar) are to be distributed directly to the consignee (as in the case for example of deliveries to a supermarket), they are transferred directly into the delivery conveyance and logged into it using most commonly PDE carried by the driver.

If the items are to be delivered individually or in small groups, they are unpacked from the rollercage (or similar), and are normally registered into the sorting centre at that stage as an audit step. They then pass through the sortation system and are either placed to warehouse store where they are registered into the warehouse, or are sorted directly to a delivery holding point.

On commencing a delivery round sequence, the deliverer shall read the identification data (RFID/bar-code/OCR) permanently attached to the delivery conveyance. This data and is normally timestamped and is transmitted by the portable data collection equipment (PDE) to the back office via a wireless telecommunications link

The items are transferred from the holding point into the delivery conveyance and shall be logged into it, most commonly using PDE carried by the deliverer, but may be by other means.

The delivery round conveyance shall then take the items individually to the consignee, where the item is unloaded and, using the PDE, the driver logs out the item to the consignee, usually collecting a signature, bullet bar-code or similar to register delivery/receipt. The PDE then updates the back office system using the wireless link at intervals determined by the operator.

FLC-CIC - Profile No.L3-3: Conformance provisions

Conformance shall be in accordance with conformance requirements of the referenced standards used.

I.2.3.1.3 UL 0103Exchange information with other authorities in area of security (Source OPTICITIES)*

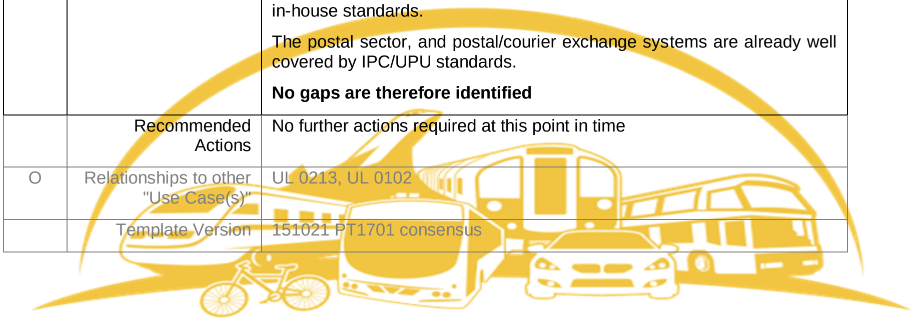
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Exchange information with other authorities in area of security**
M	**Use Case reference /id**	**UL-0103 v1 20151120**
M	Description	Requires information from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.4 UL 0104Exchange information with other authorities in area of environmental risk (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Exchange information with other authorities in area of environmental risk**
M	**Use Case reference /id**	**UL-0104 v1 20151120**
M	Description	Requires information from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.5 UL 0105Pre-trip planning – Freight (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Pre-trip planning – Freight**
M	**Use Case reference /id**	**UL-0105 v1 20151124**
M	Description	Requires information from Opticities Objective and textual description
M	Scope	Pre-trip planning/scheduling of movement of freight to an in-house or commercial consolidation centre/sorting office and then scheduling to last mile delivery
M	Scenario	Planning the movement of freight for delivery into an urban zone Closely related to UL 0102 and UL 0213
M	Actors Involved	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	MIS / TM / UL	UL, potentially also MIS
M	Assumptions	Pre-trip planning for freight uses significantly different criteria than that for personal transit Pre-trip planning is part of any consolidation and last mile delivery scheduling (be it UCC, in-house, courier, postal delivery services, fulfilment centre)
M	Available Standards	
M	Standardisation gaps identified*	Delivery scheduling will only *require* standards where it is being organised via a shared resource (UCC, postal delivery service, courier service, fulfilment centre. In house solutions or contracted courier services can use in-house standards. The postal sector, and postal/courier exchange systems are already well covered by IPC/UPU standards. **No gaps are therefore identified**
	Recommended Actions	No further actions required at this point in time
O	Relationships to other "Use Case(s)"	UL 0213, UL 0102
	Template Version	151021 PT1701 consensus



I.2.3.1.6 UL 0106Dynamic navigation (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Dynamic navigation**
M	**Use Case reference /id**	**UL-0106 v1 20151120**
M	Description	Requires information from opticities as to why this is a special case for urban freight… otherwise this is an MIS Use Case Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL/MIS
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	RRecommended action	Please see MIS Use Case
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.7 UL 0107 Embedded digital maps (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Embedded digital maps**
M	**Use Case reference /id**	**UL-0107 v1 20151120**
M	Description	Requires information from opticities as to why this is a special case for urban freight… otherwise this is an MIS Use Case
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL/MIS
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.8 UL 0108 Last mile parcel tracking (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Last mile parcel tracking**
M	**Use Case reference /id**	**UL-0108 v2 20160417**
M	Description	See UL-0213, UL-0102 This is a subset of UL 0213
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	See UL 0213
O	Relationships to other "Use Case(s)"	Subset of UL 0213
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps,starting at one, preferably in order needed to be carried out (high level)
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.9 UL 0109Freight Manager and driver assistant (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Freight Manager and driver assistant**
M	**Use Case reference /id**	**UL-0109 v1 20151120**
M	Description	Requires information from opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.10 UL 0110Access to Traffic information (Source OPTICITIES/ IRU)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Access to Traffic Information**
M	**Use Case reference /id**	**UL-0110 v1 20151120**
M	Description	Provision of relevant traffic information- congestion; green wave; etc. data.
M	Scope	Information relevant to enable vehicle to time and route their journey effectively. Closely related to “Optimise Delivery” UL0112.
M	Scenario	Freight vehicles get access to dynamic congestion, green wave information, etc. so they can increase the efficiency of travel though the urban zone.
M	Actors Involved	Urban authority, TM
M	Stakeholders	Urban authority Freight drivers Freight operators Route planners/schedulers/managers
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	Provision of relevant traffic information- congestion; green wave; etc. data GAP: Information in a standard form from Urban Authority TMs Although this could be of significance in reducing urban pollution and reducing congestion, this subject is nowhere near standardisation. A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update would seem the appropriate way to take this work forward
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.11 UL 0111Customer/Receiver databases (Source TFL)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Customer/Receiver databases**
M	**Use Case reference /id**	**UL-0111 v1 20151120**
M	Description	Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	By understanding the receiver of the item, UCCs and deliveries can be coordinated to reduce incomplete deliveries thus keeping, this can be achieved through real time updates of receivers' location and ability to receive the item.
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	After discussions we conclude that while it would be nice for the urban authority to have access to this data, it is commercially sensitive and there is likely to be significant resistance to making this data available, and the benefit is not quantifiably significant.
M	Available Standards	
M	Standardisation gaps identified*	Standardisation not appropriate at this stage
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.12 UL 0112 Delivery vehicle realtime mapping/route optimisation (Source TFL/ IRU)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Delivery vehicle real-time mapping/route optimisation**
M	**Use Case reference /id**	**UL-0112 v3 20160416**
M	Description	Geofencing and controlling routes that trucks or certain classes of trucks can use; direct along freight routes and corridors, manage adaptable restrictions
M	Scope	Real-time mapping/route control/route optimisation for freight vehicles Closely related to UL-0106 and related to UL-0113 and UL-0108
M	Scenario	Urban administrations wish to control routes that commercial vehicles take through the urban zone. In many cases this involves freight corridors to manage congestion and pollution, and these corridors may be dynamic dependant on time of day or congestion. Truck operators need to use these restrictions dynamically and have access to information in a standard format. *Geofencing* Uses GNSS systems to create a virtual zone around a particular location which activates the electric mode of hybrid vehicle buses with extended zero emission capability and other hybrid vehicles when they enter the ultra low emission zone or other zones. TfL are trialling this on hybrid buses. This can be configured to allow 'hard zones', where buses certain vehicles/taxis must always run in electric mode and 'soft zones' where they run in electric mode if there is enough battery charge remaining. The technology could also be used in low emission neighbourhoods and other roads with high concentrations of NOx and high levels of pedestrian activity. The technology could also extend to taxis although the lack of planned routeing introduces difficulties in knowing when charging will be needed. Further research into he feasibility of taxis using geofencing is needed.
M	Actors Involved	Commercial vehicle busses, taxis drivers; urban administrations and their agents
M	Stakeholders	Urban administrations, owners of affected vehicles
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	

M	Standardisation gaps identified*	1) Standard format for information made available from urban authority to truck operators/drivers (this would be quite a complex information matrix). 2)*Question. If the data is available in a standard format, is there any need for standards regarding real-time mapping and route optimisation, or is that a marketplace product (using the standardised data)* 3) Standardising Geofencing protocols etc. The CO-GISTICS project sees the need for standards that help to optimise last mile deliveries. Topics to be covered include delivery parking spaces management, congestions, noise, pollution, night delivery, trans-boarding
	Recommended Action	Standard format for information made available from urban authority to truck operators/drivers. A project team is probably required in order to develop such a matrix in order that it could apply across EU Geofencing. A project team is probably required in respect of standardising geofencing protocols
O	Relationships to other "Use Case(s)"	UL 0106, UL 0113
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	**Expected Outcomes**	**TS on standard format for information regarding freight corridors, access restrictions and times** **TS on Geofencing**
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.1.13 UL-0113 Comply with regulations (Source FRAME Architecture)

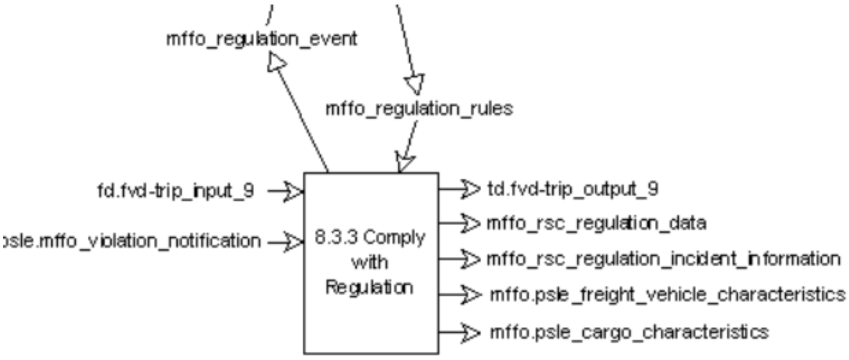

mffo_regulation_event
mffo_regulation_rules
fd.fvd-trip_input_9
psle.mffo_violation_notification
8.3.3 Comply with Regulation
td.fvd-trip_output_9
mffo_rsc_regulation_data
mffo_rsc_regulation_incident_information
mffo.psle_freight_vehicle_characteristics
mffo.psle_cargo_characteristics

Figure I-8 : Comply with regulation

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Comply with regulations**
M	**Use Case reference /id**	**UL-0113 v1 20151120**
M	Description	This is a provision in the FRAME Architecture
M	Scope	Use of standards to enable/enforce regulation
M	Scenario	Vehicles operating within an urban zone need to comply with regulations
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	The Use Cases UL0201 – to UL 0212, UL 0214, and UL 0300 series provide means to achieve this Use Case.
M	Standardisation gaps identified*	See Use Cases UL 0201 – UL 0212, UL 0214, and UL 0300 series
O	Relationships to other "Use Case(s)"	The Use Cases UL0201 – to UL 0212, UL 0214, and UL 0300 series provide means to achieve this Use Case.
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.2 UL-0200 Management of freight vehicles within the urban zone (Source CID)

The FRAME Architecture shows:

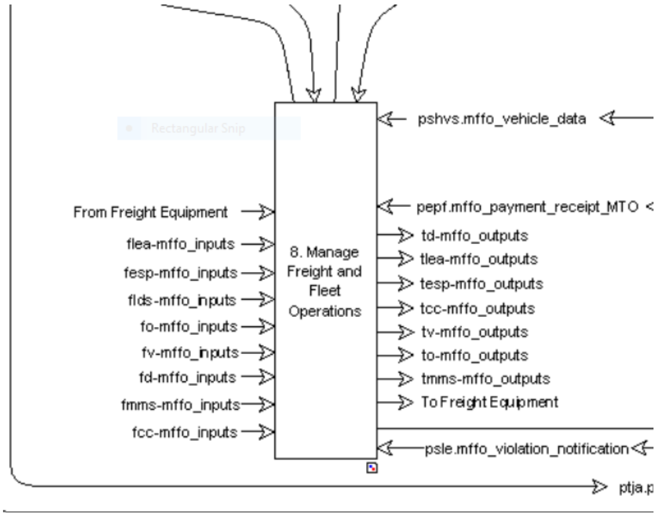

pshvs.mffo_vehicle_data
pepf.mffo_payment_receipt_MTO
From Freight Equipment
flea-mffo_inputs
fesp-mffo_inputs
flds-mffo_inputs
fo-mffo_inputs
fv-mffo_inputs
fd-mffo_inputs
fmms-mffo_inputs
fcc-mffo_inputs
8. Manage Freight and Fleet Operations
td-mffo_outputs
tlea-mffo_outputs
tesp-mffo_outputs
tcc-mffo_outputs
tv-mffo_outputs
to-mffo_outputs
tmms-mffo_outputs
To Freight Equipment
psle.mffo_violation_notification
ptja.p

Figure I-9 : FRAME Architecture: Manage Freight and Fleet operations

See Use Cases UL-0102, UL-0219, UL-0220, UL-0223, UL-0224 below.

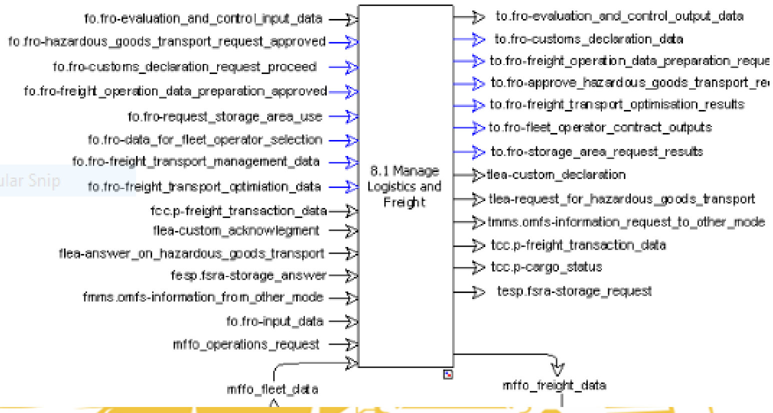

fo.fro-evaluation_and_control_input_data
fo.fro-hazardous_goods_transport_request_approved
fo.fro-customs_declaration_request_proceed
fo.fro-freight_operation_data_preparation_approved
fo.fro-request_storage_area_use
fo.fro-data_for_fleet_operator_selection
fo.fro-freight_transport_management_data
fo.fro-freight_transport_optimiation_data
fcc.p-freight_transaction_data
flea-custom_acknowlegment
flea-answer_on_hazardous_goods_transport
fesp.fsra-storage_answer
fmms.omfs-information_from_other_mode
fo.fro-input_data
mffo_operations_request
mffo_fleet_data
8.1 Manage Logistics and Freight
to.fro-evaluation_and_control_output_data
to.fro-customs_declaration_data
to.fro-freight_operation_data_preparation_reque
to.fro-approve_hazardous_goods_transport_re
to.fro-freight_transport_optimisation_results
to.fro-fleet_operator_contract_outputs
to.fro-storage_area_request_results
tlea-custom_declaration
tlea-request_for_hazardous_goods_transport
tmms.omfs-information_request_to_other_mode
tcc.p-freight_transaction_data
tcc.p-cargo_status
tesp.fsra-storage_request
mffo_freight_data

Figure I-10 : FRAME Architecure - Manage Logistics and Freight

See Use Cases , UL-0101, UL-0105, UL-0106, UL-0107, UL-0108, UL-0109, UL111, UL112; UL-0213, UL-0214, UL-0215, UL-0218, UL-0221, UL-0401, UL-0501.

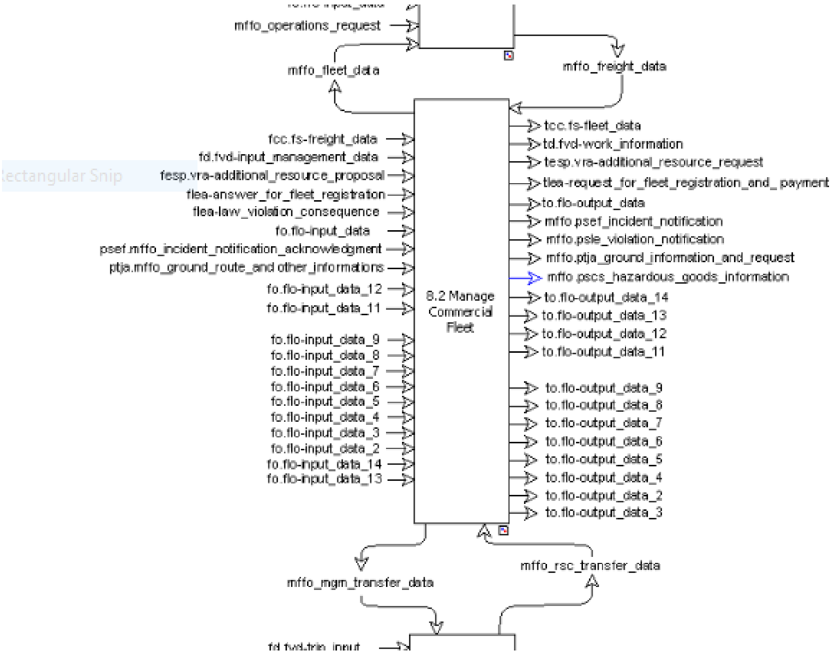

mffo_operations_request
mffo_fleet_data
mffo_freight_data
fcc.fs-freight_data
fd.fvd-input_management_data
ectangular Snip
fesp.vra-additional_resource_proposal
flea-answer_for_fleet_registration
flea-law_violation_consequence
fo.flo-input_data
psef.mffo_incident_notification_acknowledgment
ptja.mffo_ground_route_and other_informations
fo.flo-input_data_12
fo.flo-input_data_11
fo.flo-input_data_9
fo.flo-input_data_8
fo.flo-input_data_7
fo.flo-input_data_6
fo.flo-input_data_5
fo.flo-input_data_4
fo.flo-input_data_3
fo.flo-input_data_2
fo.flo-input_data_14
fo.flo-input_data_13
8.2 Manage Commercial Fleet
tcc.fs-fleet_data
td.fvd-work_information
tesp.vra-additional_resource_request
tlea-request_for_fleet_registration_and_payment
to.flo-output_data
mffo.psef_incident_notification
mffo.psle_violation_notification
mffo.ptja_ground_information_and_request
mffo.pscs_hazardous_goods_information
to.flo-output_data_14
to.flo-output_data_13
to.flo-output_data_12
to.flo-output_data_11
to.flo-output_data_9
to.flo-output_data_8
to.flo-output_data_7
to.flo-output_data_6
to.flo-output_data_5
to.flo-output_data_4
to.flo-output_data_2
to.flo-output_data_3
mffo_mgm_transfer_data
mffo_rsc_transfer_data
fd.fvd-trip_input

Figure I-11 : FRAME Architecture – Manage commercial fleet

See Use Cases UL-0102, UL-0219, UL-0220, UL-0223, UL-0224 below.

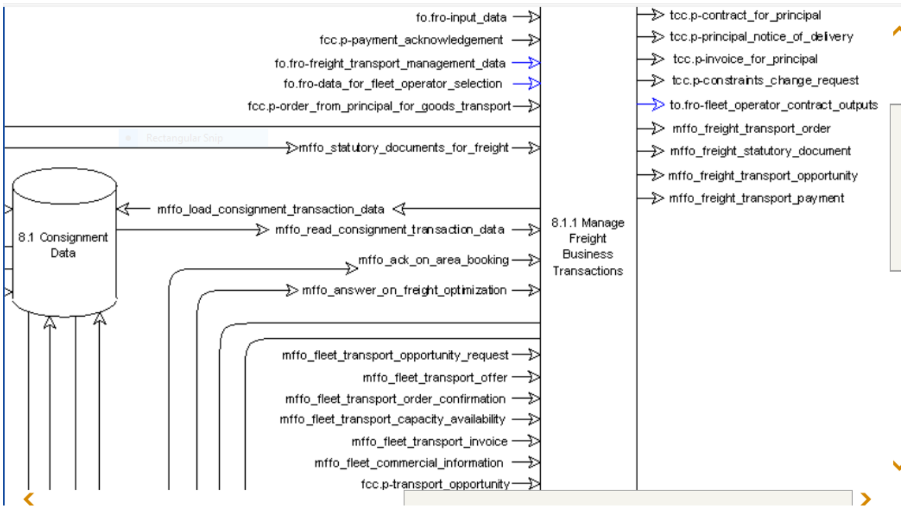

fo.fro-input_data
fcc.p-payment_acknowledgement
fo.fro-freight_transport_management_data
fo.fro-data_for_fleet_operator_selection
fcc.p-order_from_principal_for_goods_transport
mffo_statutory_documents_for_freight
8.1 Consignment Data
mffo_load_consignment_transaction_data
mffo_read_consignment_transaction_data
mffo_ack_on_area_booking
mffo_answer_on_freight_optimization
mffo_fleet_transport_opportunity_request
mffo_fleet_transport_offer
mffo_fleet_transport_order_confirmation
mffo_fleet_transport_capacity_availability
mffo_fleet_transport_invoice
mffo_fleet_commercial_information
fcc.p-transport_opportunity
8.1.1 Manage Freight Business Transactions
tcc.p-contract_for_principal
tcc.p-principal_notice_of_delivery
tcc.p-invoice_for_principal
tcc.p-constraints_change_request
to.fro-fleet_operator_contract_outputs
mffo_freight_transport_order
mffo_freight_statutory_document
mffo_freight_transport_opportunity
mffo_freight_transport_payment

Figure I-12 : FRAME Architecture - Manage Freight Business Transactions

There are no Use Cases associated with this activity because in most cases the form of business transactions is determined elsewhere than urban logistics, and in the remainder re in-house to the urban administration.

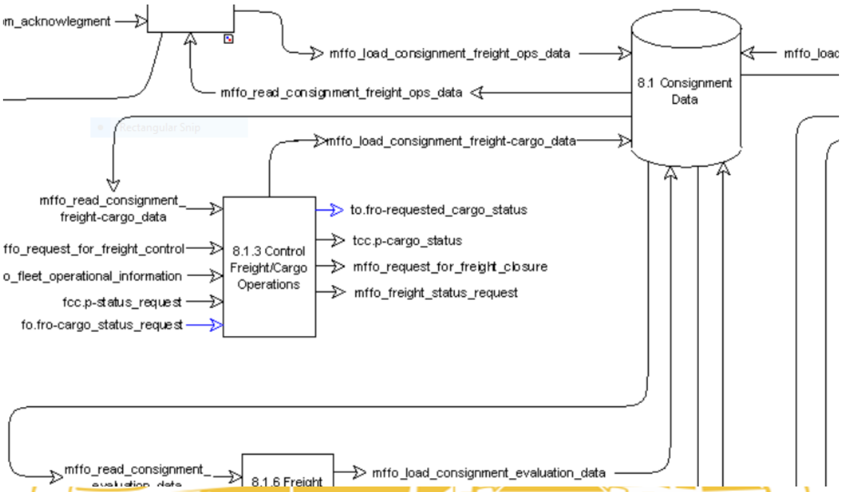

m_acknowlegment
mffo_load_consignment_freight_ops_data
mffo_read_consignment_freight_ops_data
8.1 Consignment Data
mffo_loac
mffo_load_consignment_freight-cargo_data
mffo_read_consignment_freight-cargo_data
ffo_request_for_freight_control
o_fleet_operational_information
fcc.p-status_request
fo.fro-cargo_status_request
8.1.3 Control Freight/Cargo Operations
to.fro-requested_cargo_status
tcc.p-cargo_status
mffo_request_for_freight_closure
mffo_freight_status_request
mffo_read_consignment_evaluation_data
8.1.6 Freight
mffo_load_consignment_evaluation_data

Figure I-13: Control Freight/Cargo Operations

See Use Cases UL-0105, UL-0106, UL-0107, UL-0108, UL-0109, UL-0111, UL-0112 below.

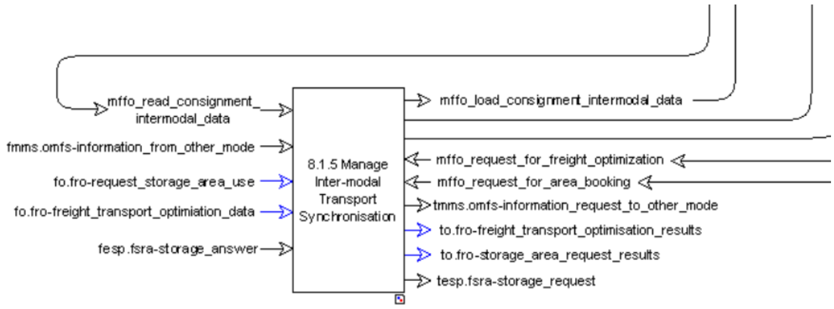

mffo_read_consignment_intermodal_data
fmms.omfs-information_from_other_mode
fo.fro-request_storage_area_use
fo.fro-freight_transport_optimiation_data
fesp.fsra-storage_answer
8.1.5 Manage Inter-modal Transport Synchronisation
mffo_load_consignment_intermodal_data
mffo_request_for_freight_optimization
mffo_request_for_area_booking
tmms.omfs-information_request_to_other_mode
to.fro-freight_transport_optimisation_results
to.fro-storage_area_request_results
tesp.fsra-storage_request

Figure I-14 : FRAME Architecture - Manage Inter-modal Transport Synchronisation

See Use Cases UL101, UL213, UL214, UL215, UL218, UL401, UL501 below.

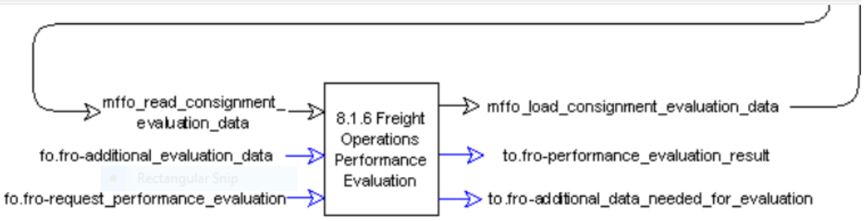
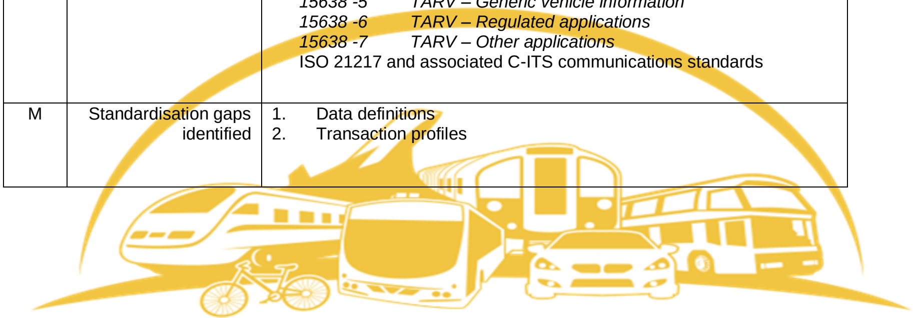

mffo_read_consignment_evaluation_data
fo.fro-additional_evaluation_data
fo.fro-request_performance_evaluation
8.1.6 Freight Operations Performance Evaluation
mffo_load_consignment_evaluation_data
to.fro-performance_evaluation_result
to.fro-additional_data_needed_for_evaluation

Figure I-15 :FRAME Architecture - Freight Operations Performance Evaluation

There are no Use Cases associated with this activity because in most cases the form of business transactions is determined elsewhere than urban logistics, and in the remainder re in-house to the urban administration.

I.2.3.2.1 UL 0201Access Control and Management (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle access management and monitoring**
M	**Use Case reference /id**	**UL-0201 v1 20151101**
M	Description	Control of commercial vehicle access to and management within Urban Zones.
M	Scenario	Urban administration wishes to control access to all or part of its Urban Zone, or manage movements within that zone.
M	Scope	specifications for common communications and data exchange aspects of the application service vehicle access monitoring that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Load recipient Load owner Vehicle operator Vehicle operator
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	*ISO 15638-8 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 8: Vehicle access management (VAM)* *ISO 15638-14 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 14: Vehicle access control* *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV – Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	1. Data definitions 2. Transaction profiles



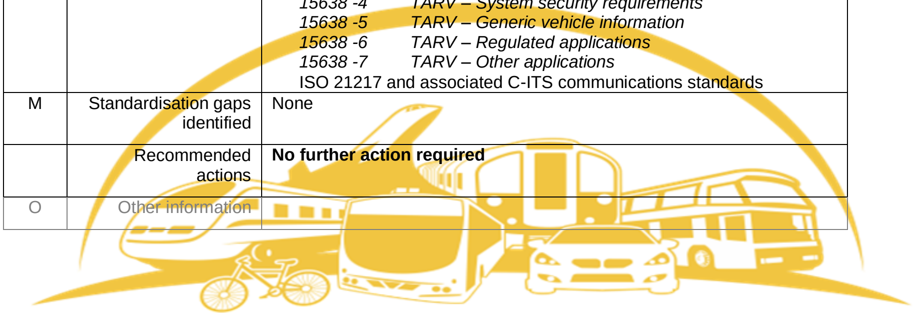
•	Recommended actions	UL 0201 Access control and management of commercial vehicles Data definitions in data repositories. Data transaction profiles (in standard or in data repository). There is no international consensus on these issues. If EU requires load specific data or data beyond general vehicle information (beyond registration number, vehicle classification etc.) it will need to develop specifications and register in standards or in a data repository. This has not yet been identified as a need, so at the moment is considered a low priority, However this priority is likely to increase in the near future. **Recommendation: Project team to identify urban administration needs and specify a European profile and relevant data concepts.**
O	Other information	

I.2.3.2.2 UL 0202Remote Tachograph Monitoring (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Remote digital tachograph monitoring**
M	**Use Case reference /id**	**UL-0202 v1 20151101**
M	Description	Remote monitoring of vehicle tachographs within Urban Zones (to comply to European Regulation: Article 9 of Regulation (EU) No 165/2014).
M	Scenario	Enforcement agent of the Urban administration reads RTM data using 5.8 GHz DSRC.
M	Scope	Specifications for common communications and data exchange aspects of the application service remote digital tachograph monitoring that a jurisdiction regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner
M	Stakeholders	Urban administration Vehicle operator Load owner
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-9 (Currently TS, IS in ballot process) Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 9: Remote digital tachograph monitoring *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV – Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None. Annex b) of the draft in ballot for an IS is designed to exactly meet the European regulation
	Recommended actions	**Member States should support the DIS/FDIS ballots relevant for this work item**
O	Other information	

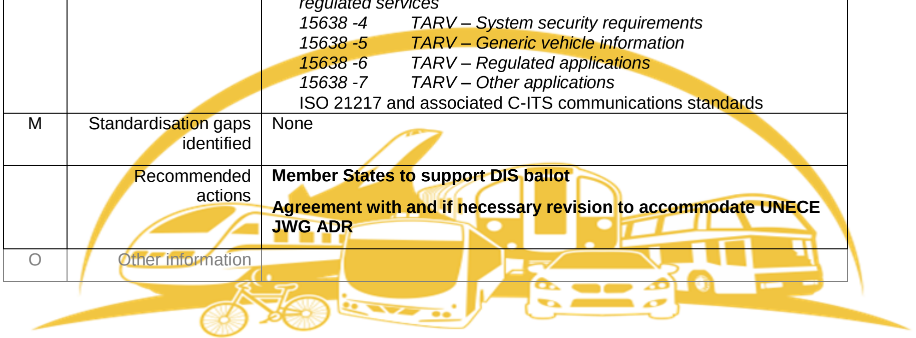
I.2.3.2.3 UL 0203 Emergency messaging system/eCall (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Emergency messaging system/eCall**
M	**Use Case reference /id**	**UL-0203 v1 20151101**
M	Description	Providing emergency data to an application service provider concerning the location, identification, and load of a vehicle in an emergency situation (accident, breakdown or other alarm generated).
M	Scenario	A vehicle involved in an emergency situation sends data to an Application Service Provider who determines the assistance provision to be provided, and whether to alert police and or 'Public Service Assistance Points' (PSAP). The data includes location of the incident, identification of the vehicle, and identification of the cargo, (or a hyper-link to this data).
M	Scope	Specifications or common communications and data exchange aspects of the application service 'Emergency Messaging System/eCall'.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	CEN TS 16405 Intelligent transport systems — eSafety — eCall Additional optional dataset for commercial vehicles ISO 15638-10 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 10: Emergency messaging system/eCall *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None
	Recommended actions	**No further action required**
O	Other information	



I.2.3.2.4 UL 0204ADR management (Sources TARV; OPTICITIES)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Accord européen relatif au transport international des marchandises Dangereuses par Route, cargo management**
M	**Use Case reference /id**	**UL-0204 v1 20151101**
M	Description	Providing emergency data to an application service provider. Specifications for common communications and data exchange aspects of the application service ADR (dangerous goods) that a regulator may elect to require or support as an option.
M	Scenario	The provision of information to an application service provider concerning ADR goods being carried by a vehicle, and their condition.
M	Scope	specifications for common communications and data exchange aspects of the application service ADR (dangerous goods) that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	CEN TS 16405 Intelligent transport systems — eSafety — eCall Additional optional dataset for commercial vehicles ISO 15638-18 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 18: ADR (Dangerous goods) *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None
	Recommended actions	**Member States to support DIS ballot** **Agreement with and if necessary revision to accommodate UNECE JWG ADR**
O	Other information	

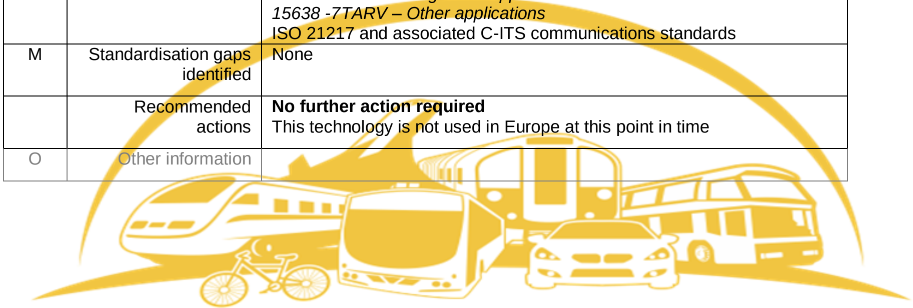


I.2.3.2.5 UL 0205 Driver Work Records Monitoring (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Driver Work Records**
M	**Use Case reference /id**	**UL-0205 v1 20151101**
M	Description	Remotely providing data to an agent of the administration (via an application service provider) concerning the drivers electronic work diary.
M	Scenario	Where drivers are required to maintain an electronic work record/diary which is connected to the IVS of the vehicle, and can be remotely accessed by wireless means to provide data to an agent of the administration (via an application service provider) concerning the drivers electronic work diary (hours worked and location records).
M	Scope	Specifications for common communications and data exchange aspects of the application service driver work records that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration/regulator Agent of urban administration Vehicle driver Vehicle operator
M	Stakeholders	Urban administration Vehicle operator Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-11 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 11: Driver work records*15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None
	Recommended actions	**No further action required. Such data is likely to be controlled at a national level so will be nationally specified.** NOTE within Europe driver hours are controlled using remote tachograph monitoring, not electronic work diaries.
O	Other information	

I.2.3.2.6 UL 0206 Vehicle Mass Measurement (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle Mass Measurement**
M	**Use Case reference /id**	**UL-0206 v1 20151101**
M	Description	A vehicle remotely provides "mass data" (dynamic measured impact on road pavement) to the administration/regulator (via the Application Service Provider) for control and enforcement purposes general purposes such as monitoring and access control.
M	Scenario	Collection, collation, and transfer of vehicle mass data from an in-vehicle system to an application service provider to enable data provision to jurisdictions for the control and management of equipped vehicles based on the mass of the regulated vehicle, or for gathering road impact statistics. Vehicles whose impact on the road pavements is lower than the indicated gross weight capacity may be allowed onto roads normally prohibited to that category of vehicles if it is only partially loaded.
M	Scope	Specifications for common communications and data exchange aspects of the application service "Vehicle 'Mass' Monitoring" that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner
M	Stakeholders	Urban administration Vehicle operator Load owner Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-12 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 12: Vehicle 'mass' monitoring *15638 -1TARV – Framework and architecture* *15638 -2TARV – Common platform parameters using CALM* *15638 -3TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4TARV – System security requirements* *15638 -5TARV – Generic vehicle information* *15638 -6TARV – Regulated applications* *15638 -7TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None
	Recommended actions	**No further action required** This technology is not used in Europe at this point in time
O	Other information	



I.2.3.2.7 UL 0207Mass information for control and enforcement (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Mass information for control and enforcement**
M	**Use Case reference /id**	**UL-0207v1 20151101**
M	Description	A vehicle remotely provides “mass data” (dynamic measured impact on road pavement) to the administration/regulator (via the application service provider) for control and enforcement purposes.
M	Scenario	Collection, collation, and transfer of vehicle mass data from an in-vehicle system to an application service provider to enable data provision to jurisdictions for the control and management of equipped vehicles based on the mass of the regulated vehicle, or use of such data to enable compliance with the provisions of regulations. Vehicles whose mass indicates they will damage the road may be put into a different tax or class or fined or banned from accessing particular routes.
M	Scope	Specifications for common communications and data exchange aspects of the application service “Vehicle ‘Mass’ Monitoring” for control and enforcement that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-13 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 13: Mass information for jurisdictional control and enforcement (MICE) *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, ‘Approval Authority’ approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None. This is a TS, but no plans to evolve it to an IS.
	Recommended actions	**No further action required** This technology is not used in Europe at this point in time
O	Other information	

I.2.3.2.8UL 0208Vehicle Speed Monitoring (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle Speed Monitoring**
M	**Use Case reference /id**	**UL-0208 v1 20151101**
M	Description	Remotely monitor vehicle speed
M	Scenario	Remote collection of current or historical speed data
M	Scope	Specifications for common communications and data exchange aspects of the application service Vehicle speed monitoring that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator
M	Stakeholders	Urban administration Vehicle operator Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638- 16 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 16: Vehicle speed monitoring *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	Data definitions for different vehicle speed data concepts
	Recommended actions	**Add to meta data concept registry and/or define in a standards deliverable.** **Low priority**
O	Other information	

I.2.3.2.9 UL 0209Consignment and location monitoring (Source ISO TARV)

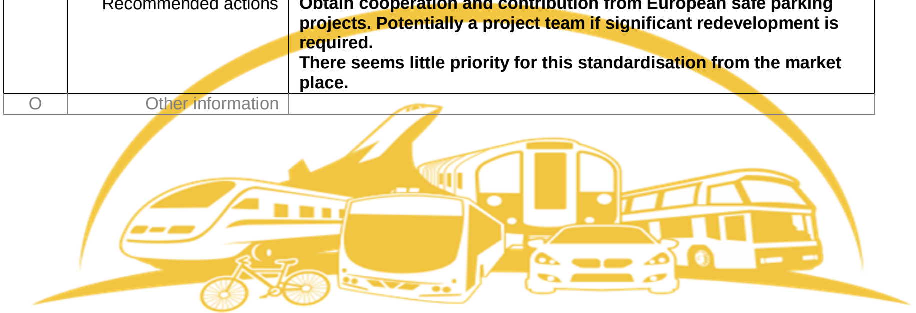
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Consignment and Location Monitoring**
M	**Jse Case reference /id**	**UL-0209 v1 20151101**
M	Description	Remote collection of vehicle consignment and location data.
M	Scenario	The TARV vehicle consignment and location monitoring system centres on the IVS and information provided to it from on-board, advising and updating on the consignment status. Typically, it is appropriate where both the location of the regulated vehicle and the status of the consignment is required. The IVS generates vehicle consignment data, at loading and unloading stops or periodically whilst the regulated vehicle is turned-on and moving, and monitors the location of the regulated vehicle during its journey, periodically, as determined by the system. Vehicle location is generated independently by the IVS's GNSS receiver. The content of data concerning the vehicle consignment is generated in accordance with ISO 26683 Part 1 in conformance with one of the 'Profiles' defined in ISO 26683-2.
M	Scope	Specifications for common communications and data exchange aspects of the application service Consignment and location monitoring that a *regulator* may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available

M	Identified standards (not exhaustive list)	ISO 15638-17 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 17: Consignment and location monitoring *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards ISO 26683-1 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 1: Context, architecture and referenced standards ISO 26683-2 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 2: Application interface profiles
M	Standardisation gaps identified	None
	Recommended actions	**None**
O	Other information	

I.2.3.2.10 UL 0210Vehicle Parking Management/Facilities (Source ISO TARV)

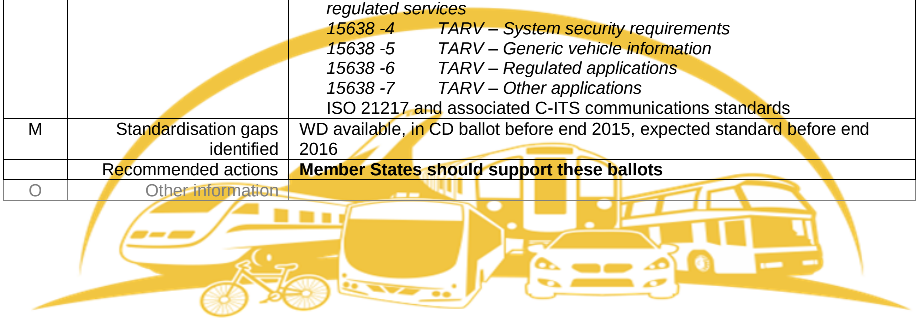
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle parking facilities**
M	**Use Case reference /id**	**UL-0210 v2 20160416**
M	Description	Provide data exchanges for a secure parking reservation system
M	Scenario	From the view of a jurisdiction, and its police, the general objectives for the vehicle parking facility application service include: ➢ Solve the safety problems due to regulated vehicles, being parked in dangerous locations (such as shoulders), posing high risk for both passing traffic and parked vehicle. ➢ Reduce policing costs to prevent crime (for example, goods of a value of Euro €7 billion are stolen in Europe from trucks each year [source EC Directorate General for Energy and Transport, Faber Maunsell, AECOM, Project SETPOS]). ➢ Achieve political objectives for environmental sustainability. ➢ From the view of a vehicle parking facility manager, the general objectives for the vehicle parking facility (VPF) application service. ➢ Provide a pre-booked service for vehicle parking to quality of service requirements defined by its operational policy or imposed by the jurisdiction within which it is situated, or to commercial requirements. NOTE: en-route on-demand bookings are short notice pre-bookings within this context ➢ At the discretion of the parking facility to provide an at-gate booking service. ➢ Identify the arrival of the regulated vehicle at the parking zone and activate any access mechanism to allow the regulated vehicle to park. ➢ Provide and manage the vehicle parking facility to quality of service requirements defined by its operational policy or imposed by the jurisdiction within which it is situated or to commercial requirements. ➢ Identify and enable the legitimate departure of the regulated vehicle from the parking zone and activate any access mechanism to allow the regulated vehicle to depart. From the view of a vehicle parking reservation system, the general objectives for the vehicle parking facility application service include: ➢ Provide a pre-booked reservation system (probably but not necessarily an internet based reservations service) for vehicle parking to quality of service requirements defined by its operational policy or imposed by the jurisdiction within which it is situated, or to commercial requirements. ➢ At the discretion of the parking facility to provide an at-gate booking service. ➢ Manage fee collection and other payments. ➢ Obtain pre-trip load and security information and provide to vehicle parking facility manager. From the view of a vehicle operator, the general objectives for the vehicle parking facility application service include: ➢ Improve safety. ➢ Reduce insurance costs. ➢ Improved fleet management and logistics management. ➢ Meet employer's requirements for working conditions. ➢ Ability to make requests for "Parking Slots", specifying the time of day required, the duration required, the type of vehicle and goods, either reserved pre-trip, or on-demand during the trip.

·		From the view of a TARV vehicle driver, the general objectives for the vehicle parking facility application service include: ➢ Support to the truck drivers in respecting traffic and driving regulations. ➢ Relief from responsibility for finding a secure and safe location to park the regulated vehicle during overnight and rest periods. ➢ Assist the driver to find socially acceptable resting facilities. ➢ Ability to make requests for "Parking Slots", specifying the time of day required, the duration required, the type of vehicle and goods, on-demand during the trip. See also UL-0227
M	Scope	Specifications for common communications and data exchange aspects of the application service for common communications and data exchange aspects of the application service 'Vehicle Parking Facility' that a regulator may elect to require or support as an option
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-19 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 19: Vehicle parking facility *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	The present document is a TS awaiting input from European Projects in this area, before it is developed as an EN/IS.
	Recommended actions	**Obtain cooperation and contribution from European safe parking projects. Potentially a project team if significant redevelopment is required.** **There seems little priority for this standardisation from the market place.**
O	Other information	



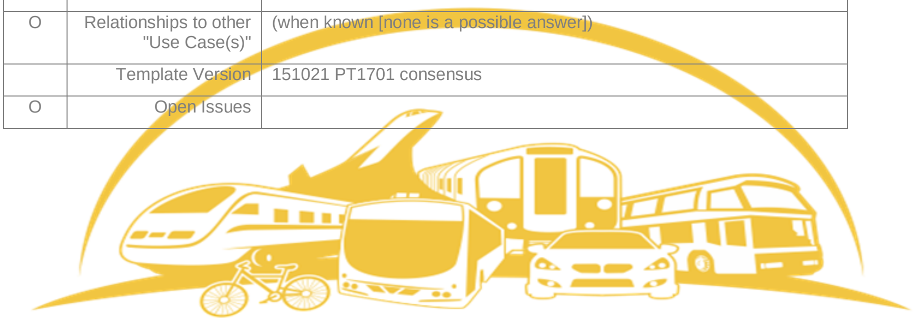
I.2.3.2.11 UL 0211Vehicle weigh-in-motion (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Weigh in motion**
M	**Use Case reference /id**	**UL-0211 v1 20151101**
M	Description	Weigh in motion either using equipment on-board the vehicle, or using equipment laid-in-road with the result transferred either to a centre or transmitted to and stored in memory on the vehicle.
M	Scenario	The provision of 'weigh-in-motion monitoring' and specifies the form and content of the transmission of such data required to support such systems, and access methods to that data. The data may be transferred by a variety of means (as ITS-station <> ITS-station data transfers in a C-ITS environment using 5.9 GHz, 3G, 4G, LTE or similar), transfers using interrogations from short range dedicated communication systems (such as 5.8 GHz), etc. Includes a profile for remote WIM using 5.8 GHz to comply to upcoming European Regulation.
M	Scope	Specifications for common communications and data exchange aspects of the application service weigh-in-motion monitoring (WIM-On-board and WIM-Roadside) that a jurisdiction regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638- 20 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 20: weigh-in-motion monitoring *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	WD available, in CD ballot before end 2015, expected standard before end 2016
	Recommended actions	**Member States should support these ballots**
O	Other information	



I.2.3.2.12 UL 0212Vehicle enforcement using roadside sensors (Source ISO TARV)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle enforcement using roadside sensors**
M	**Use Case reference /id**	**UL-0212 v1 20151124**
M	Description	Objective and textual description
M	Scope	specification is to reinforce enforcement by using a combination of information from both in-vehicle systems (AVI and TARV generic data) and roadside/in-road sensors.
M	Scenario	In many countries road side sensors are already widely used for jurisdiction enforcement purposes. These road side sensors (e.g. for emissions management, or roadside weigh stations) can be used in combination with AVI and/or TARV data for enhancing enforcement by eliminating/reducing problems of incorrect setting/tampering etc. and/or complementing/ corroborating data obtained from on-board systems. By collecting data from various roadside sensors, obtaining AVI and/or TARV data from targeted vehicles; then collating these vehicle and roadside sensor generated data concepts, they can then be transferred from the roadside sensor to the agent of the jurisdiction. This can be achieved by the normal TARV means, via the ASP, or by secure short range communications (for example at 5.8 GHz) directly back to the roadside, where the collated information can be sent by landline or cellular connection directly to the agent of the jurisdiction. In some cases, new means of monitoring, management and enforcement may be enabled.
M	Actors Involved	Urban administration and its agents, Truck operators Drivers
M	Stakeholders	Urban administration and its agents, Truck operators Drivers Cargo owners
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	ISO 15638-21 "Vehicle Enforcement using roadside sensors" is currently under development within ISO TC204 WG7 (work item Led by Japan).
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

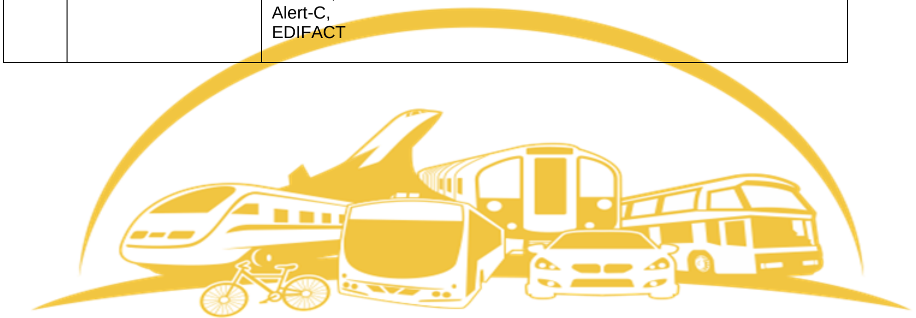


I.2.3.2.13 UL 0213Urban Consolidation Centre Management (Source PT 1701)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Urban Consolidation Centres (UCC)**
M	**Use Case reference /id**	**UL-0213 v1 20151101**
M	Description	interurban movements of product are channelled to a UCC, consolidated, and driven 'the last mile' in a low emission vehicle, properly loaded to maximise delivery efficiency, and the same vehicles could effect collection rounds, delivering the collected items to the UCC from where they can make a modal shift to other transport means for the next stage of their journey.
M	Scenario	European Urban administrations are committed (by European and National Regulation) to cut pollution in cities. Emissions in cities have become a major cause of ill-health and death, now perhaps surpassing deaths caused by cigarette smoking in many countries (albeit part of this comparator is caused by the reduction of the number of persons smoking). The greatest contributor to urban pollution are emissions from diesel engines. The most significant contributors to diesel engine emissions in most cities are commercial vehicles. It is postulated that most commercial vehicles in cities are making deliveries or collections. It is contended that most of these vehicles spend a significant part of their time only partially loaded. Reducing the number of commercial vehicle deliveries and collections made by diesel powered vehicles would therefore contribute significantly to the reduction of pollution in cities. Every delivery/collection requires the vehicle to be parked while the collection/delivery is made. Delivery vehicles frequently find parking difficult, especially to /from smaller enterprises. On road parking causes congestion, and congested vehicles emit pollution from all vehicles, that are delayed by the congestion. Given that most delivery/collection vehicles spend much of their time only partially loaded, more efficient delivery/collection would both reduce pollution and reduce congestion delays for other road users. If low emission vehicles, such as electric vehicles, could be used for last mile delivery/collection, pollution could be further and significantly reduced, or at least moved to a generating power station, and therefore away from the city. (Project CO-GISTICS) The freight transportation industry must achieve high performance levels in terms of economic efficiency and quality of service to optimise and increase the efficiency of the cargo transport operations (minimizing costs, times and use of resources like space and equipment) taking advantage of the data visibility from the logistic services (e.g. proof of delivery, route planning, track and trace...) and cooperative systems. The last mile of the cargo transportation process (cargo delivery) is a crucial step in the overall process and its proper monitoring can guarantee increased quality of service and improvements on exception handling or avoidance of possible errors on deliveries. The CO-GISTICS project sees the need for standards that help to optimise last mile deliveries. Topics to be covered include delivery parking spaces management, congestions, noise, pollution, night delivery, trans-boarding from big trucks to small electric vehicles, development of economic models and dynamic schedules and definition of KPIs for last mile delivery.

M	Scope	Specifications for common communications and data exchange aspects of the application service Urban Consolidation Centre.
M	Actors Involved	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Freight centre manager Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available

M	Identified standards (not exhaustive list)	*ISO 26683-1 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 1: Context, architecture and referenced standards* *ISO 26683-2 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 2: Application interface profiles* **Universal Post Corporation Standards** a) Barcode symbology for postal items b) Barcode symbology for postal receptacles c) Communication of postal information using two-dimensional symbols d) Data presentation in ASN.1 **IPC Identification/codification standards** a) Air carriers. identification/codification of b) Airports. identification/codification of c) Countries. identification/codification of d) Data constructs for the communication of information on postal items, batches and receptacles e) FACT-Based licence plates for parcels f) FACT-Based representation of postal information and identifiers g) Framework for communication of information about postal items. batches and receptacles h) Communication of postal information using two-dimensional symbols ID-Tagging of letter mail items i) Placement area definitions; UPU EDI Message Development Guide j) RFID and RDC - Air interfaces: Communications and interfaces Part A: Parameters k) RFID- Reference architecture and terminology l) RFID - System requirements and test procedures o) Item tracking events, identification/codification of n) Office of exchange, identification/codification of o) Postal consignments, identification/codification of p) Postal despatches, identification/codification of q) Postal items, identification/codification of r) Postal receptacles. identification/codification of IPC EDI Messages standards a) Format of message exchanges b) Standard messages for consignments c) Standard messages for despatches d) Standard messages for items e) Standard messages for transport 3GPP LTE Datex 2, Alert-C, EDIFACT



·	Standardisation gaps identified	IPC has designed interoperable codification and message standards for every likely operational scenario that a UCC is likely to face. Although designed for national postal sorting and delivery organisations, by substituting the word ‘collection/delivery’, in place of ‘postal’, they meet all the requirements that a UCC is likely to face in its operations in respect of identification and messaging. They have been proven in use by the international postal community over a quarter of a century, in some cases since the end of WW2. ISO 26683 provides methodology for the UCC consolidation and final round process. It may therefore be concluded that: There are already adequate standards available to enable a fully interoperable UCC operation (and one that could co-exist interoperably with the international postal sector).
	Recommended actions	**Guidelines on the operation of such UCCs (probably in the form of a Technical Specification, could be beneficial in finding and interpreting such available standards.** **No active demand.** **Low priority.**
O	Other information	

I.2.3.2.14 UL 0214Oversize management (Source OPTICITIES) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Oversize management**
M	**Use Case reference /id**	**UL-0214 v1 20151124**
M	Description	Routing and Management of Oversized vehicles
M	Scope	To provide better data to HGVs and large freight vehicles to enable improved route guidance avoiding road restrictions and to provide better warnings to oversized vehicles to reduce the likelihood on bridge strikes or stuck vehicles causing delays.
M	Scenario	Over-height vehicles are a major issue, and are getting even higher recognition now than they used to. Mainly because if an over-height vehicle strikes a rail or metro bridge, it impacts on both modes of transport (road and rail). Over-width vehicles cause significant congestion. Over-length vehicles often have problems negotiating turns in narrow city streets. Existing measures of managing oversize vehicles (static signing, physical warnings (beams) or dynamic signs) are not proving to be fully effective in in mitigating HGVs using roads which are not suitable for them, which may be a function of more relied use on SatNavs. Possible solutions which may require standards include: (a) Standards for height, weight and width data within HGV SatNav systems (and ability for truck drivers to enter manually or automatically the associated data for their vehicle); (b) Use of V2I standards to provide better in-cab warnings about obstacles, based on automatic measurement of the vehicle – ensuring more targeted information.; (c) Automated warnings to urban administrators in the event of an actual structure strike that could cause road or rail delay (e.g. Bridge Strike) to enable a rapid response.
M	Actors Involved	Urban administrations Truck drivers Truck operators Truck owners Traffic control centre Asset owners (bridge owners etc.)
M	Stakeholders	Urban administrations Truck drivers Truck operators Truck owners Cargo owners Asset owners
M	MIS / TM / UL	UL
M	Assumptions	Truck drivers are able to assess the relevant data for their vehicles. This may be easy for all loads, although abnormal loads normally require detailed planning anyway.
M	Available Standards	None known
M	Standardisation gaps identified*	Oversize Management UL 0214 1) Asset restriction data in SatNavs systems. Format for Urban Administrators to provide data to SatNav providers 2) V2I messaging for in cab warnings

·		
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	Asset data, geocoded with location, height, width and weight restrictions vehicle data, height, width and weight.
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

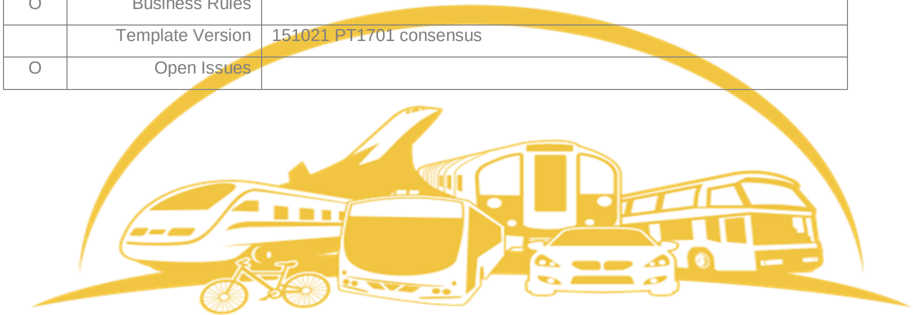
I.2.3.2.15 UL 0215 Scheduling infrastructure (restrictions – day- time of day- length of stay- other limitations

* closely related to or could be combined with UL 0111 /UL 0112*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Freight Scheduling infrastructure**
M	**Use Case reference /id**	**UL-0215 v1 20151124**
M	Description	Scheduling infrastructure (restrictions – day- time of day- length of stay- other limitations)
M	Scope	Provide Euro-wide standardisation of a) the format of schedule management information available to truck operators and drivers b) the availability of schedule management information to truck operators and drivers
M	Scenario	Control to and restrictions within the urban zone varies from urban zone to urban zone. Currently the regulations and restrictions are made available in different ways and in different forms. The objectives of this Use Case are to standardise the format of data available, and to standardise the way and minimum requirements to make this data available.
M	Actors Involved	Receiver/despatcher Truck driver Truck operator Consolidator Scheduler Cargo owner Urban administration
M	Stakeholders	Receiving/despatching organisation Truck operator Cargo owner Urban administration
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	See UL110 and UL113
O	Data Requirements	UL110 and U113
O	Relationships to other "Use Case(s)"	This Use Case is closely related to UL110 and UL113
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.2.16 UL 0216 Description of freight offer (Source OPTICITIES) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Description of freight offer**
M	**Use Case reference /id**	**UL-0216 v1 20151124**
M	Description	Requires information from Opticities and textual description
M	Scope	This is the description of the freight offer: — Covered areas — Freight lines — Limitations — ADR rules (for dangerous goods)
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

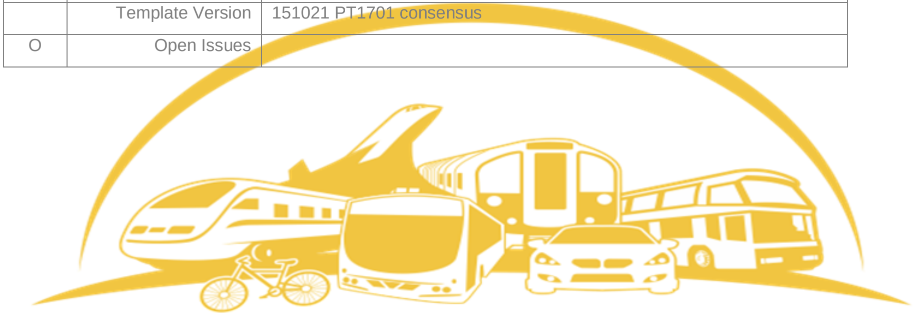


I.2.3.2.17 UL 0217Monitor Compliance (Source OPTICITIES) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Monitor Compliance**
M	**Use Case reference /id**	**UL-0217 v1 20151124**
M	Description	It is unclear from information available from Opticities whose compliance is being monitored- is the subject the freight operator, or the Urban Administration. More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	Possibly closely linked to UL 0201 and UL 0212
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.2.18 UL 0218ICT framework handling RT heterogeneous mobility resources (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**ICT framework handling RT heterogeneous mobility resources**
M	**Use Case reference /id**	**UL-0218 v1 20151124**
M	Description	Unclear why this is listed by Opticities as a freight issue and not an MIS issue. More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



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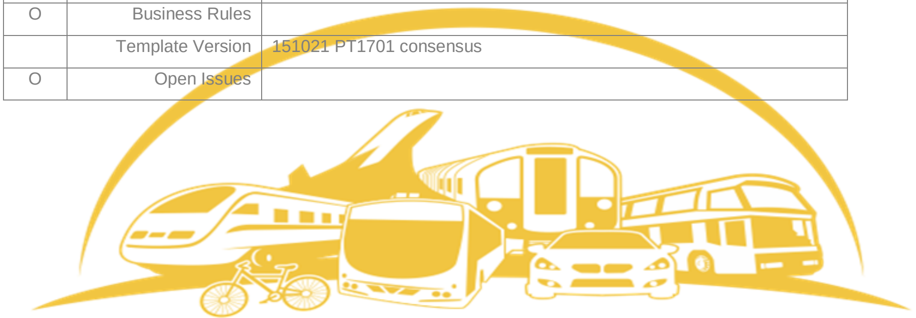
I.2.3.2.19 UL 0219Network management (Source OPTICITIES)*

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Network management**
M	**Use Case reference /id**	**UL-0219 v1 20151124**
M	Description	Unclear which actor's network and unclear which network. More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



I.2.3.2.20 UL 0220Freight Fares (Source OPTICITIES) *

	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Freight Fares**
M	**Use Case reference /id**	**UL-0220 v1 20151124**
M	Description	Unclear of the objective of this Use Case More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.2.21 UL 0221 Freight Delivery schedule timetables (Source OPTICITIES) *

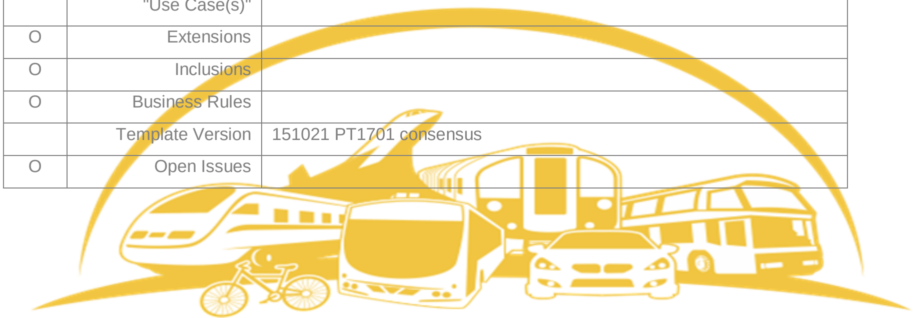
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Delivery schedule timetables**
M	**Use Case reference /id**	**UL-0221 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	Sharing delivery vehicle the data around location of the delivery can also prevent incomplete deliveries, additionally many telematics providers can now record data on the emissions produced by the vehicle and the driving habits of the driver this data can then be collected and analysed to demonstrate the potential environmental benefits of shared last mile. It can also contribute to streamlining activity to increase the environmental benefits of UCCs. Data about the delivery and servicing local infrastructure (location of loading bays, locations of vehicles class restrictions etc.) can be massively aid the routing of delivery and servicing vehicles. This is can streamline the process of delivery, which would increase the capacity of the UCC and overall efficiency of the process. Additionally, data about high emissions area, ULEZ and other environmental data can be shared which can improve the overall environmental strategy of UCCs.
M	Actors Involved	Consolidation centres (UCC, post, courier, in-house) Truck operators Truck drivers Receivers/despatchers
M	Stakeholders	Consolidation centres (UCC, post, courier, in-house) Truck operators Receivers/despatchers Cargo owner
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	See UL 0102, UL0108,and 0213
	Recommended Actions	Covered by other UL Use Cases. No specific further action recommended
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Closely related to UL 0213, UL 0215, UL 0216
O	Triggers	(or identify continuous operation)
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.2.22 UL 0222Optimise Resources (Source OPTICITIES) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Optimise Resources**
M	**Use Case reference /id**	**UL-0222 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

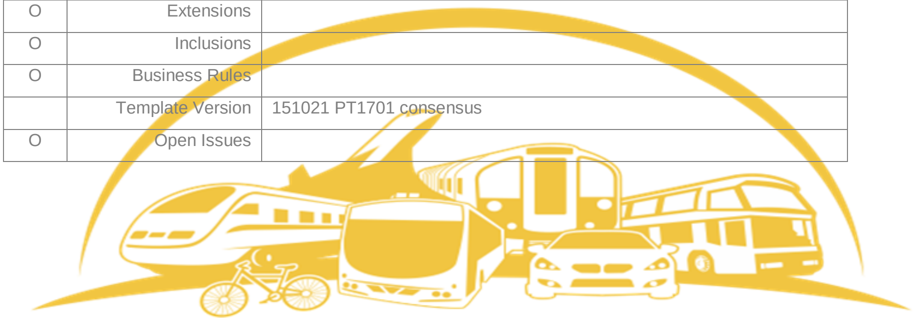
I.2.3.2.23 UL 0223Improve E2E Freight efficiency (Source OPTICITIES) *

	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Improve E2E Freight efficiency**
M	**Use Case reference /id**	**UL-0223 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	The CO-GISTICS project sees the need for standards that help to optimise last mile deliveries. Topics to be covered include delivery parking spaces management, congestions, noise, pollution, night delivery, trans-boarding from big trucks to small electric vehicles, development of economic models and dynamic schedules and definition of KPIs for last mile delivery.
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



I.2.3.2.24 UL 0224Vehicle Technology (Source OPTICITIES) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle Technology**
M	**Use Case reference /id**	**UL-0224 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



I.2.3.2.25 UL 0225Innovative load units (Source OPTICITIES) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Innovative load units**
M	**Use Case reference /id**	**UL-0225 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.2.26 UL 0226Restriction Zones Information Harmonisation (Source IRU)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Restriction Zones Information Harmonisation**
M	**Use Case reference /id**	**UL-0226 v1 20151124**
M	Description	Standardisation of information formats for provision of restriction zones information.
M	Scope	Development of standard formats for access restriction zone information.
M	Scenario	There is no harmonisation of access restriction zones conditions. It is probably impractical to standardise these, but the data about them could be made available in standard formats.
M	Actors Involved	Urban administrations
M	Stakeholders	Urban administrations Recipients/despatchers Truck operators Truck drivers
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	See UL 0215
	Recommended Actions	No additional action recommended
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Almost identical with and should be merged with UL 0215
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.2.27 UL 0227 Intelligent Truck Parking and Delivery Areas Management (Source CO-GISTICS)

This is a late submission Use Case by the project CO-GISTICS and may be considered a combination of UL-0210 and other Use Cases in this series.

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent Truck Parking and Delivery Areas Management (ITP/DAM)**
M	**Use Case reference /id**	**UL-0227 v1 20160415**
M	Description	Management of Urban parking for loading/unloading, highway parking places for resting and parking at hubs, and dry-port electronic payment for parking.
M	Scenario	This service contains information about parking availability for trucks or vans aiming at the efficient allocation of available parking space as well as at the efficiently management of peak hours of in-bound in truck traffic volume around mayor hub infrastructure, e.g. airports or urban areas. The aim of the ITP/DAM service is to: • optimise the truck stops along their route (generally inter-urban areas), • optimise delivery of goods in urban areas (urban) and • optimise interfacing of road transport with other modes (intermodal hubs) See also UL-0210 CO-GISTICS sees the need for standards that help delivery parking spaces management, congestions, noise, pollution, night delivery, trans-boarding.
M	Scope	Information about parking availability for trucks or vans
M	Actors Involved	Urban administration Fleet operations manager Vehicle driver or operator Intermodal terminal operators
M	Stakeholders	Urban administration Fleet operations manager Vehicle driver or operator Intermodal terminal operators
M	MIS / TM / UL	UL
M	Assumptions	The trucks are equipped with C-ITS, 2G, 3G, 4G/LTE communication devices to receive the information related to parking.
M	Identified standards (not exhaustive list)	IEEE802.11p/ETSI ITS-G5, Cellular
M	Standardisation gaps identified	None
	Recommended actions	None
O	Other information	This Use Case is applied at four CO-GISTICS pilot sites.

I.2.3.2.28 UL 0228Priority and Speed Advice Service (Source CO GISTICS)

I.2.3.2.28.1 UL 0228.1 Priority and Speed Advice Service (Source CO GISTICS)

This is a late submission Use Case by the project CO-GISTICS and may be considered a combination of UL-0208 and other Use Cases in this series. See also UL-0228-2.

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Priority and Speed Advice Service**
M	**Use Case reference /id**	**UL-0228.1 v1 20160415**
M	Description	Service to reduce the number of stop-and-go events and therefore the accelerations resulting in the reduction of the fuel consumption and emissions of the freight trucks circulating along signalized intersections.
M	Scenario	Three scenarios for Priority and Speed Advice are supported: 1. A general speed advice approach to the freight transport. This info allows the driver to choose a fuel-efficient and comfortable speed profile when approaching a traffic light through the provision of a speed advice or the remaining green/red time (as a countdown). 2. Priority for selected transport vehicles. The priority service will be implemented in selected intersections where the terminal systems will notify the system of increased traffic arriving at the intersection and requiring priority. The request will be accepted, depending on the existing conditions at the intersection at the time of the vehicle arrival, and the signal will remain green long enough for the trucks to cross the intersection. 3. In the case of the Vigo pilot site, the priority is not provided per intersection. It is provided in a defined route according were the timing of traffic lights is modified increasing green light time when the truck enters the route and back to normal regulation once the truck has crossed the route.
M	Scope	Reduction of fuel consumption and emissions, better management of and smoother traffic flow, reduction of delays.
M	Actors Involved	Vehicle driver or operator Traffic managers
M	Stakeholders	Fleet operations manager Vehicle driver or operat.r Urban administrations Traffic managers
M	MIS / TM / UL	UL
M	Assumptions	The traffic lights are able to provide in real time estimation of the remaining green/red time and/or priority to special vehicles. The traffic controller is equipped with a G5-enabled unit or connected to the traffic management centre. The vehicles are equipped with a G5-enabled unit or have LTE connection respectively.

M	Identified standards (not exhaustive list)	ETSI TS 102 894-1 (Facility layer) ETSI EN 302 636-4-1 (Geonetworking layer) ETSI TS 102 724 (G5) ETSI EN 302 637-3 (DENM) ETSI EN 302 637-2 (CAM) SAE J2735 (SPAT and MAP)
M	Standardisation gaps identified	None
	Recommended actions	None
O	Other information	This Use Case is applied at four CO-GISTICS pilot sites.

I.2.3.2.28.2 UL 0228.2 Priority and Speed Advice Service Macro Approach (Source CO-GISTICS) (Source CO GISTICS)

This is a late submission Use Case by the project CO-GISTICS and may be considered a combination of UL-0208 and other Use Cases in this series. See also UL-0228.1.

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Priority and Speed Advice Service (Macro Approach)**
M	**Use Case reference /id**	**UL-0228.2 v1 20160415**
M	Description	The service supports the driver to choose a fuel-efficient and comfortable speed profile during its driving tasks. In a strictly competitive sector, a fleet and transport operator tries to generate competitive advantage partly through cost reduction. The main saving can be achieved by reducing fuel consumption. Cooperative services could support fleet operators and drivers to satisfy this requirement, making available data (e.g. weather conditions, traffic data) useful to suggest a fuel-efficient speed profile, prior and during the trip.
M	Scenario	One macro scenario for Priority and Speed Advice is supported: A general speed advice approach to the freight transport. This info allows the driver to choose a fuel-efficient and comfortable speed profile during the whole route (denoted in the following by macro level).
M	Scope	Reduction of fuel consumption and emissions, better management of and smoother traffic flow, reduction of delays.
M	Actors Involved	Vehicle driver or operator Traffic managers Motorway Managers
M	Stakeholders	Fleet operations manager Vehicle driver or operator Motorway Managers
M	MIS / TM / UL	MIS
M	Assumptions	1. The truck driving is performing a route; 2. The vehicles are able to send/receive information through long-range 3G/4G system; 3. The information received concerns also weather and traffic conditions data; 4. The information concerning the boarding time should be available in order to compute the speed estimation.
M	Identified standards (not exhaustive list)	Long-range (3G/4G)
M	Standardisation gaps identified	None
	Recommended actions	None
O	Other information	This Use Case is applied at four CO-GISTICS pilot sites.

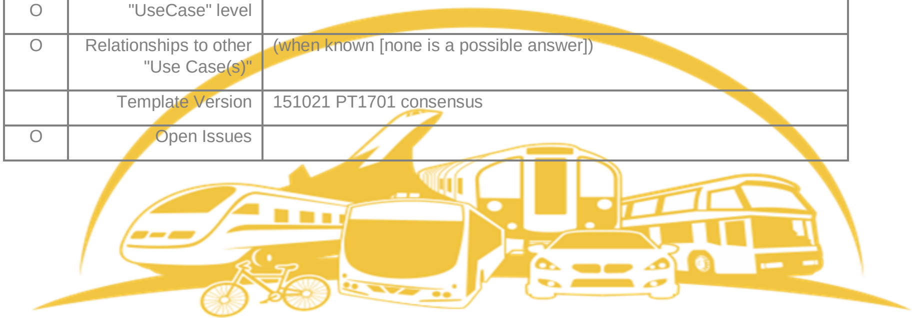
I.2.3.3 UL 0300Management of vehicle generated pollution within the urban domain (Source CID)

I.2.3.3.1 UL 0301Emissions monitoring –General (Source OPTICITIES) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Emissions monitoring –General**
M	**Use Case reference /id**	**UL-0301 v1 20151124**
M	Description	Monitoring of local pollution levels to manage air quality proactively.
M	Scope	Getting data from local pollution monitoring stations and feeding into traffic management system.
M	Scenario	Roads in cities are not just to get vehicles from A to B, they can be defined as social spaces (squares, highstreets), living spaces (residential, schools) and moving spaces (expressways, arterial roads). A single model of pollution management for a whole city cannot take this into account. Some cities want to manage traffic to make social and living spaces better places (at the cost to the arterial routes) and pollution monitoring can be a feed into this model. i.e. if a living space pollution is high, gate the traffic to either ensure that it keeps moving through that space (not queuing) or reduce the volume in that area.
M	Actors Involved	Traffic manager Road user Resident
M	Stakeholders	Traffic manager
M	MIS / TM / UL	TM/UL
M	Assumptions	None
M	Available Standards	Regional – UTMC Air Quality MIB
M	Standardisation gaps identified*	1) EU wide interface between air quality *outstations* and traffic management systems to allow vendor interoperability
	Recommended Action	UL 0301 Emissions monitoring -general Develop Standard for air quality *outstations* and traffic management systems A project team may be required to overcome vendor lock in aspects
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.3.2 UL 0302Urban Low Emission Zone Management (Source TFL) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Urban Low Emission Zone Management**
M	**Use Case reference /id**	**UL-0302 v1 20151124**
M	Description	Managing polluting vehicles in urban areas using charging and enforcement.
M	Scope	Providing detection/identification of polluting vehicles, charging regime and enforcement regime.
M	Scenario	To improve air quality in urban areas it may be necessary to encourage road users to move to less polluting vehicles. This can be achieved by levying a charge on polluting vehicles as they enter the urban area and enforcing that charge.
M	Actors Involved	Traffic enforcement Central government Drivers
M	Stakeholders	Freight carriers
M	MIS / TM / UL	UL
M	Assumptions	Use of ANPR enforcement system. Central government allow access to vehicle owners database.
M	Available Standards	Regional UTMC ANPR Schema.
M	Standardisation gaps identified*	1) Legal basis for being able to charge polluting vehicles (when vehicles are actually legal on the road). 2) EU standard for ANPR to *Instation* data exchange format. 3) Cross boundary enforcement outside of member state. 4) Standards for urban administrators to access central government databases for vehicle look up. 5) Standards for evidential integrity (encryption, image quality, size, timestamping etc).
	Recommended Actions	UL-0302 Urban Low Emission Zone Management. European data format for ANPR data exchange and evidential integrity (possibly as part of a general UL data formats PT). The other issues are political /regulatory decisions.
O	"UseCase" level	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	



I.2.3.3.3 UL 0303 Monitor Emissions Compliance in Urban Zone

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Monitor Emissions Compliance in Urban Zone**
M	**Use Case reference /id**	**UL-0303 v1 20151124**
M	Description	It is unclear from information available from Opticities whose compliance is being monitored- is the subject the freight operator, or the Urban Administration. More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	"UseCase" level	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Probably closely related to UL-0301 ,
O	Triggers	(or identify continuous operation)
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.3.4 UL 0304Cross Border

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Cross border Enforcement** (Opticities, TFL)
M	**Use Case reference /id**	**UL-0304 v1 20151130**
M	Description	Cross border enforcement
M	Scope	City Administrations/Member states access to driver databases for de-criminalised offences and connect into VERA (3 is it now) to get an update on the cross boundary position for de-criminalised enforcement with a view to (where possible) harmonising member states position on this regarding information exchanges and processes.
M	Scenario	'Cross Border Enforcement' refers to the pursuit of traffic offences committed by drivers of a car which is registered in an EU Member State different than the one where they were detected. The goal of the Directive is to offer an automated tool for enforcement authorities in the Member State where the offence was committed to pursue and fine the drivers of cars registered in other EU Member States when they commit traffic offences. Current co-operation agreements exist in the form of bi-lateral and multi-lateral agreements and many EU Member States already have systems in place to follow up traffic fines. However, they are often not able to deal with the increasingly complex cross-border problems posed by traffic offenders. The Directive presents an EU wide automated approach. This new Directive will also mean that EU Member States will not have to negotiate new bilateral agreements with other countries. in May 2014, the European Court of Justice ruled that the legal basis of the Directive on Cross-Border Exchange of Information related to road safety 2011/82, which came into force in November 2013, was incorrect. The European Court of Justice found that the measures proposed in the Directive do not concern 'prevention of crime' as defined under the police co-operation rules, but rather road safety, which is a transport issue. However, given the importance of the law for road safety, the ECJ said the current rules will stay in place while a new proposal is agreed. The Court has granted a one-year transition period, meaning the rules will remain in effect until May 2015. Following the ruling a new Directive 2015/413 was adopted in March 2015 with a legal basis under the EU transport policy. EU Member States must transpose the new legislation into their national law by May 2015 or risk facing EU infringement procedures. In the meantime, the 2011/82 Directive remains in place at national law level until this is replaced by the newly transposed legislation. Three countries, UK, Ireland and Denmark have a later transposition deadline of May 2017 According to the European Commission, non-resident drivers account for approximately 5% of road traffic in the EU. However, 15% of the number of detected speed offences are committed by non-resident drivers. Moreover, according to the Commission document, a foreign-registered car is three times more likely to commit traffic offences than a domestically-registered one. The Commission also gives the example of France, where speeding offences committed by foreign registered cars reach approximately 25% of the total, with the figure going up to 40-50% of the total during periods of high transit and tourism. Consequently, the Commission expects the highest positive benefits to be observed in countries with high levels of transit and tourism traffic, such as Austria, Belgium, France, Germany, Hungary, Italy, Luxembourg, Poland or Spain.

		Eight major road safety related offences are included in the text of the EU Directive: — Speeding; — Not using a seatbelt; — Not stopping at a red traffic light or other mandatory stop signal; — Drink driving; — Driving under the influence of drugs; — Not wearing a safety helmet (for motorcyclists); — Using a forbidden lane (such as the forbidden use of an emergency lane, a lane reserved for public transport, or a lane closed down for road works); — Illegally using a mobile phone, or any other communications device, while driving. The Directive will be most effective in following up offences which can be detected automatically, such as speeding and running red lights.
M	Actors Involved	Member states, City administrations
M	Stakeholders	Member states, City administrations EDPS
M	MIS / TM / UL	UL
M	Available Standards	None
M	Standardisation gaps identified*	If the Directive is to work there needs to be not only standard agreement of access to driver licence databases (political agreement, not standards) but also standardised transactions, standardised data formats, and standardised transaction formats.
	Recommended Actions	UL-0304- Cross border enforcement A project team to determine the transaction and data format standardisation required in order to enable the /directive to be applied and function efficiently.
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Probably closely related to UL-0217 , but further information on UL0217 required.
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.3.5 UL 0305Green balancing and controls (Source OPTICITIES) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Green balancing and controls**
M	**Use Case reference /id**	**UL-0305 v1 20151124**
M	Description	Need input from Opticities to pursue this. Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.3.6 UL 0306Eco-drive Support Service (Source CO-GISTICS)

This is a late submission Use Case by the project CO-GISTICS and may be considered in combination with other emission control and improvement use-cases.

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Eco-drive Support Service**
M	**Use Case reference /id**	**UL-0306 v1 20160415**
M	Description	Support truck drivers and fleet operators in adopting an energy efficient driving style in order to reduce and to validate fuel consumption and CO$_2$ emissions
M	Scenario	• Truck Driver: Eco-drive support services provide drivers with on trip, pre- and post-trip advice. The main advantage of such services base on the additional information with regards to the total fuel consumption and driving behaviour during a trip with respect to the defined European standard driving cycles UDC and EUDC. Usually, knowledge about fuel consumption is vague so that the system takes into account events that occurred while driving, but that are no longer evident after the trip. Specifically, the information about the total fuel consumption from origin to destination does not reflect the specific conditions causing the increase or decrease of fuel consumption. • Fleet operator: the advantage of the fleet operations are implementing environmental programme (reduction of CO2 and other emissions, energy saving); saving costs (fuel, accidents, sick leaves, risk management); taking care of the personnel (wellbeing).
M	Scope	Validation of book values and reduction of fuel consumption and CO$_2$ emissions
M	Actors Involved	Fleet operations manager Vehicle driver or operator
M	Stakeholders	Fleet operations manager Infratructure authorities (airports, ports, etc.) Vehicle driver or operator
M	MIS / TM / UL	UL
M	Assumptions	Pre-trip fuel consumption planning is done using significantly different criteria in comparison to post-trip fuel consumption evaluation.

M	Identified standards (not exhaustive list)	3GPP LTE IEEE802.11p/ETSI ITS-G5, Hybrid DIN ISO 26000 (Sustainability guidelines), e.g. http://www.ecodrive.eu/en/service ISO 14001:2004 (Plan-Do-Check-Act, PDCA) Environment Management Norm CEN/TC 278/WG2 – I.T.S. standardization working group Freight, Logistics and Commercial Vehicle Operation FprEN ISO 24534-3 Electronic Registration Information for vehicle trade E/ECE/324/Rev.2/Add.100/Rev.3 or E/ECE/TRANS/505/Rev.2/Add.100/Rev.3 (12 April 2013), "Agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions", Addendum 100: Regulation No. 101, *Uniform provisions concerning the approval of passenger cars powered by an internal combustion engine only, or powered by a hybrid electric power train with regard to the measurement of the emission of carbon dioxide and fuel consumption and/or the measurement of electric energy consumption and electric range, and of categories M1 and N1 vehicles powered by an electric power train only with regard to the measurement of electric energy consumption and electric range.*
M	Standardisation gaps identified	1. Voluntary guidelines for Best Practice 2. Voluntary guidelines for environmental quality management 3. Data format definition, no focus on eco-drive 4. Includes emission characteristics, but not eco-drive 5. Test engine operation, but not with real-time data exchange driving behaviour
	Recommended actions	Development of standards: additional annex linked to C-ITS. standardisation initiatives
O	Other information	This Use Case is applied at four CO-GISTICS pilot sites.

I.2.3.3.7 UL 0307CO2 Footprint Monitoring and Estimation (Source CO-GISTICS)

This is a late submission Use Case by the project CO-GISTICS and may be considered in combination with other emission control and improvement use-cases.

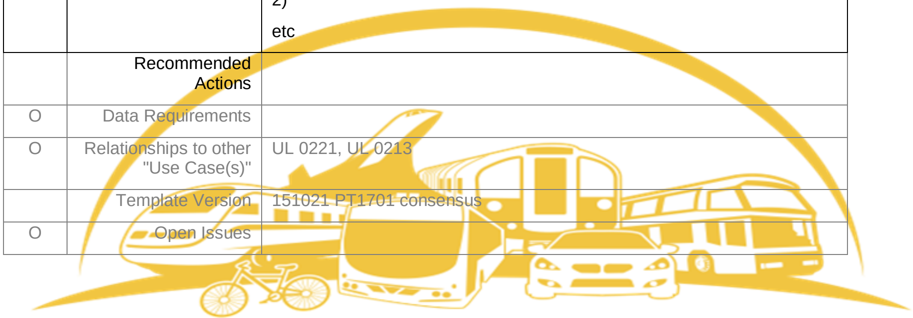
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**CO2 Footprint Monitoring and Estimation**
M	**Use Case reference /id**	**UL-0307 v1 20160415**
M	Description	Carbon footprint monitoring and estimation was selected to reflect the importance of innovation and standardized approaches in this new field of research activities.
M	Scenario	The challenge of reliable carbon foot print monitoring is closely related to the difficulty of understanding the reasons of increased fuel consumption. In normal logistics operation the most important influence factor comes with the load, which has to be added to the empty weight of the truck. Nevertheless, engine and driving behaviour additionally influence the total CO2 emissions. As transportation impact the global climate change in a severe manner, a better understanding of the existing monitoring methodologies will play an important role for future policy and tax instruments, already suggested by many experts to reduce greenhouse emissions. Up to now many companies, report their yearly CO2 emissions and also have yearly targets to achieve savings, yet on a voluntary basis.
M	Scope	Estimation and measurement of CO_2 emissions from transport activity based on real-time information, this service has no interaction with the driver.
M	Actors Involved	Fleet operations manager Vehicle driver or operator
M	Stakeholders	EU and National governments Urban administrations Public transport authorities Cargo service customer
M	MIS / TM / UL	UL
M	Assumptions	UL-0xx3 v1 (Eco-drive Support Service) is applied. Fleet configuration data is available, freight statistics and average fuel consumption per vehicle and time of engine operation is available, CAN-Bus data and/or satellite positioning of location and speed profiles per second is available

M	Identified standards (not exhaustive list)	3GPP LTE DIN ISO 26000 (Sustainability guidelines), e.g. http://www.ecodrive.eu/en/service ISO 14001:2004 (Plan-Do-Check-Act, PDCA) Environment Management Norm CEN/TC 278/WG2 – I.T.S. standardization working group Freight, Logistics and Commercial Vehicle Operation EN16258: Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers) For the pilot site in Bordeaux the following French regulation (décrets) apply: The information on CO2 for transport services ia disposition from the French "Grenelle de l'environnement" debate. The obligation was introduced by an article of the law known as "Grenelle II", specified in article L1431-3 of the "Code des transports". There are three regulatory texts: - décret n° 2011-1336 of October 24, 2011 relative to the information of the quantity of CO2 emission for a transport service - l'arrêté of April 10 2012 on the application of artcles 5, 6 and 8 of décret n° 2011-1336 - l'arrêté of April 10 2012 on the application of artcles 14 of décret n° 2011-1336
M	Standardisation gaps identified	1. Voluntary action plans 2. Voluntary action plans 3. No C-I.T.S. classification 4. In-Vehicle data formats
	Recommended actions	Development of new standards to close gaps.
O	Other information	This Use Case is applied at seven CO-GISTICS pilot sites.

I.2.3.4 UL 0400Loading bays information and reservation services for logistical efficiency (Source CID)

I.2.3.4.1 UL 0401Loading unloading places (Source OPTICITIES, TFL) *

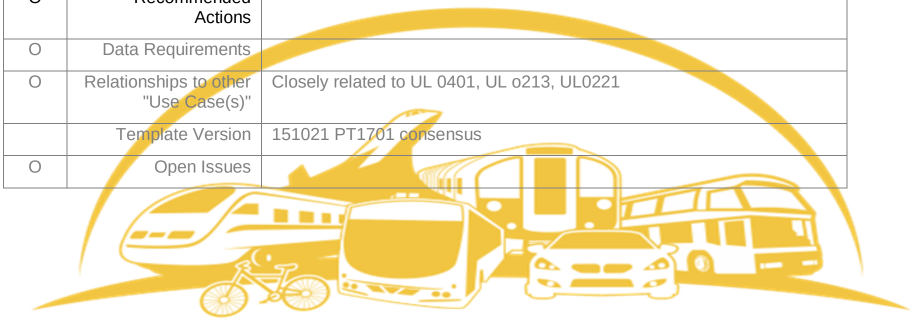
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Loading bays information and reservation services for logistical efficiency**
M	**Use Case reference /id**	**UL-0401 v1 20151124**
M	Description	Standardised booking system for referencing and booking loading bays Unsure if there is some additional requirement hidden in “for logistical efficiency”- need input from Opticities
M	Scope	Booking system for loading bays. Standardised identification system for loading bays.
M	Scenario	Last mile delivery/collection Booking system for loading bays. Standardised identification system for loading bays (Note loading bay reservation is not covered in UL 0213, and is related to UL 0221)
M	Actors Involved	Receivers/despatchers Urban administrations and their agents in-house or commercial consolidation centre/sorting offices loading bay owners truck operators Drivers
M	Stakeholders	Cargo owners Urban administrations and their agents in-house or commercial consolidation centre/sorting offices loading bay owners truck operators
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	UL 0221, UL 0213
	Template Version	151021 PT1701 consensus
O	Open Issues	



I.2.3.5 UL 0500Loading bays information and reservation services for specific freight vehicles (Source CID)

I.2.3.5.1 UL 0501 Measurement place : weight no of axles etc./ covered area/freight lines/limitations-time of day-day-size/ADR rules) (Source OPTICITIES)*

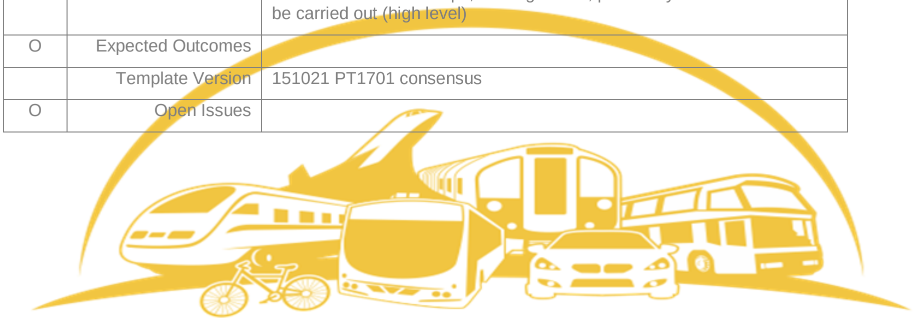
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Loading bays information and reservation services for specific freight vehicles -Measurement place**
M	**Use Case reference /id**	**UL-0501 v1 20151124**
M	Description	More information required from Opticities as to why this is a separate Use Case Measurement place: weight no of axles etc./ covered area/freight lines/limitations- time of day-day-size/ADR rules
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	Receivers/despatchers Urban administrations and their agents in-house or commercial consolidation centre/sorting offices loading bay owners truck operators Drivers UNECE JWG RID (re ADR)
M	Stakeholders	Cargo owners Urban administrations and their agents in-house or commercial consolidation centre/sorting offices loading bay owners truck operators
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Recommended Actions	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Closely related to UL 0401, UL o213, UL0221
	Template Version	151021 PT1701 consensus
O	Open Issues	



I.2.3.6 UL 0600Cargo identification (Where relevant to movements inside the urban domain) (Source CID)

I.2.3.6.1 UL 0601Cargo Identification- Predetermined *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Cargo identification (inside urban zone)**
M	**Use Case reference /id**	**UL-0601 v1 20151124**
M	Description	Further information required as to the reason this idenitification is required and who by and if and why it is different to UL0102,UL 0108, UL 0209, Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Recommended Actions	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	UL0102,UL 0108, UL 0209,
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
	Template Version	151021 PT1701 consensus
O	Open Issues	



I.2.3.6.2 UL 0602 Cargo Identification – Dynamic *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Cargo Identification – Dynamic**
M	**Use Case reference /id**	**UL-0602 v1 20151124**
M	Description	Further information required as to the reason this identification is different from UC 0601
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

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I.2.3.7 UL 0700Use of alternatively fuelled vehicles for urban logistics (Source CID) *

I.2.3.7.1 UL0700 Use of alternatively fuelled vehicles for urban logistics (Source CID) *

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Use of alternatively fuelled vehicles for urban logistics**
M	**Use Case reference /id**	**UL-0701 v1 20151124**
M	Description	Use of alternatively fuelled vehicles for urban logistics
M	Scope	This identified subject is a commercial and/or political decision it is not a subject for standardisation.
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	No standardisation action required
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
	Template Version	151021 PT1701 consensus
O	Open Issues	

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I.2.3.8 UL 0800Charging alternatively fuelled vehicles (Source CID)

I.2.3.8.1 UL 0801Charging alternatively fuelled vehicles (Source CID)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Charging alternatively fuelled vehicles on streets**
M	**Use Case reference /id**	**UL-0801 v1**
M	Description	Provision of information related to location, availability and pricing of alternatively fuelling stations (electric vehicles) placed along the streets and managed by specific operators or urban administrations.
M	Scenario	'Charging Spot'(s) in the vicinity and/or surrounding areas on the travel of an electrical vehicle have a limited number of parking lots. Certain lots can be occupied and their availability in time has to be known in real time by each electric vehicle to be considered in their energy control strategies to optimize their route. Reservation and/or payment of a charging spot, are to be assumed also in such scenario.
M	Scope	Specifications for common communications and data exchange aspects for application service 'Charging Spot access on street'.
M	Actors Involved	Urban administration Urban administrations Charging spot operator Vehicle driver or operator Traffic managers Trip planning service providers
M	Stakeholders	Urban administration Urban administrations Charging spot operator Vehicle driver
M	MIS / TM / UL	UL / TM
M	Assumptions	Such vehicle has one or more of C-ITS communications available: 2G, 3G, 4G/LTE, ITS-G5.
M	Identified standards (not exhaustive list)	ISO/NP 15118-xx Road vehicles -- Vehicle to grid communication interface. DATEX II ETSI TS 101 556-1 V1.1.1 (2012-07) -- Electric Vehicle Charging Spot Notification Specification ETSI TS 101 556-3 V1.1.1 (2014-10) -- Communications system for the planning and reservation of EV energy supply using wireless network
M	Standardisation gaps identified	The present ISO TC22 / CEN TC301 documents are NP and ETSI documents are TS awaiting input from experts in this area, before it is developed as an EN/IS.
	Recommended actions	UL 0801 Charging alternatively fuelled vehicles on streets Obtain cooperation and contribution from European EV charging spot management projects. Potentially a project team if significant redevelopment is required.
O	Other information	

I.2.3.9 UL 0900Charging (e.g. during loading/unloading at the specific bays) (Source CID)

I.2.3.9.1 UL 0901Charging (e.g. during loading/unloading at the specific bays) (Source CID)

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Charging (e.g. during loading/unloading at the specific bays)**
M	**Use Case reference /id**	**UL-0901 v1 20151124**
M	Description	Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.10 UL 1000Intelligent parking for light vehicles (Source CID)

Finding and making connections among different modes of travel and daily life tasks – seamlessly – remains a challenge. No solution exists today at a national or international level that combines personal agenda, community, real-time data on available connections for all traditional modes of travel (cars, public transport, trains and planes), let alone emerging models of shared transportation for cars, bicycles and accommodation.

Currently, for such applications, we can identify different trip planner like Citymapper, established players like Google but also OEM involvement with Moovel by Daimler, Moovit backed by BMW and a few others.

As multimodal integration platform there is also IPITA – Integrated Proactive Intermodal Travel Assistant is the solution that aims to optimize intermodal travel planning, booking and navigation, using real-time maps and geo-specific information. Interfaces to the traffic management systems for road, rail and air ensure the latest traffic information and predictions. Any changes and disruptions to travel plans – such as scheduling delays, congestion or weather problems – will be detected quickly. Given travel requirements and constraints, IPITA is also a platform from which alternative modes of travel or real-time rerouting, rebooking and re-ticketing can be suggested. All of this will be provided by a single, seamless interface that includes one mobile ticket across all modes of travel

But concerning all these applications, urban parking access and availability are rarely taken in account, to optimize connections between cars and public transports (subway, busses, trams and trains).

Considering parking availability, CEN TC278 standard DATEX II 2.3 has been recently enhanced by a specific parking publication container including dynamic data like:

- Occupancy information for a parking site, a group of parking sites or a group of parking spaces (all declared in the static model and referenced):
  - Number of spaces (as an override in case of dynamic changes),
  - Number of vacant spaces (as a number, as a ‘higher than’ or ‘lower than’ information as well as in an enumerated form),
  - Number of occupied spaces (as a number, in enumerated form as well as in trend form),
  - Number of parking vehicles;
- Information on individual parking spaces (occupied or free, temporarily closed);
- Overriding thresholds: It is possible to override the static threshold information, i.e. the defined fill grades of a parking site for which the dynamic status information should change between different states (incl. overcrowding states);
- Status information: A state information on the fill grade of a parking site incl. overcrowding information (in limited form also for a group of parking sites);
- Validity of parking space- and group of parking space-declarations: Spaces might be temporary closed or defined for mixed usage (i.e. declaration not valid all the time);
- Information about the availability of additional equipment or additional service facilities (overriding the amount, current availability, opening and vacancy information);
- Fill- and exit rates (sensor data, which can be based on a static measurement site table information);
- Vehicle count within interval, i.e. incoming or outgoing vehicles or change of occupancy within time

Considering Parking access and availability Use Cases we can have two types of Use Cases:

- Parking access and availability in multimodal areas
- Parking access and availability along streets

I.2.3.10.1 UL 1001Parking Availability in multimodal areas

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for light vehicles:** **Parking Availability in multimodal areas**
M	**Use Case reference /id**	**UL-1001 v1**
M	Description	Provision to drivers and travellers of information concerning the location of parking places and availability of parking spaces in the context of a multimodal trip planner.
M	Scope	Users may request this information before their trip or during their trip. In both cases existing parking places around a certain location either -indicated by the user (which may be driver/navigation system), or -according to the position of the driver. Requests to the urban logistics domain are addressed to get the actual availability of free parking spaces. This Use Case may be part of "Actual Trip Plan Delivery". This information may be displayed on maps.
M	Actors Involved	Driver / traveller Traveller information providers Car park operators
M	Stakeholders	
M	MIS / TM / UL	UL / MIS
M	Assumptions	Such vehicle has one or more C-ITS communications available: 3G, 4G/LTE, ITS-G5.
M	Available Standards	Transmodel/NeTEx: for parking place retrieval ISO/TS 18234-7:2013 Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI) ISO/DTS 21219-14 Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI) CEN/TS 16157-6) DATEX II 2.3(Dec. 2014) evolutions for parking space availability for parking space availability
M	Standardisation gaps identified*	1) Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas car park operators deliver information about parking space availability using DATEX II. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged.
O	Other information	

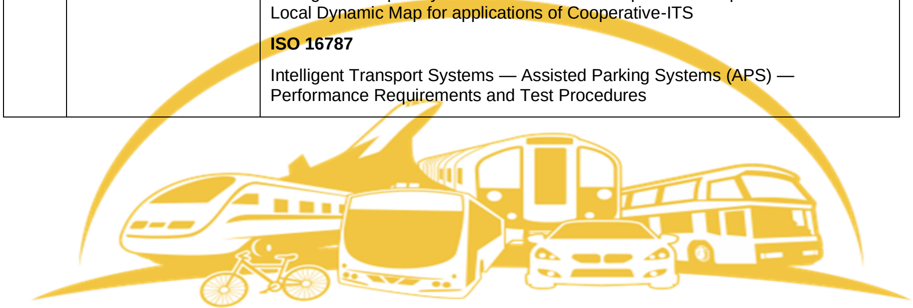
Rc_UL02- Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas car park operators deliver information about parking space availability using DATEX II. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged. To be included in work proposed in RC_MI10-.

I.2.3.10.2 UL1002 Off-street Parking access and availability

The availability of real-time occupancy information from street-parking, allows extending existing added-value services for parking, as well as makes it possible to introduce new ones. Dynamic parking guidance, VMS in street network, online and mobile information services, as well as parking operational picture systems, can be extended to include up-to-date street-parking information. Dynamic pricing can be introduced to ensure parking availability in most crowded areas. Depending on the type and geospatial resolution and accuracy of data, also more sophisticated services can be introduced.

Several commercial products exist for occupancy counting in street-parking by using surface-mounted or flush-mounted ground sensors. These sensors use either infrared or magnetic loop technology to detect a vehicle presence above them. The sensors are battery-operated and connect wirelessly to concentrator devices, which transmit occupancy data further to a central system. The central system maintains data from all sensors and typically visualizes the data for use of the parking operator on a map-based monitoring dashboard. The drivers are often given their own view to the occupancy data by product-specific mobile apps.

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for light vehicles:** **Off-street Parking Access and Availability**
M	**Use Case reference /id**	**UL-1002 v1**
M	Description	Provision to drivers of information concerning the location of parking places their availability, their cost by duration and the access to reach them.
M	Scope	Drivers request this information in real time around a destination point -indicated by the user (which may be driver or navigation system), -according to the position of the vehicle (map of free places) This information can be displayed on embedded maps.
M	Actors Involved	driver traveller information providers car park operators urban administration Urban administrations
M	Stakeholders	
M	MIS / TM / UL	UL / TM
M	Assumptions	Such vehicle has one or more C-ITS communications available: 3G, 4G/LTE, ITS-G5.
M	Available Standards	**ISO/TS 18234-7:2013** Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI) **ISO/DTS 21219-14** Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI) **CEN/TS 16157-6)** DATEX II 2.3(Dec. 2014) evolutions for parking space availability **ISO/TS 17931:2013** Intelligent transport systems -- Extension of map database specifications for Local Dynamic Map for applications of Cooperative-ITS **ISO 16787** Intelligent Transport Systems — Assisted Parking Systems (APS) — Performance Requirements and Test Procedures



M	Standardisation gaps identified*	Car park operators deliver information about parking space availability using DATEX II. 1/ An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. 2/ Development of standards based on ITS-G5 broadcasted services, to describe equivalent Local Dynamic Map elements related to : - Available places - Cost of parking lot €/hr - … And transmit it towards vehicles
O	Other information	

Rc_SO02- Recommendation: Car Park Operators deliver information about parking space availability using DATEX II; Providing: a) An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. b) Development of standards based on ITS-G5 broadcasted services, to describe equivalent Local Dynamic Map elements related to: Available places; Cost of parking lot €/hr; etc. And transmit it towards vehicles. This work is probably best led by the DATEX standards community. (I.2.10.3.2)

I.2.3.10.3 UL 1003Parking Availability along streets

The availability of real-time occupancy information from street-parking, allows extending existing added-value services for parking, as well as makes it possible to introduce new ones. Dynamic parking guidance, VMS in street network, online and mobile information services, as well as parking operational picture systems, can be extended to include up-to-date street-parking information. Dynamic pricing can be introduced to ensure parking availability in most crowded areas. Depending on the type and geospatial resolution and accuracy of data, also more sophisticated services can be introduced.

Several commercial products exist for occupancy counting in street-parking by using surface-mounted or flush-mounted ground sensors. These sensors use either infrared or magnetic loop technology to detect a vehicle presence above them. The sensors are battery-operated and connect wirelessly to concentrator devices, which transmit occupancy data further to a central system. The central system maintains data from all sensors and typically visualizes the data for use of the parking operator on a map-based monitoring dashboard. The drivers are often given their own view to the occupancy data by product-specific mobile apps.

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for light vehicles: On-street Parking Availability**
M	**Use Case reference /id**	**UL-1003 v1**
M	Description	Provision to drivers of information concerning the location of parking spots, their availability, their duration possibility and cost along the streets.
M	Scope	Drivers request this information in real time around a destination point -indicated by the user (which may be driver or navigation system), -according to the position of the vehicle (map of free places) This information can be displayed on embedded maps.
M	Actors Involved	Driver Traveller information providers Urban administration Urban administrations
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	Such vehicle has one or more C-ITS communications available: 3G, 4G/LTE, ITS-G5.
M	Available Standards	**ISO/TS 18234-7:2013** Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI) **ISO/DTS 21219-14** Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI) **CEN/TS 16157-6)** DATEX II 2.3(Dec. 2014) evolutions for parking space availability **ISO/TS 17931:2013** Intelligent transport systems -- Extension of map database specifications for Local Dynamic Map for applications of Cooperative-ITS **ISO 16787** Intelligent Transport Systems — Assisted Parking Systems (APS) —Performance Requirements and Test Procedures
M	Standardisation gaps identified*	1/ An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. 2/ Development of standards based on ITS-station broadcasted services, to describe equivalent local dynamic map elements related to : - Available spots - Locations of spots - Cost of parking spots (€/hr) - … And transmit it towards vehicles.
O	Other information	

Rc_SO02- Recommendation: a) An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. b) Development of standards based on ITS-station broadcasted services, to describe equivalent local dynamic map elements related to : Available spots; locations of spots; Cost of parking lot €/hr; etc.. And transmit it towards vehicles. This work is probably best led by the DATEX standards community. (I.2.3.10.2).

I.2.3.10.4 UL-1004 Parking spot internal access management

When a parking has been chosen by a driver, and when vehicle has reached this parking spot, it can be helpful for the driver to be assisted by a dedicated navigation able to give him the guidance to reach an adequate parking spot, in this parking. In such scenario an available parking spot (in case of disabled or old persons) very closed from lifts or exits can be indicated to the driver. In such scenario an adequate trajectory can have been sent by the car park to the vehicle to reach the spot.

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for light vehicles: Parking spot internal access management**
M	**Use Case reference /id**	**UL-1004 v1**
M	Description	Provision to drivers of information concerning the location and the access trajectory of an available parking spot in a car park.
M	Scope	Vehicle receives from the car park infrastructure some information related to the best trajectory to reach an available spot: -chosen by the user or the car park and tacking in account some personal parameters (disabled person, luggage, ..) to facilitate access to pedestrian exit These trajectory indications can be displayed on embedded maps.
M	Actors Involved	Driver Car park operator Urban administrations
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	Such vehicle has one or more C-ITS communications available: Wifi 11n, ITS-G5 and specific localization systems (no GNSS coverture).
M	Available Standards	**ISO/TS 18234-7:2013** Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI) **ISO/DTS 21219-14** Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI) **CEN/TS 16157-6)** DATEX II 2.3(Dec. 2014) evolutions for parking space availability **ISO/TS 17931:2013** Intelligent transport systems -- Extension of map database specifications for Local Dynamic Map for applications of Cooperative-ITS **ISO 16787** Intelligent Transport Systems — Assisted Parking Systems (APS) —Performance Requirements and Test Procedures
M	Standardisation gaps identified*	No standards for indoor positioning and navigation systems New elements to include in Local Dynamic Map related to a Car Park internal description: — Available spots locations — Evolution of MAP standard to describe different paths to reach a spot — Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. Adaptations of existing standards and new standards have to be engaged for future Valet Parking applications (Autonomous Vehicles).
O	Other information	

Rc_SO03- **It is recommended that Standards be developed for new elements to include in Local Dynamic Map related to a Car Park internal description including: Available spots locations; Evolution of MAP standard to describe different paths to reach a spot; Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. This work is probably best led by the DATEX II standards community.**

Rc_UL07- **Adaptations of existing standards and new standards have to be engaged for future Valet Parking applications (Autonomous Vehicles).**

I.2.3.11 UL 1100intelligent parking for light commercial vehicles (Source CID)**

I.2.3.11.1 UL-1101 intelligent parking for light commercial vehicles (Source CID)**

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**intelligent parking for light commercial vehicles**
M	**Use Case reference /id**	**UL-1101 v1 20151124**
M	Description	Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.2.3.12 UL 1200Intelligent parking for heavy goods vehicles (Source CID)**

I.2.3.12.1 UL-1201 Intelligent parking for heavy goods vehicles (Source CID)**

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for heavy goods vehicles**
M	**Use Case reference /id**	**UL-1201 v2 20160416**
M	Description	Intelligent parking for heavy goods vehicles
M	Scope	See UL0210 and UL 0227
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

I.3 · UL Existing CEN/TC 278 working groups involved and co/cross working arrangements

CEN TC278 WG2 Freight and Fleet
ISO TC278 WG7 General fleet management and commercial/freight

At the moment CEN TC278 WG2 is nascent and has no active working items, and has no achieved deliverables. ISO TC204 therefore represents the focus for standardisation.

The TARV (Telematics Applications for Regulated Vehicles), a family of 7 “base” standards covering framework, architecture, communications, security, data, and general rules for “applications” standards for both regulated applications and non-regulated applications, (+two further under development) application standards, many of which will be appropriate for control and management of commercial vehicles in urban environments.

WG7 has also produced two standards ISO 26683-1 and ISO 26683-2; Freight land conveyance content identification and communication (FLC-CIC). Part 1 is a general architecture, and part 2 offers a number of application profiles (that include urban consolidation and last mile delivery).

Other WG7 deliverables cover secure movement of freight through the delivery cycle, and emerged from the US follow-up following the terrorist events of 9/11.

WG2 is well represented in TC204 WG7, and may well lead the development of additional parts to the TARV series.

WG2 has cooperated with WG7 in the standardisation aspects for remote tachograph monitoring and weigh in motion, using CEN 5.8 GHz DSRC technology, at the instigation of the European Commission, to provide reference standards for new European Regulations in these areas, As a result these TARV deliverables now have profiles that specifically match European regulatory requirements. Once this standardisation is finalized through the ISO system, WG2 will take the work items to fast track them through CEN to become EN/ISO standards.

I.4 UL International/European harmonisation requirements

As seen above, the cooperation between the nascent CEN TC278 WG2 and ISO TC204 WG7 is good. Because of the CEN/ISO Vienna agreement, wherever there is a global requirement/interest, more and more of the standards will be first developed as ISO standards.

I.5 UL Gap and overlap analysis involving European and international SDOs and their relevant deliverables

I.5.1 UL--0110v1 Provision of relevant traffic information- congestion; green wave; etc. data

GAP: Information in a standard form from urban authority TMs.

Although this could be of significance in reducing urban pollution and reducing congestion, this subject is nowhere near standardisation.

Rc_UL08- Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats. (Possibly part of Rc_UL01- joint project)

I.5.2 Delivery vehicle realtime mapping/route optimisation

UL-0112 v2 20151124

1) Standard format for information made available from urban authority to truck operators/drivers (this would be quite a complex information matrix).

2) Question. If the data is available in a standard format, is there any need for standards regarding real-time mapping and route optimisation, or is that a marketplace product (using the standardised data)??

3) Standardising Geofencing protocols etc.

Recommendation

The private sector is very active in the area of realtime route planning and delivery. A standard would have benefit in enabling the market to successfully address these issues. However, we have identified little demand from outside urban administrations.

Rc_UL04- Geofencing: A project team is probably required in respect of standardising geofencing protocols
Priority Level: Medium ***(in relation to other UL Recommendations)***

I.5.3 Vehicle access management and monitoring

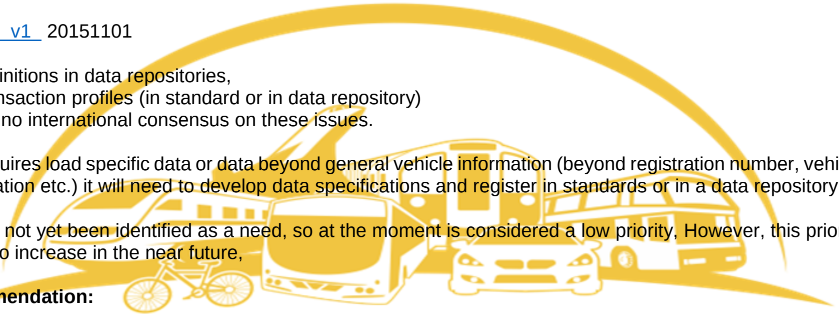
UL-0201 v1 20151101

Data definitions in data repositories,
Data transaction profiles (in standard or in data repository)
There is no international consensus on these issues.

If EU requires load specific data or data beyond general vehicle information (beyond registration number, vehicle classification etc.) it will need to develop data specifications and register in standards or in a data repository.

This has not yet been identified as a need, so at the moment is considered a low priority, However, this priority is likely to increase in the near future,

Recommendation:



Rc_UL01-B European profile and relevant data concepts for vehicle access management and monitoring. Project team to identify urban administration needs and specify. Could be part of a larger data format/data profiles project.

I.5.4 Vehicle Speed Monitoring

UL-0208 v1 20151101

Add to meta data concept registry and/or define in a standards deliverable.

Low priority. No specific PT action proposed

I.5.5 Urban Consolidation Centres (UCC)

Ul-0213 v1 20151101
Guidelines on the operation of such UCCs (probably in the form of a Technical Specification, could be beneficial in finding and interpreting such available standards.
No active demand

Low priority ***(in relation to other UL Recommendations)***

No action recommended within timespan of CID

I.5.6 Oversize Management

Oversize Management UL-0214
1) Asset restriction data in SatNavs systems. Format for Urban Administrators to provide data to SatNav providers
2) V2I messaging for in cab warnings

Rc_UL01-C Oversize Management - Project Team to determine data formats for Urban Administrators to provide data to SatNav. Could be part of larger PT on Data formats definition.

I.5.7 Emissions monitoring

UL-0301 Emissions monitoring General
Develop Standard for air quality *outstations* and traffic management systems
A project team may be required to overcome vendor lock in aspects

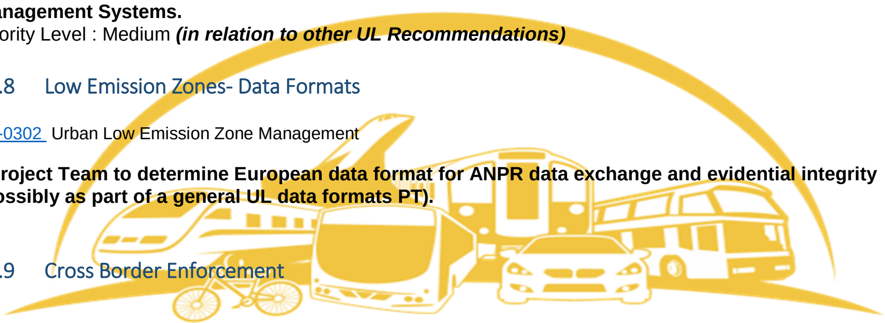
Rc_UL03- Emissions monitoring - Project Team to determine standard for Air Quality *outstations* and Traffic Management Systems.
Priority Level : Medium ***(in relation to other UL Recommendations)***

I.5.8 Low Emission Zones- Data Formats

UL-0302 Urban Low Emission Zone Management

Rc_UL01-D Project Team to determine European data format for ANPR data exchange and evidential integrity (possibly as part of a general UL data formats PT).

I.5.9 Cross Border Enforcement



UL-0304- Cross border Enforcement

Rc_UL01-E Cross border enforcement;- A project team to determine the transaction and data format standardisation required in order to enable the /directive to be applied and function efficiently

I.5.10 Charging alternatively fuelled vehicles on streets

UL 0801 Charging alternatively fuelled vehicles on streets

Obtain cooperation and contribution from European EV charging spot management projects. Potentially a project team if significant redevelopment is required. (Future action)

I.6 UL Potential revision of existing standards,

I.6.1 Weigh in motion

UL-0211 v1 20151101
WD available, in CD ballot before end 2015, expected standard before end 2016
Member States should support these ballots

I.6.2 Vehicle parking facilities

UL-0210 v1 20151101

The present document is a TS awaiting input from European Projects in this area, before it is developed as an EN/IS

Obtain cooperation and contribution from European safe parking projects. Potentially a project team if significant redevelopment is required.

See also late submission UL-0227.

Seems to be low priority. ***(in relation to other UL Recommendations)***

I.7 UL Roadmap with targeted deliverables and concrete actions to speed up deployment of Urban-ITS

A number of the recommendations for Urban logistics are centred around standardisation of data formats and transactions:

Rc_UL01-A Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats

Rc_UL01-B European profile and relevant data concepts for vehicle access management and monitoring. Project team to identify urban administration needs and specify. Could be part of a larger data format/ata profiles project

Rc_UL01-C Oversize Management - Project team to determine data formats for urban administrators to provide data to SatNav. Could be part of larger PT on data formats definition;

Rc_UL01-D Project Team to determine European data format for ANPR data exchange and evidential integrity (possibly as part of a general UL data formats PT);

Rc_UL01-E Cross border enforcement;- A project team to determine the transaction and data format standardisation required in order to enable the /directive to be applied and function efficiently.

A combined project, judged as high priority, ***(in relation to other UL Recommendations)*** *is recommended*

Rc_UL01- A combined project "Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics" is therefore recommended whose scope is to (at least) include:
Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement.
Priority: HIGH

The following project(s) are also considered HIGH PRIORITY (in relation to other UL Recommendations)

Rc_UL03- Emissions monitoring - Project Team to determine standard for Air Quality *outstation***s and Traffic Management Systems**

The following project(s) are also considered MEDIUM PRIORITY (in relation to other UL Recommendations)

Rc_UL04- Geofencing: A project team is probably required in respect of standardising geofencing protocols
Priority Level: Medium

The following project(s) are also considered beneficial but low PRIORITY ***(in relation to other UL Recommendations)***

I.8 UL Funding issues

Of the three priority areas, urban logistics is the least established and organised. Although there has been significant research and testing, an organised approach in, say the way of public transport and traffic management, has not yet evolved, and indeed there is only coincidental cohesion between freight movements, vehicle parking and alternative fuel recharging.

Further, in the quarter of a century of standardisation efforts, the commercial freight sector has shown little interest in standardisation. Apart from a few major hauliers, the sector is, by its nature, largely comprised of SMEs, whose interest lies in the daily logistic of freight movement, and the longer term goals and aspirations for freight movement efficiency and sustainability, seem far removed.

If the European Commission wishes to progress any of these areas cohesively, it will need to stimulate this work through project teams and direct intervention.

Annex J Communications and Security (CS) issues for Urban-ITS

J.1 Communications objectives, summary and scope addressed

J.1.1 Stakeholder engagement

PT 1701 has, in its membership, leading experts from the world of vehicle communications and Cooperative-ITS.

The network of personal connections into the standardisation community for ITS is direct and extensive. The PT project leader (K. Evensen) is the editor for ISO 21217, the architecture on which C-ITS multiple media communications are being established. Dr Williams was creator and editor of several of the associated media standards that link into the CALM architecture and both the project leader and Dr Williams were principal architects of the communications air interface for road vehicles concept. Both have extensive knowledge of these standards, and have personal contact into the ISO and ETSI committees that created the standards and have personal contact with the editors.

J.1.2 Cooperative-ITS and Urban-ITS

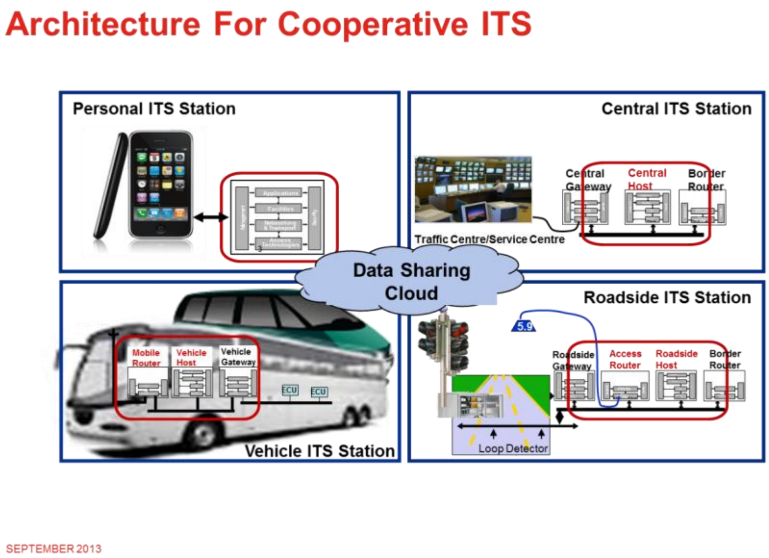
Cooperative-ITS (C-ITS) is one of the key advances of ITS facilitated by the European Commission.
It is at the least essential that there is effective coexistence between C-ITS and Urban-ITS, therefore accommodation of C-ITS within the Urban-ITS paradigm.

However, it turns out that C-ITS provides both a migration path out of legacy silo systems into the interoperable paradigm of Urban-ITS and provides many basic requirements (such as security) that will be required by Urban-ITS.

C-ITS can be regarded as both a toolkit and as a technical platform for Urban-ITS.

With C-ITS in this context, we refer to the complete definition from ETSI EN 302 665 and ISO 21217, and not the reduced V2V/V2I often referred by the car makers.

C-ITS in the Urban-ITS context covers Travellers with the Personal ITS-station, vehicles of various modes and types, Roadside/depot/*outstation* functions, and central/back-office/*instation* functions
See figure J–1 Which provides the following architecture:


Architecture For Cooperative ITS

Personal ITS Station
Central ITS Station
Central Gateway
Central Host
Border Router
Traffic Centre/Service Centre
Data Sharing Cloud
Roadside ITS Station
5.9
Roadside Gateway
Access Router
Roadside Host
Border Router
Loop Detector
Mobile Router
Vehicle Host
Vehicle Gateway
ECU
ECU
Vehicle ITS Station

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Figure J–1: Architecture for C-ITS

NOTE: In Figure J–1 a cloud approach refers to via the internet, and not the "cloud service providers "such as Microsoft, Amazon IBM, etc).

This means that all data storage/data processing will per definition happen inside one of the four classes of ITS-station. The data sharing cloud functions as a 'Virtual Private Network' over the internet, or more precisely over IPv6 which is the new Internet protocol.

Enabling and, where appropriate, applying the C-ITS paradigm for Urban-ITS will allow:

- interoperable communication over different bearers without having to specify these for each of the applications/Use Cases we define in Urban-ITS;
- security features that support cross-domain trust between all actors, at the same time as providing privacy support according to national/EU regulations;
- remote management possibilities that allow unattended Stations that may be remotely loaded with new services, and automatic configuration and maintenance;
- stations may also run locally determined ITS services side-by-side with the standardized Urban-ITS set, giving a high degree of local freedom to Urban Administrations to set their own policies.

Most of the C-ITS standards needed to support Urban-ITS are already available, but two areas need urgent attention:

- Setting common policies for Urban-ITS regarding the use of C-ITS. This is suggested to be done by a project that create and support a handbook include the following elements:
  - Best practices for the various roles of Urban-ITS (authorities setting policies, operators, implementers/suppliers),
  - Guide(s) showing how the different C-ITS standards may be applied,
  - Guide showing how to become part of the overall Security hierarchy;

- A mandatory test scheme is needed to verify conformance to communication/ operational/performance requirements. This is often referred to as type approval or equipment certification. A strong industry consortium or government organization is needed to control and manage the process on a European level. It is suggested that Urban-ITS attaches to the overall C-ITS process aimed at the goal of conformance testing. It is recommended that a project team is formed to study conformance testing requirements specifically for Urban-ITS;

- Defining the missing security standards regarding interfaces between roadside/personal/central ITS-stations, patterned on well-established Vehicle ITS-station security standards.

J.1.3 Common/Interoperable data

The C-ITS standards include a standard called “Local Dynamic Map” (LDM) which specifies data held accessible by an ITS-station. (ISO TR 17424). The LDM is defined as a:

“conceptual data store which is embedded in an ITS-station containing topographical, positional and
status information within a dedicated geographic area of interest, relevant to ITS-stations

Note 1 to entry: The LDM is supported by service functions, which ensure the accessibility, integrity, and security.”

The LDM is closely aligned with TPEG (Transport Protocol Experts Group) specifications.[89]

These specifications offer a method for transmitting multimodal traffic and travel information, regardless of client type, location or required delivery channel (e.g. DAB, HD radio, Internet, DVB-x, DMB, GPRS, Wi-Fi …). Language independence has also been a prime principle in the design.

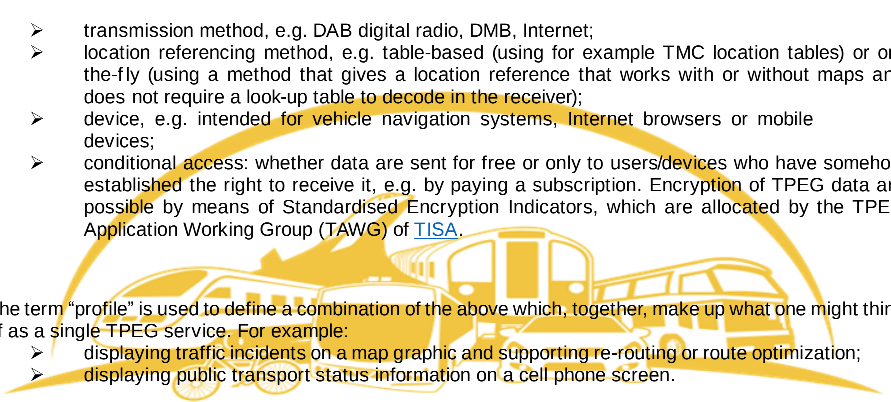
In contrast to TMC (event-based road traffic information), TPEG refers to a whole set or toolkit of specifications, for offering a wider range of services to a wider range of users and devices.

TPEG services are defined in a modular way and can therefore vary in a number of “directions”:

- application, e.g. road traffic messages, public transport information or parking information.

Each application is uniquely identified by an Application ID (AID) that are allocated by the TPEG Application Working Group (TAWG) of TISA;

- transmission method, e.g. DAB digital radio, DMB, Internet;
- location referencing method, e.g. table-based (using for example TMC location tables) or on-the-fly (using a method that gives a location reference that works with or without maps and does not require a look-up table to decode in the receiver);
- device, e.g. intended for vehicle navigation systems, Internet browsers or mobile devices;
- conditional access: whether data are sent for free or only to users/devices who have somehow established the right to receive it, e.g. by paying a subscription. Encryption of TPEG data are possible by means of Standardised Encryption Indicators, which are allocated by the TPEG Application Working Group (TAWG) of TISA.



The term “profile” is used to define a combination of the above which, together, make up what one might think of as a single TPEG service. For example:

- displaying traffic incidents on a map graphic and supporting re-routing or route optimization;
- displaying public transport status information on a cell phone screen.

Any TPEG-service is uniquely identified worldwide by a TPEG Service ID (SID) consisting of three elements called SID-A, SID-B, SID-C, as described in ISO/TS 18234-2. TISA, as worldwide registrar for TPEG SID, is responsible for allocating and maintaining TPEG Service IDs in a Registry to ensure a worldwide unique identification of a TPEG service.

Each TPEG Application is assigned a unique number called the Application Identifier (AID) which is standardized in ISO/TS 18234-1. An AID is defined whenever a new application is developed. The AIDs allocated at the time of publication of this Technical Report are the following (see Table J.1)

Table J–1: TPEG AID table

AID Number (Hex)	Application	Abbreviated term
0	Service and Network Information application	SNI
1	Road Traffic Message application	RTM
2	Public Transport Information application	PTI
3	Parking Information application	PKI
4	Congestion and Travel Time application	CTT
5	Traffic Event Compacy application	TEC
6	Conditional Access Information application	CAI
7	Traffic Flow and Prediction	TFP
8	Fuel Price Information	FPI

Further information on DATEX II is provided in Section D.2.3.29 (and discussed in sections E.1.3; E.4.2; E.4.3; and can be obtained from
http://www.datex2.eu/

Figure J.2 below shows the data flow in the view of different media.

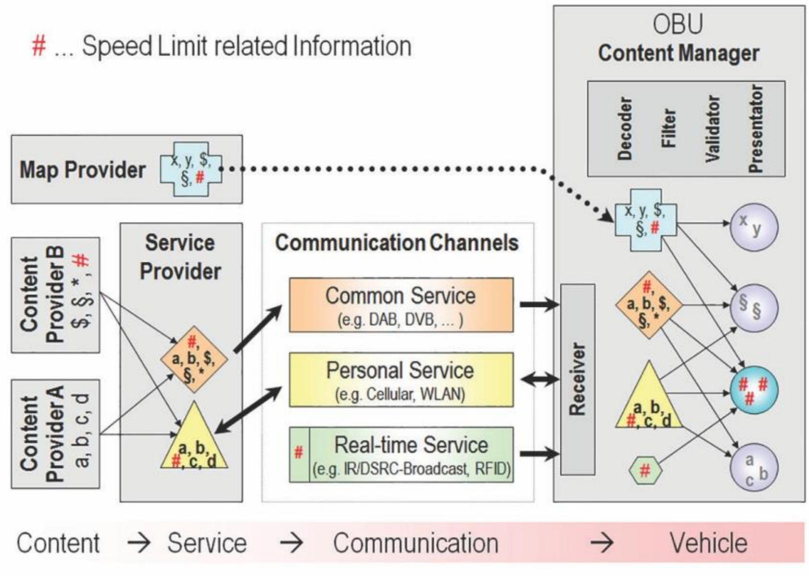

# ... Speed Limit related Information
OBU
Content Manager
Decoder
Filter
Validator
Presentator
Map Provider
x, y, $, §, #
Content Provider B
$, §, *, #
Content Provider A
a, b, c, d
Service Provider
#, a, b, $, §, *
a, b, #, c, d
Communication Channels
Common Service
(e.g. DAB, DVB, ...)
Personal Service
(e.g. Cellular, WLAN)
#
Real-time Service
(e.g. IR/DSRC-Broadcast, RFID)
Receiver
x y
§ §
# # #
a b c
Content → Service → Communication → Vehicle

Figure J–2 : Dataflow in the view of different media (Source ISO TR 17424)

The Freight and Fleet Standards for "Telematics Applications for Regulated Vehicles" (TARV) , ISO 15638 series, is broadly compatible to C-ITS, and uses the concepts of ISO 21217 and its associated standards. TARV has a "Data Tree" kept in a "Data Pantry" that broadly fulfils the same objectives as LDM + host characterisation data. (TARV was approved as a Standard before LDM and its concepts are finalised, so at some stage some harmonisation of data concepts will be required. However, this is not considered a priority at this point in time).

The TARV 'Basic Vehicle Data 'for commercial vehicles comprises:

- Data format version
- Message identifier
- Prime service provider identifier
- Application service provider identifier
- Session control data
- Vehicle unique identifier
- Vehicle class identification
- VIN number
- Propulsion storage type
- Time and timestamp (UTC sec)
- Location
- Error estimation (covariance matrix)
- Direction of travel
- Ignition status
- Other movement sensors
- IVS identification
- Manufacturer identification
- Driver(s) identification
- Trailer identification

- Load data

and additional data provision options for ‘core application data’ and regulated applications.

- Additional data options for ‘core application data’
    - Accelerometer data
    - Gyroscope data
    - Camera/video data
    - Vehicle speed data
    - Alarm status data and records.

J.1.4 Multimodality

Multimodality in this context is the ability to make a journey or transport goods by more than one transport means.

In particular, for multimodal transport of people, the use of personal devices in form of smartphones and tablets are essential. The communication between the transport system and the end users are based on Internet with underlying media such as 3G/LTE, Wi-Fi and Bluetooth. Standardisation of these lower-layer protocols can be viewed as given, and no further work is needed apart from the management, profiling and security mentioned in later sections.

The higher layer protocols and data sets mentioned in the previous section is a different story. Here there are no standards, and every operator of a specific transport means is free to choose their own application service and protocols for smartphone app and/or web service. This has led to significant divergence in the market, and is one of the obvious reasons that there is no interoperability of Multimodal Information Systems.

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J.1.5 Creation of (multimodal) transport datasets

See J.1.2 and J.1.3

J.1.6 Multiple means of communication

The TARV concept is based on multiple means of communication in an environment that can itself migrate as new communications options become available.

See J.1.7

J.1.7 Creation of urban-interurban interfaces

ITS-station<>ITS-station communications are not inherently sensitive to urban-interurban issues. The main carrier of ITS information is the Internet, and this dependence will only increase in the coming period.

Therefore, information flow between urban and interurban zones are already supported on the technical level.

However, on the higher layers there are significant gaps related to institutional issues. So these interfaces need to be strengthened by standards at higher layers, and also regulatory means need to be considered to implement and expand interoperability of urban/interurban information transfer.

J.1.8 Use of open standards, architectures and specifications

C-ITS is a required constituent of most Urban-ITS provision, and, given its presence provides an efficient means of overcoming the historical legacy issues in respect of communications within the urban environment.

Figure J–3 shows an example of the historical situation in respect of the ‘silo approach to communications.

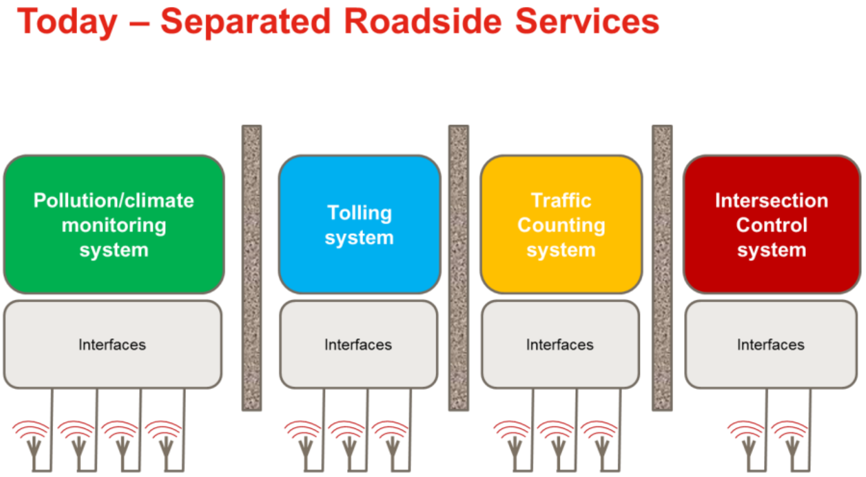

Today – Separated Roadside Services
Pollution/climate monitoring system
Tolling system
Traffic Counting system
Intersection Control system
Interfaces
Interfaces
Interfaces
Interfaces

Figure J–3: Separated roadside services

Using ITS-station standardised communications as the principle means to communicate between urban-ITS actors will change this example to that shown in Figure J–4.

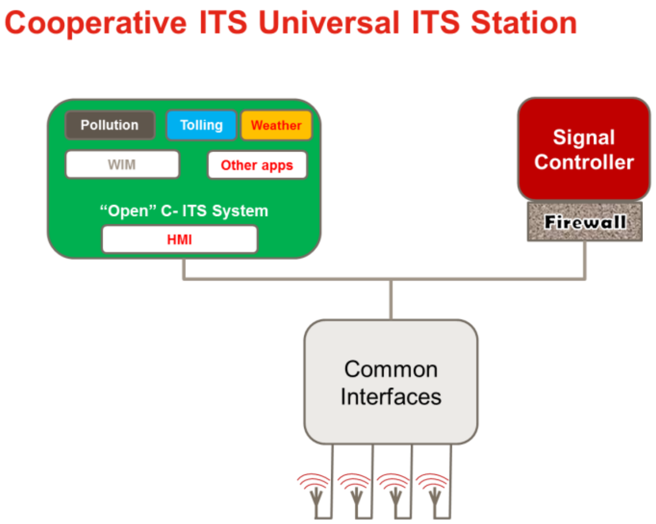

Cooperative ITS Universal ITS Station
Pollution
Tolling
Weather
WIM
Other apps
"Open" C- ITS System
HMI
Signal Controller
Firewall
Common Interfaces

Figure J–4: Cooperative-ITS – ITS-station

To be more specific in our case of MIS, TM and UL, we have the following Figure (J–5):

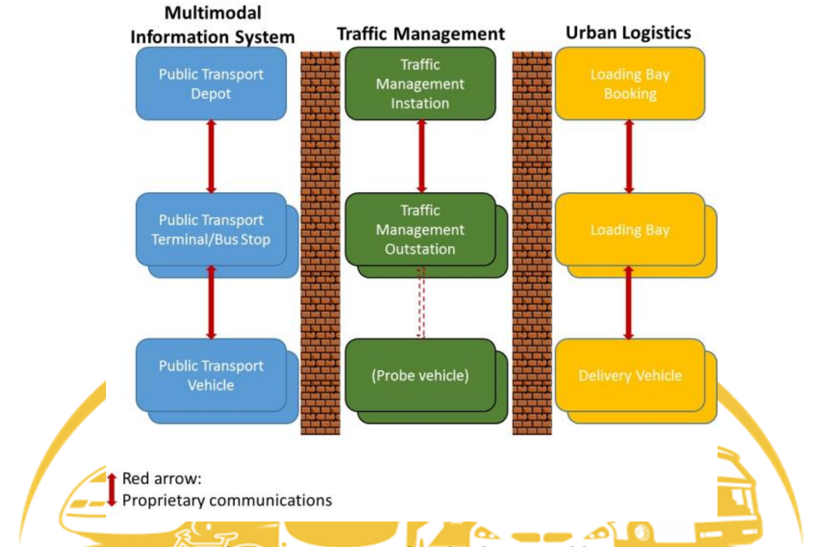

Multimodal Information System
Traffic Management
Urban Logistics
Public Transport Depot
Public Transport Terminal/Bus Stop
Public Transport Vehicle
Traffic Management Instation
Traffic Management Outstation
(Probe vehicle)
Loading Bay Booking
Loading Bay
Delivery Vehicle
Red arrow:
Proprietary communications

Figure J–5: Current situation in many cities

Figure J–5 shows the current situation in many cities in Europe.

With the exception of park-and-ride and public transport priority at intersections (in some locations), although both traffic management and public transport are urban tasks and of a crucial common interest for a city, due to different organisations (TM is the task of the urban traffic management unit and public transport normally is sourced out to a transportation company) there is no close cooperation in terms of supporting real-time multimodal information (i.e. delivering travel times using cars compared to using public transport means). This is why existing multimodal journey planners are currently usually restricted to public transport information.

- In many cities, the different public transport modes (bus, metro, rail, taxi) are often not well connected from an ICT perspective. Standards are mainly used on a high data level for reporting and fleet management. There is usually minimal communication between the MIS and other urban transport systems.
- Traffic management is often very specialized with much of the expertise residing with the system supplier and a few specialists in the public sector. Some cities in Europe have a city-level traffic management system, and city-wide parking advisory systems, but often the traffic management is handled at a district or corridor level, or even as stand-alone intersections. Interfaces are often proprietary resulting in strong lock-in on several levels. Note that some countries like UK and partly Germany have opened up with national standards and have city-wide coordination. European coordination and cross-domain data exchange is still an open need.
- Urban logistics is perhaps the least implemented of the three. Some of the major cities have parts of this, in particular managing parking access and restricted zone access. Also here there is a distinct lack of proper standards, and lock-in is an increasing problem.

Perhaps the biggest problem from a communications perspective is that the interfaces in each of these sectors are frequently proprietary, and there are no provisions to exchange information between the domains. This is illustrated by the brick wall between the domains.

They way out of this situation is simple in theory, but will require new standards and not the least policies and regulations to foster the wide deployment needed of the new features.

The next stage is illustrated as in Figure J–6:

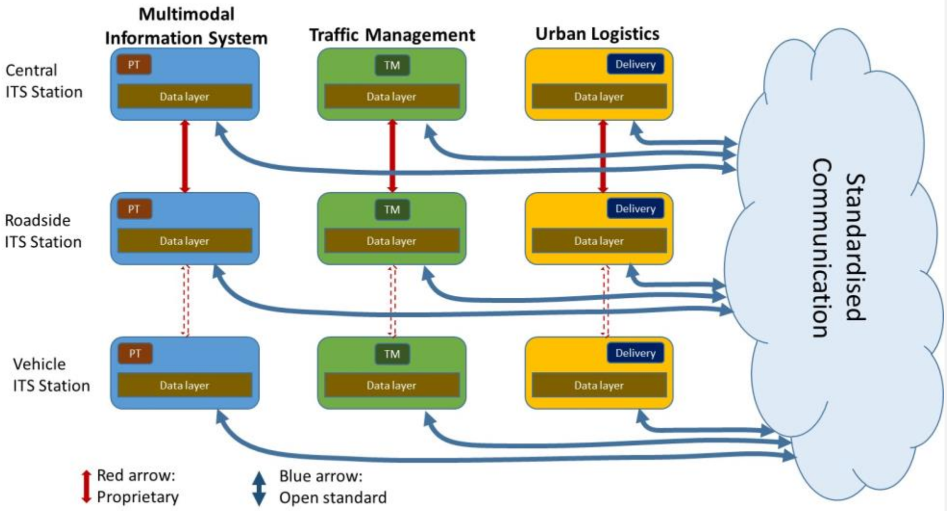


Figure J–6: Migrating current system to the future – step one

Figure J–6 shows the proposed approach. It is clear that any proposal must be based on the current situation, and be able to organically grow the new open solution by slowly replacing bit by bit of the existing solution.

The approach here is as follows:

- The top level (back-office) is extended to support the new open standards for data exchange via secure protocols over the internet. This is done by applying the lower level, management and security protocols described in ISO 21217. Additionally, the data and information protocols must be developed. This is relevant for communication down to the *outstation* level, but also for communication directly to the public via smartphones/web services/vehicle devices. From an urban management perspective, it is essential to also start the cross-domain data sharing at all levels, so that MIS, TM and UL will all share data between themselves. But note that the operation will have to continue as is in the migration phase, so that all the proprietary interfaces will need to be supported for many years to come.

- The middle level (field deployed/field device) is what is close to the road. This is e.g. the bus depot, the bus stop, the TM *outstation* or the car park. The proposal is that all of these will continue their operation as-is, but every time their equipment is somehow updated, or a new function is needed at that place, the local system is upgraded to full ITS-station functionality. This involves standard interface and data inside the secure, managed domain. To maintain regular operation, the current proprietary interfaces and protocols should be kept during a long transition phase. The ITS-station protocols also allow horizontal communication towards other nearby roadside stations.

- Adding open ITS-station communications capability will allow vehicles and people to communicate either with the local roadside station, or directly with the central Station operating the back office.

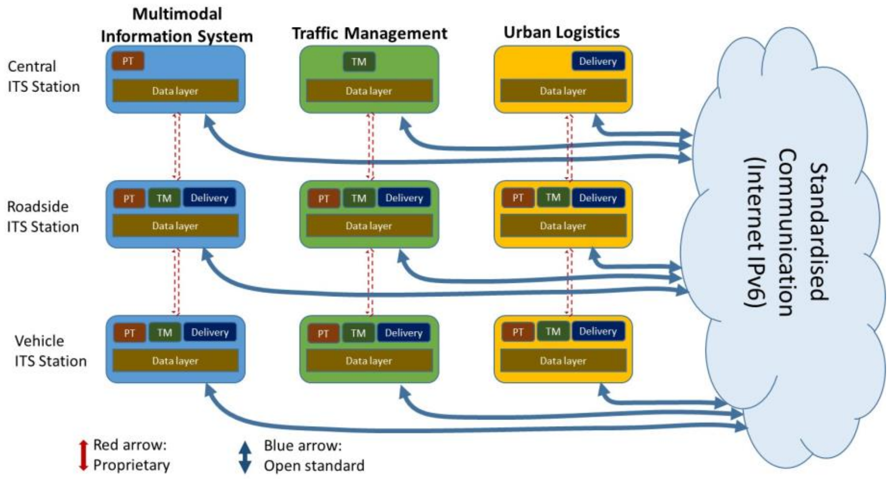

Multimodal Information System
Traffic Management
Urban Logistics
Central ITS Station
Roadside ITS Station
Vehicle ITS Station
PT
TM
Delivery
Data layer
Standardised Communication (Internet IPv6)
Red arrow: Proprietary
Blue arrow: Open standard

Figure J–7: ITS-station in Urban-ITS

The third step is when the Roadside ITS-stations get more widespread. They will then be able to take on new roles and facilitate a flexible data sharing and action decision set. This is shown in figure J–6 above, and has the following features:

- The top level will still operate the core service as earlier, but will phase out the proprietary communications over time. Instead the open ITS-station protocols will allow direct communication with the peer central stations, so that service off-loading can be done in critical situations, and also so that the data and statistics will be much richer. Additionally, the direct interlinkage towards the end users stand to benefit not only MIS, but also TM and UL operation.
- At the roadside station level, the ITS-S will also phase out proprietary protocols. It will allow secure operation of more services, so that one single roadside “box” can take several functions from MIS, TM and UL at the same time.
- The end users are those that will benefit the greatest. Instead of being locked in to one service-one box paradigm, or the currently emerging “one city service one app”, the new set will allow the vehicle ITS-station or the personal ITS-station residing in each user’s smartphone, to support a number of such applications in an open, secure, managed standard. And this will finally allow interoperability across city boundaries, and also towards interurban services.

Taking the legacy approach, if we just consider systems that are already mandated or about to be mandated, we will get the result shown in Figure J–8. Already this has started to happen.

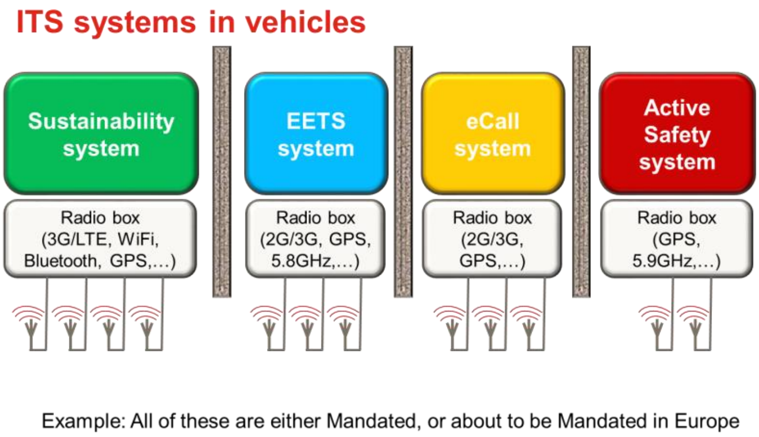

ITS systems in vehicles
Sustainability system
EETS system
eCall system
Active Safety system
Radio box (3G/LTE, WiFi, Bluetooth, GPS,…)
Radio box (2G/3G, GPS, 5.8GHz,…)
Radio box (2G/3G, GPS,…)
Radio box (GPS, 5.9GHz,…)
Example: All of these are either Mandated, or about to be Mandated in Europe

Figure J–8 ITSs in vehicles- Legacy approach

Using C-ITS, communicating via ITS-stations we get the physical architecture shown in Figure J–9.

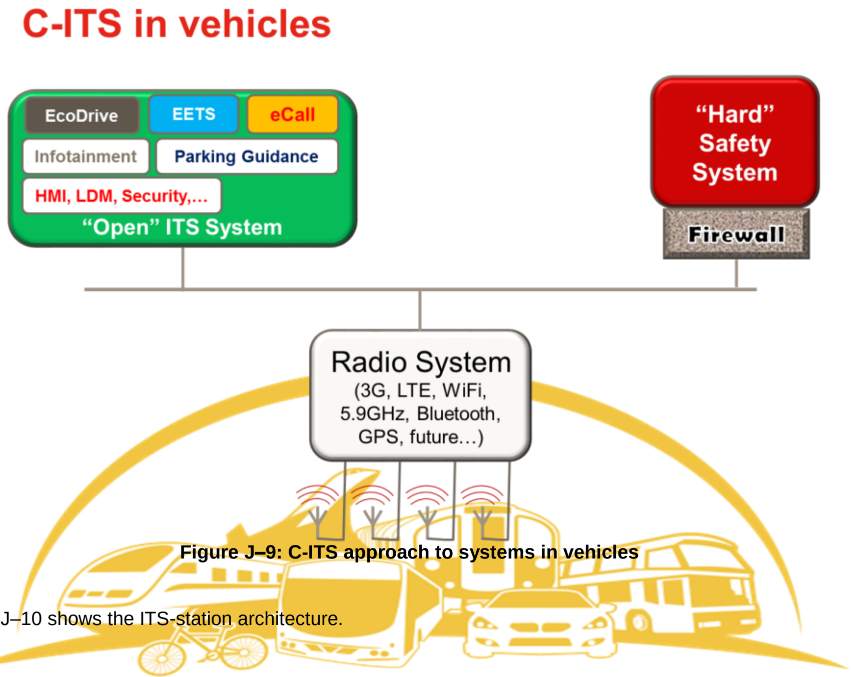

C-ITS in vehicles
EcoDrive
EETS
eCall
Infotainment
Parking Guidance
HMI, LDM, Security,…
"Open" ITS System
"Hard" Safety System
Firewall
Radio System
(3G, LTE, WiFi, 5.9GHz, Bluetooth, GPS, future…)

Figure J–9: C-ITS approach to systems in vehicles

Figure J–10 shows the ITS-station architecture.

The ITS-station architecture provides a “bounded secure managed domain”, and will support most wireless technologies that the ITS-station is given access to (2G,3G, 4G/LTE (E-UTRAN), 5.9GHz, 5.8 GHz DSRC, mobile wireless broadband, 60 GHz, etc.)

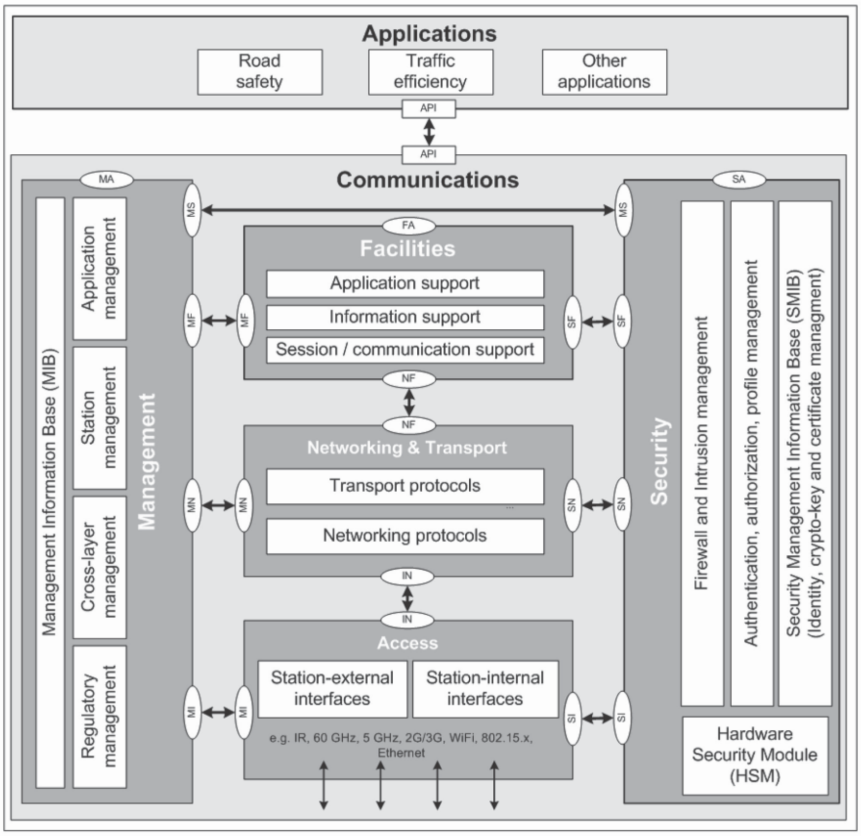

Applications
Road safety
Traffic efficiency
Other applications
API
API
Communications
MA
SA
MS
MS
FA
Facilities
Application support
Information support
Session / communication support
MF
MF
SF
SF
NF
NF
Networking & Transport
Transport protocols
Networking protocols
MN
MN
SN
SN
IN
IN
Access
Station-external interfaces
Station-internal interfaces
e.g. IR, 60 GHz, 5 GHz, 2G/3G, WiFi, 802.15.x, Ethernet
MI
MI
SI
SI
Management Information Base (MIB)
Application management
Station management
Cross-layer management
Regulatory management
Management
Security
Firewall and Intrusion management
Authentication, authorization, profile management
Security Management Information Base (SMIB) (Identity, crypto-key and certificate managment)
Hardware Security Module (HSM)

Figure J–10— ITS-S reference architecture

ISO 21217 describes the common architectural framework around which ITS-stations are instantiated and provides references to relevant International Standards, including access technology support standards, various networking and transport protocol standards, facilities standards, and ITS-station management and security standards. It also describes the general architecture of peer-to-peer communications over various communication networks between ITS communication nodes. These nodes may be ITS-stations as described in this International Standard or any other reachable nodes. See Figure J.1 above.

While the concept of the CALM architecture is in principle simple, it has been evolving and developing since its conception in 2000, and the total network of standards now behind C-ITS is now substantial and comprehensive.

Summary

The ITS-station is a key component in Cooperative-ITS.

All ITS that communicate with vehicles will use ITS-stations.

Any roadside to vehicle future systems will need to use ITS-stations.

(so will be so equipped in any event.)

Conformance testing is an essential requirement

This section has described the issues required to overcome “silo’s”, and shown that the ITS-solution offers a technically effective and cost effective way to overcome these issues and provide a flexible migration path to the future.

As can be seen above, the work on C-ITS communication within the context described above has been comprehensively developed of a period of 15 years, and as can be seen above, is substantially complete.

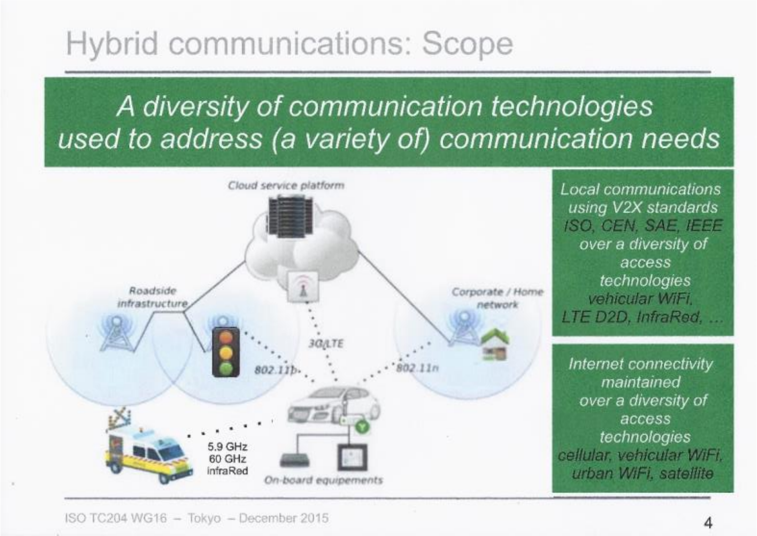
No additional standardisation requirements, other than those already being undertaken for C-ITS, are required.

Rc_Gn03- It is recommended that ITS-station communications is a preferred mechanism for data exchange, and provides a migration path to move from ‘silos’ to an urban-ITS paradigms.

J.2 Hybrid C-ITS communications

PT1701 expresses its thanks to Paris Mines Tech and T.Ernst for permission to reproduce the slides used in this section, and acknowledges their origin.

J.2.1 General



Hybrid communications: Scope

A diversity of communication technologies used to address (a variety of) communication needs

Local communications using V2X standards ISO, CEN, SAE, IEEE over a diversity of access technologies vehicular WiFi, LTE D2D, InfraRed, …

Internet connectivity maintained over a diversity of access technologies cellular, vehicular WiFi, urban WiFi, satellite

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Figure J–11: Hybrid communications

This section identifies the sort of situations in which hybrid communications are needed and:

- Explains how a diversity of radios & applications can be exploited
- Does not bind application to a given access technology
- Leave the choice of access technology to ITS-S management.

Hybrid communication ITS-stations provide:
- ITS-station diversity (vehicle, roadside, central, personal)
- Communications scenario diversity (V2X, internet, nomadic)
- Communications media diversity (2G/3G/4G/ WiFi,
- End-to-end communications between 2 peers over a variety of access networks.

Typical application requiring 2 communication flows, e.g. in-vehicle signage:

- V2X / 5.9 GHz between R-ITSS (roadside ITS-station) and V-ITSS (vehicle ITS-station)
- Point-2-Point push/pull between C-ITSS (central ITS-station) and Vehicle/Personal ITS-station.

J.2.3 Hybrid communications Types

Non-IP communications: For time-critical local broadcast V2X safety applications

IP-based communications: for all other applications requiring end-to-end communications over a variety of networks

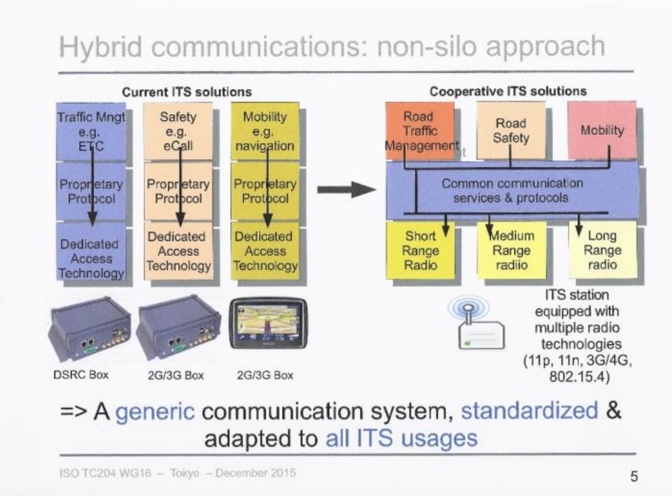
- Innovative value added services
- Multimedia and comfort information to road users
- Non time-critical road-safety information to road users
- EV, freight, logistics, public transport, multi-modal
- Fleet management
- Remote diagnostic

=> traffic efficiency / comfort mobility / non time-critical safety applications

J.2.4 IP for end-to-end communications

- Technology-agnostic applications IP is designed to exploit a diversity of access technologies
- Internet connectivity e.g. remote access to ITS-station or from ITS-station for (remote diagnostic, map update, roadside infrastructure control)
- e2e communications between ITS-stations over a variety of networks e.g. vehicle ITSS – central ITSS path combining 11p, 3G & optic fibre
- Maintaining information flow over any available media e.g. switching between 11p, 11n, cellular, satellite, digital broadcast
- Interoperability with various ITS & non-ITS sectors
- IP-based communications are necessary for
  - Technology-agnostic applications IP is designed to exploit a diversity of access technologies
  - Internet connectivity e.g. remote access to ITS-station or from ITS-station for (remote diagnostic, map update, roadside infrastructure control)
  - e2e communications between ITS-stations over a variety of networks e.g. vehicle ITSS – central ITSS path combining 11p, 3G & optic fibre
  - Maintaining information flow over any available media e.g. switching between 11p, 11n, cellular, satellite, digital broadcast
- Interoperability with various ITS & non-ITS sectors

J.2.5 Non-silo approach of hybrid communications



Hybrid communications: non-silo approach

Current ITS solutions

Traffic Mngt e.g. ETC | Safety e.g. eCall | Mobility e.g. navigation

Proprietary Protocol | Proprietary Protocol | Proprietary Protocol

Dedicated Access Technology | Dedicated Access Technology | Dedicated Access Technology

DSRC Box | 2G/3G Box | 2G/3G Box

Cooperative ITS solutions

Road Traffic Management | Road Safety | Mobility

Common communication services & protocols

Short Range Radio | Medium Range radio | Long Range radio

ITS station equipped with multiple radio technologies (11p, 11n, 3G/4G, 802.15.4)

=> A generic communication system, standardized & adapted to all ITS usages

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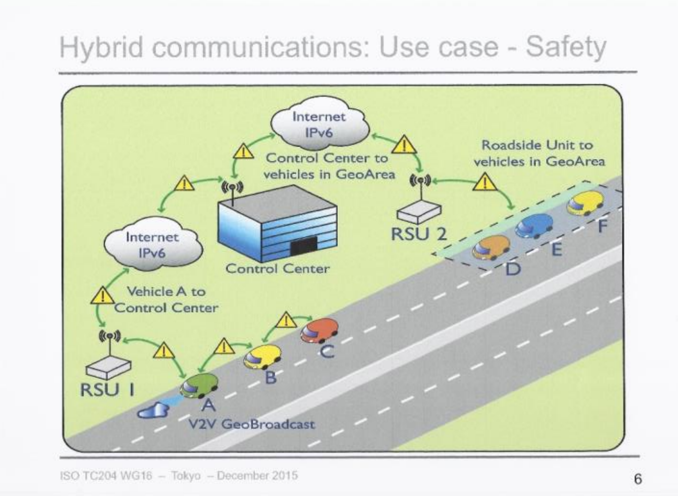
Figure J–12: Non-silo approach of hybrid communications

J.2.6 Hybrid communications : example



Hybrid communications: Use case - Safety

Internet IPv6
Control Center to vehicles in GeoArea
Roadside Unit to vehicles in GeoArea
RSU 2
F
E
D
Internet IPv6
Control Center
Vehicle A to Control Center
RSU I
C
B
A
V2V GeoBroadcast

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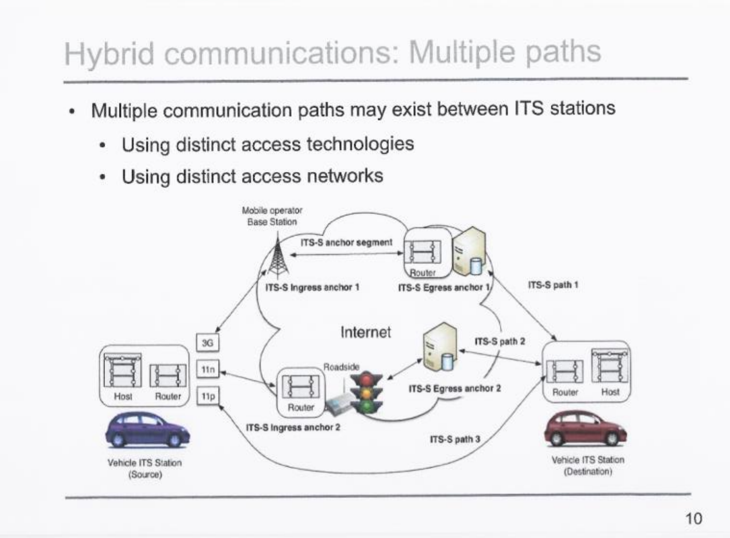
Figure J–13: Hybrid communications :-example

J.2.7 Hybrid Communications – multiple paths



Hybrid communications: Multiple paths

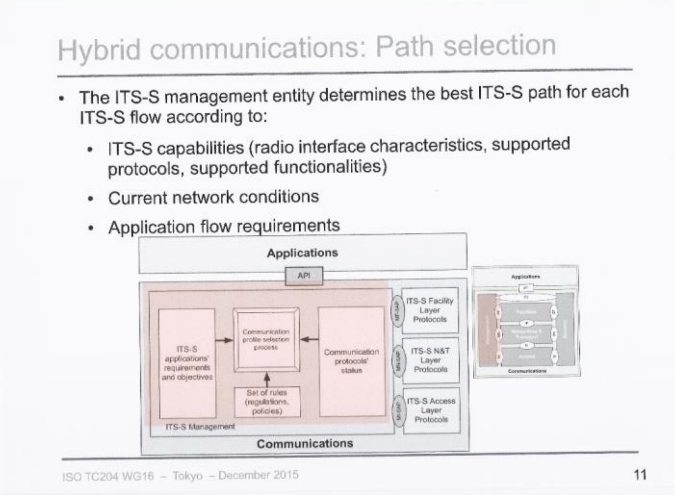
- Multiple communication paths may exist between ITS stations
  - Using distinct access technologies
  - Using distinct access networks

Mobile operator Base Station
ITS-S anchor segment
Router
ITS-S Ingress anchor 1
ITS-S Egress anchor 1
ITS-S path 1
Internet
ITS-S path 2
3G
11n
11p
Host
Router
Roadside
Router
ITS-S Egress anchor 2
Router
Host
ITS-S Ingress anchor 2
ITS-S path 3
Vehicle ITS Station (Source)
Vehicle ITS Station (Destination)

10

Figure J–14: Hybrid communications – Multiple paths

J.2.7 Hybrid Communications – Path selection



Hybrid communications: Path selection

- The ITS-S management entity determines the best ITS-S path for each ITS-S flow according to:
  - ITS-S capabilities (radio interface characteristics, supported protocols, supported functionalities)
  - Current network conditions
  - Application flow requirements

Applications
API
ITS-S applications' requirements and objectives
Communication profile selection process
Communication protocols' status
Set of rules (regulations, policies)
ITS-S Management
MF-SAP
MN-SAP
MI-SAP
ITS-S Facility Layer Protocols
ITS-S N&T Layer Protocols
ITS-S Access Layer Protocols
Communications
Applications
Communications

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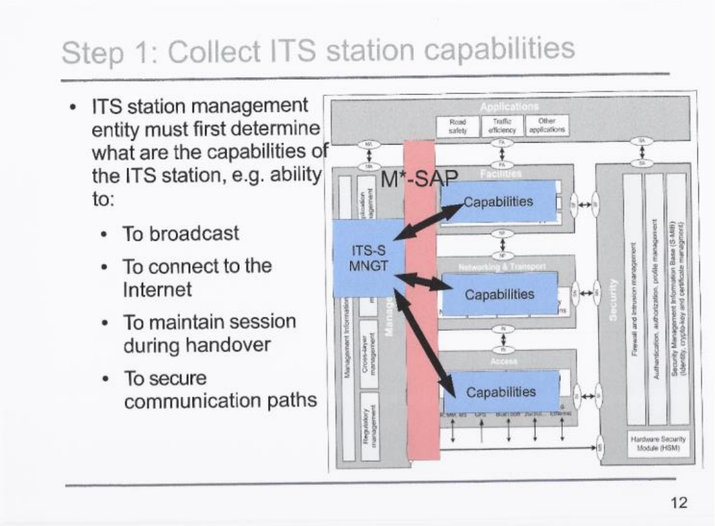
Figure J–15: Hybrid communications – Path selection

J.2.8 Hybrid Communications – Collect ITS-station capabilities



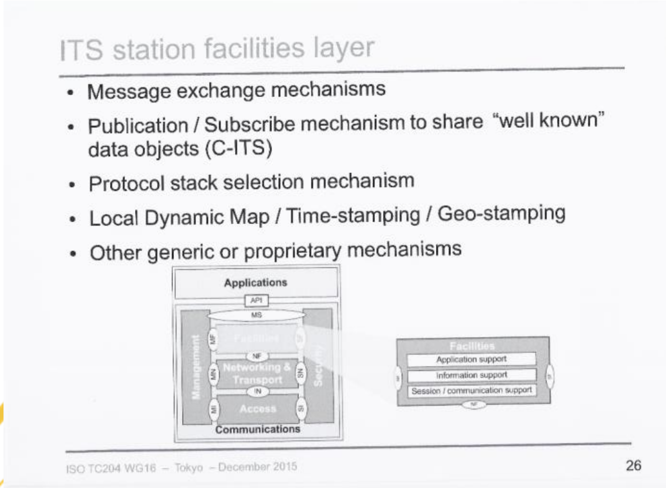
Step 1: Collect ITS station capabilities

- ITS station management entity must first determine what are the capabilities of the ITS station, e.g. ability to:
  - To broadcast
  - To connect to the Internet
  - To maintain session during handover
  - To secure communication paths

Applications
Road safety
Traffic efficiency
Other applications
MA
FA
SA
M*-SAP
Facilities
Capabilities
ITS-S MNGT
Networking & Transport
Capabilities
Access
Capabilities
Management Information Base
Cross-layer management
Regulatory management
Manage
Security
Firewall and Intrusion management
Authentication, authorization, profile management
Security Management Information Base (S-MIB) (Identity, crypto-key and certificate management)
Hardware Security Module (HSM)

Figure J–16: Hybrid communications – Collect ITS-station capabilities

J.2.9 Hybrid Communications – Collect layer information



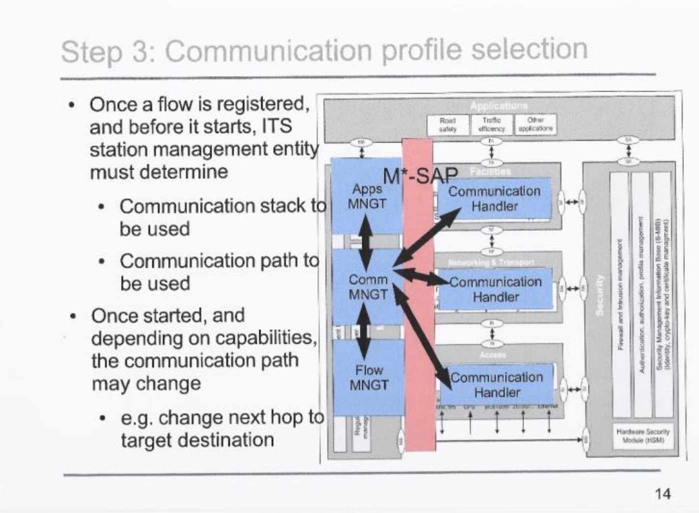
ITS station facilities layer

- Message exchange mechanisms
- Publication / Subscribe mechanism to share "well known" data objects (C-ITS)
- Protocol stack selection mechanism
- Local Dynamic Map / Time-stamping / Geo-stamping
- Other generic or proprietary mechanisms

Applications
API
MS
Management
MF
Facilities
NF
Networking & Transport
MN
SN
IN
Access
MI
SI
Security
Communications
Facilities
Application support
Information support
Session / communication support
NF

Figure J–17: Hybrid communications – Collect layer information

J.2.10 Hybrid Communications – Communication profile selection



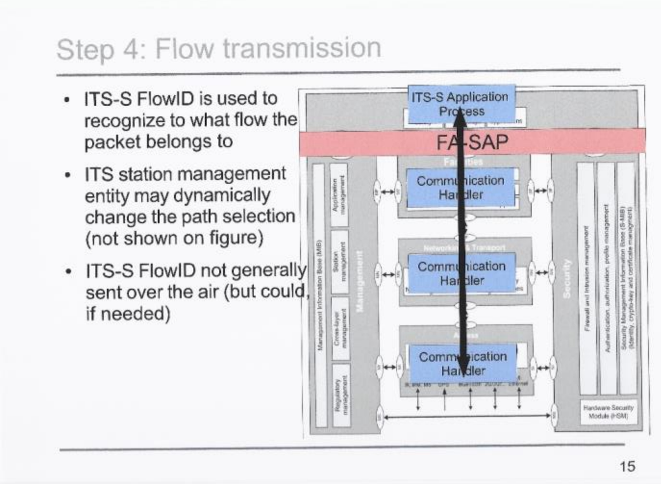
Step 3: Communication profile selection

- Once a flow is registered, and before it starts, ITS station management entity must determine
  - Communication stack to be used
  - Communication path to be used
- Once started, and depending on capabilities, the communication path may change
  - e.g. change next hop to target destination

Applications
Road safety
Traffic efficiency
Other applications
M*-SAP
Apps MNGT
Comm MNGT
Flow MNGT
Facilities
Communication Handler
Networking & Transport
Communication Handler
Access
Communication Handler
Security
Firewall and Intrusion management
Authentication, authorization, profile management
Security Management Information Base (S-MIB) (Identity, crypto-key and certificate management)
Hardware Security Module (HSM)
14

Figure J–18: Hybrid communications – Communication profile selection

J.2.11 Hybrid Communications – Flow Transmission



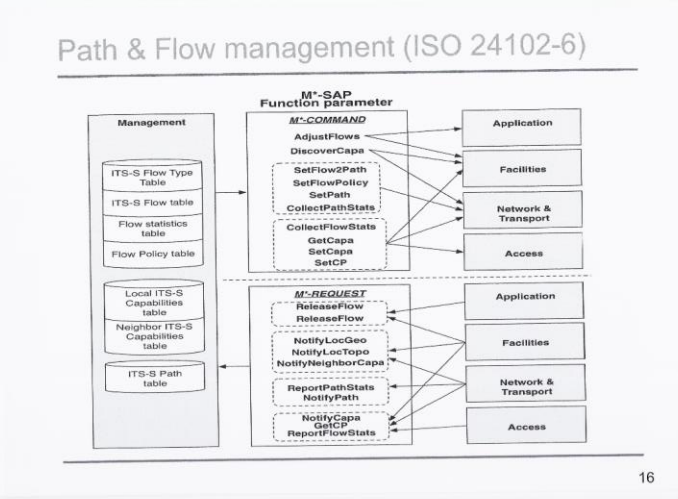
Step 4: Flow transmission

- ITS-S FlowID is used to recognize to what flow the packet belongs to
- ITS station management entity may dynamically change the path selection (not shown on figure)
- ITS-S FlowID not generally sent over the air (but could, if needed)

ITS-S Application Process
FA-SAP
Facilities
Communication Handler
Networking & Transport
Communication Handler
Access
Communication Handler
Management
Management Information Base (MIB)
Application management
Station management
Cross-layer management
Regulatory management
Security
Firewall and Intrusion management
Authentication, authorization, profile management
Security Management Information Base (S-MIB) (Identity, crypto-key and certificate management)
Hardware Security Module (HSM)
15

Figure J–19: Hybrid communications – Flow transmission

J.2.12 Hybrid Communications – Path and Flow management

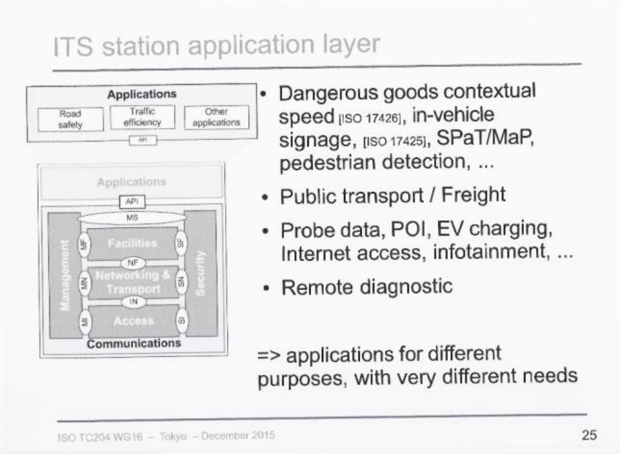


Path & Flow management (ISO 24102-6)

M*-SAP
Function parameter
Management
ITS-S Flow Type Table
ITS-S Flow table
Flow statistics table
Flow Policy table
Local ITS-S Capabilities table
Neighbor ITS-S Capabilities table
ITS-S Path table
M*-COMMAND
AdjustFlows
DiscoverCapa
SetFlow2Path
SetFlowPolicy
SetPath
CollectPathStats
CollectFlowStats
GetCapa
SetCapa
SetCP
M*-REQUEST
ReleaseFlow
ReleaseFlow
NotifyLocGeo
NotifyLocTopo
NotifyNeighborCapa
ReportPathStats
NotifyPath
NotifyCapa
GetCP
ReportFlowStats
Application
Facilities
Network & Transport
Access
Application
Facilities
Network & Transport
Access

Figure J–20: Hybrid communications – Path and flow management

J.2.13 Hybrid Communications – Application layer



ITS station application layer

Applications
Road safety
Traffic efficiency
Other applications
API
Applications
API
MS
Management
Facilities
MF
SF
NF
Networking & Transport
MN
SN
IN
Access
MI
SI
Security
Communications

- Dangerous goods contextual speed [ISO 17426], in-vehicle signage, [ISO 17425], SPaT/MaP, pedestrian detection, …
- Public transport / Freight
- Probe data, POI, EV charging, Internet access, infotainment, …
- Remote diagnostic

=> applications for different purposes, with very different needs

Figure J–21: Hybrid communications – Application layer

J.2.14 Hybrid Communications – Standards

- ISO 21217 / EN 302 665: ITS-station Architecture published
- ISO 21210 IPv6 networking published
- ISO 24102-6 Flow and Path Management work in progress
- ISO 17429 Generic ITS-stations facilities work in progress
- ISO 17423 ITS application requirements and objectives for selection of communication profiles published
- ISO 17419 Classification & management of ITS applications in a global context published

New work items recently approved

- ISO 21196 Secure sessions.

J.3 Security objectives, summary and scope addressed

J.3.1 Introduction

Security is one of the essential tools needed for Urban-ITS. In current deployments, it is handled in diverse proprietary manners, and sometimes not at all. This has been possible as long as the systems have been relatively small and fragmented, and the protocols have been proprietary and off-line. The threats have not been significant enough to warrant a security overhead.

When the current Urban-ITS evolves into the next stage as described in these documents, the situation changes. All relevant interfaces become open standards mainly carried over the Internet, personal data starts to be transferred, the links between the different subsystems creates one entire Urban-ITS as one critical system that will have dire consequences if allowed to fail.

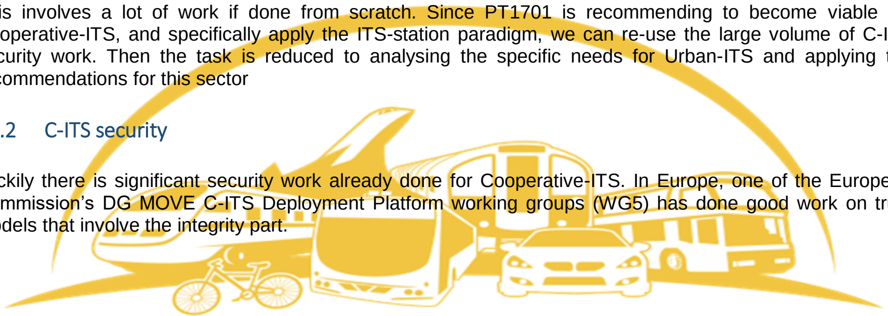
Therefore, we need to apply strong security measures for the following:

- Confidentiality: All critical information must be protected from snooping, and all privacy-relevant information must either be removed or protected in other ways acceptable to the Privacy Directive
- Integrity: Information exchanged between the different units and actors must be trustable, and any attempt to manipulate or insert false information must be detected and stopped.
- Availability: Since Urban-ITS becomes one mission-critical system, it is essential to have security tools that detect and manage proper operation. This involves multiple redundant communication links, secure remote station management etc.

This involves a lot of work if done from scratch. Since PT1701 is recommending to become viable via Cooperative-ITS, and specifically apply the ITS-station paradigm, we can re-use the large volume of C-ITS security work. Then the task is reduced to analysing the specific needs for Urban-ITS and applying the recommendations for this sector

J.3.2 C-ITS security

Luckily there is significant security work already done for Cooperative-ITS. In Europe, one of the European Commission's DG MOVE C-ITS Deployment Platform working groups (WG5) has done good work on trust models that involve the integrity part.



The following are the main conclusions and recommendations from WG5:

The experts of WG5 have identified specific recommendations for all work items described in the previous chapters of this report. The following high level recommendations aim to summarise the main high level recommendations that can be derived from the more specific recommendations on the single work items in Annex 1-4 of its work:

i. One common C-ITS trust model all over Europe shall be deployed that shall support full secure interoperability at the European level.
ii. To that end, a common certificate policy of the trust model for C-ITS day 1 deployment in Europe needs to be defined urgently.
iii. The appropriate legislative framework for C-ITS (e.g. new delegated acts or the identification of the amendments to the existing regulatory framework) needs to be set in place quickly to support a CITS deployment starting from 2019.
iv. The roles of the entities at European level to support the deployment and operations of C-ITS in Europe need to be identified and defined (e.g. roles within a European C-ITS security credential management system or within the compliance assessment process).
v. The financing scheme needs to be discussed to identify which parties will support or contribute to the financing scheme.
vi. Standardization activities for the gaps identified in the reports (e.g., revocation of trust) should be addressed urgently.
vii. A time plan for the design and deployment of the security elements (e.g., CA) of an EU wide C-ITS with the most significant milestones should be drafted.

All of these requirements are valid also for Urban-ITS in Europe, and it is strongly suggested to attach to this work to assure that the specific needs for Urban-ITS are met. To this effect there is a need to start some quick-acting study groups to define the specific needs for cities and urban areas, and follow these needs and requirements through the overall C-ITS process.

J.3.3 EU-US Task Force HTG6

Another large contributor is the EU-US Task Force, where Harmonization Task Group 6 has done an extensive analysis of Security Policy as seen from the authority side. All reports and documentation can be found at the DG CONNECT news site: https://ec.europa.eu/digital-agenda/en/news/harmonized-security-policies-cooperative-intelligent-transport-systems-create-international.

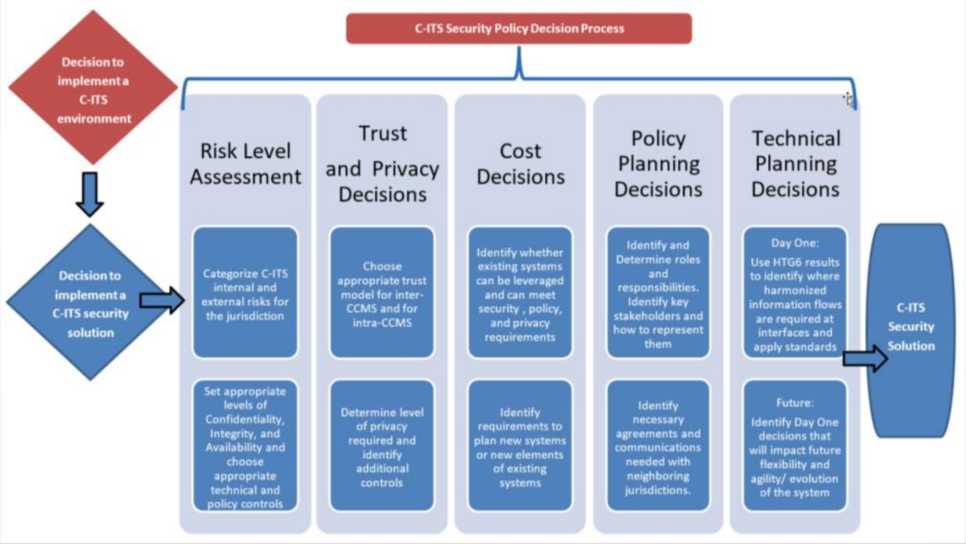
In particular, the Executive Summary is recommended reading since that summarizes all advice for the authorities and public sector, with particular relevance for Urban Administrations and public sector operators.
The following is an excerpt from this website:

As deployment planning moves forward into pilot operational sites, questions arise about how to ensure security for such a complex technical system. In late 2013, the European Commission (EC), the United States Department of Transportation (USDOT), and Transport Certification Australia (TCA) committed resources and experts to develop a harmonized policy framework in a way that maximized benefits for all Nations and minimized duplicative efforts. This initiative ran in parallel with the technical development of security solutions. The results of HTG6 collaboration are: a policy framework as well as guidance for decision-makers and technical deployers as they seek harmonized security solutions within and across borders.

The body of work produced by HTG6 members presents the maximum set of common policy approaches that return benefits. While many C-ITS security policies and approaches can differ regionally without negative impact to jurisdictional deployments, important benefits are realized from a set of policies being as similar as practical across regions.

As jurisdictions take steps toward planning and deploying C-ITS including near-term system upgrades or the addition of new applications, the HTG 6 results can support interaction with other emerging C-ITS while preserving local functionality.

HTG6 describes the process of establishing a security system as follows:


C-ITS Security Policy Decision Process
Decision to implement a C-ITS environment
Decision to implement a C-ITS security solution
Risk Level Assessment
Categorize C-ITS internal and external risks for the jurisdiction
Set appropriate levels of Confidentiality, Integrity, and Availability and choose appropriate technical and policy controls
Trust and Privacy Decisions
Choose appropriate trust model for inter-CCMS and for intra-CCMS
Determine level of privacy required and identify additional controls
Cost Decisions
Identify whether existing systems can be leveraged and can meet security , policy, and privacy requirements
Identify requirements to plan new systems or new elements of existing systems
Policy Planning Decisions
Identify and Determine roles and responsibilities. Identify key stakeholders and how to represent them
Identify necessary agreements and communications needed with neighboring jurisdictions.
Technical Planning Decisions
Day One: Use HTG6 results to identify where harmonized information flows are required at interfaces and apply standards
Future: Identify Day One decisions that will impact future flexibility and agility/ evolution of the system
C-ITS Security Solution

:

Figure J–22: process of establishing a security system for C-ITS

This Figure (J–22) graphically summarizes the process needed to set up an interoperable, secure system for Urban-ITS. It involves significant work that will need cross-sector cooperation and agreement inside a city, but also between cities in a country, and between countries. Since this is a rather big task, it is recommended that a study group is set up to synthesize and get consensus on the cross-sector needs for Urban-ITS; to bring these into the overall C-ITS process; follow these through the process to make sure the Urban needs are covered, and then bring results back as a handbook of recommended practice so that all cities and urban regions can implement their roles as needed. This could be included in the proposed EU-ICIP.

There are a number of recommendations from HTG6, see document "Summary of Results (HTG6-2)" at: http://ec.europa.eu/newsroom/dae/document.cfm?action=display&doc_id=11396

Most of these recommendations are folded into the C-ITS WG5 findings mentioned above, and are not further handled in this PT except as background material for our recommendations for follow-up actions.

Recommendations:

Rc_Gn03- It is recommended that ITS-station communications is a preferred mechanism for data exchange, and provides a migration path to move from 'silos' to an urban-ITS paradigms.

Rc_PI05- Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work

Rc_Gn07- The overall recommendation for Urban-ITS security is to follow the C-ITS security process to ensure that Urban-ITS needs are met.

Rc_Pl11- A PT to study how C-ITS security shall be applied for Urban use. Specifically: practical advice to Urban administrations, and national/regional level needs to get going based on recommendations

Rc_Pl12- Urban-ITS attaches significance to the goal of conformance testing, it is recommended that a project team is formed to study conformance testing requirements specifically for Urban-ITS. Within the C-ITS context, with a view to providing essential standards in this area.

Rc_Pl13- One specific task is identifying the missing security standards regarding interfaces between roadside/personal/central its-stations, patterned on well-established vehicle its-station security standards.

J.4 Enable rather than prescribe or proscribe

The use of Standards is voluntary, but EC may see the need for Harmonised standards. Also there may be a need to work together with National Authorities to set policies and regulations needed for cross-boundary interoperability.

J.5 Relevant business/service areas and applications identified with key stakeholders

All involved in Cooperative-ITS.

J.6 Other gap and overlap analysis involving European and international SDOs and their relevant deliverables

See Annex P.

J.6.1 Business service area(s) (Use Cases)

Potentially all ITS services.

As this area is comprehensively covered elsewhere, a Use Case chart is not provided.

J.6.2 Other applications

Will host communications for almost any ITS applications so far envisaged. The C-ITS concept works better the more applications are involved, and the more open standard data is being exchanged in a secure, privacy-protecting way.

J.6.3 Working groups involved and co/cross working arrangements

Significant work has been done between the EC and USDOT over the last years. This has involved several aspects on ITS communications and security. Please see

https://ec.europa.eu/digital-agenda/en/news/harmonized-security-policies-cooperative-intelligent-transport-systems-create-international

for more information.

- ISO TC204 WG16, WG17 and WG18, and potentially all application working groups at the communication level.
- CEN TC278 WG16 and potentially all application working groups at the communication level.
- ETSI TC-ITS
- IEEE 802.11 and P1609
- SAE J2735 and J2945-x

Are all cooperating to achieve common and interoperable ITS-station<>ITS-station communications across a range of wireless media

J.6.4 International/European harmonisation requirements

Significant international harmonization work has been done between the EC and USDOT over the last years. This has involved several aspects on ITS communications and security. Please see https://ec.europa.eu/digital-agenda/en/news/harmonized-security-policies-cooperative-intelligent-transport-systems-create-international

for more information.

The outcome of several Harmonization Task Groups (HTGs) is of direct relevance to Urban-ITS. In particular, HTG6 work on Security Policy is important. Please see the executive summary at http://ec.europa.eu/newsroom/dae/document.cfm?action=display&doc_id=11393

There are a number of suggested actions coming out of that, the most important once are summarised at the end of this Annex.

J.7 Other gap and overlap analysis involving European and international SDOs and their relevant deliverables

J.7.1 Other standards requirements to achieve objectives

None known at this point in time, but more work has to be done to effect the security paradigm.

Refer to C-ITS platform documents.

J.7.2 Other existing Standards

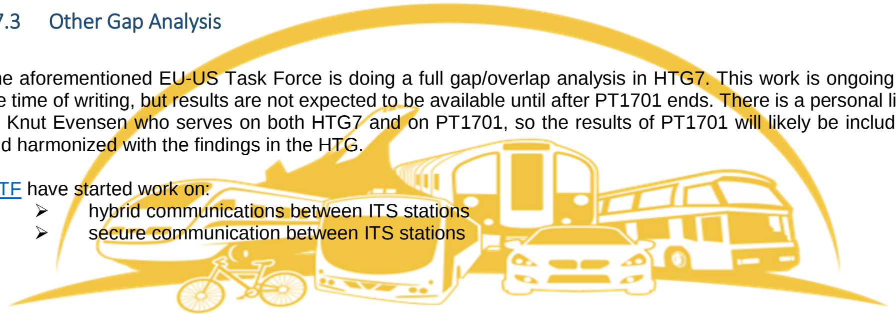
Many legacies. The proposed route provides a migration path.

J.7.3 Other Gap Analysis

The aforementioned EU-US Task Force is doing a full gap/overlap analysis in HTG7. This work is ongoing at the time of writing, but results are not expected to be available until after PT1701 ends. There is a personal link by Knut Evensen who serves on both HTG7 and on PT1701, so the results of PT1701 will likely be included and harmonized with the findings in the HTG.

IETF have started work on:

- hybrid communications between ITS stations
- secure communication between ITS stations



So gaps in this area will be filled.

DG MOVE is also currently running the C-ITS Deployment Platform, and as part of this several WGs are doing work related to standards for the Urban environment. In particular, WG7 is doing studies of standardisation needs. The leadership of PT1701 are directly involved in the Platform, and we expect the results from PT1701 and WG7 to be harmonized.

J.7.4 Other requirement for new Standard(s)

The following is a non-exhaustive list of communications and safety -related standards. This also includes those standards needed for the "mechanics" of operating an ITS-station through all life cycle phases.

Since these standards and proposed actions are not related directly to applications Use Cases, this section does not justify the findings through Use Cases as the other section does, but rather relies on the findings from external projects and the expertise of the group.

Standards gaps that needs to be filled

Rc_PI10-
Rc_SO01- Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.

The groundwork for how to deploy this is done in HTG6 which also supplies the basic reference framework and terminology.

J.8 Funding issues

Thanks to the work in HTG7 most of the funding to create the intellectual basis for this work has been funded. However, funding may be required to complete ETSI standards in this area.

Annex K Urban-ITS Architecture aspects (UA)

K.1 UA Coherence of Use Cases with FRAME Architecture

An analysis of the Use Cases for the Traffic Management (TM), Multimodal Information Services (MIS) and Urban Logistics (UL) domains described in other annexes of this report shows that a majority of them have good coherence with the functionality provided by the FRAME Architecture. Most of the data inputs, data exchanges, data amalgamation and collation, data processing and resulting information outputs are included, and as a consequence much of the required functionality is included. This includes the exchange of data and information with third parties such as other transport modes and travel information providers. Thus the FRAME Architecture is able to support several services of which the following are examples:

- ➢ The ability for travellers to plan and implement trips involving several transport modes, including pre-payment for some modes of travel;
- ➢ The ability for those that move goods to do so using several transport modes including the storage of freight between transport modes;
- ➢ The provision of travel information to travellers, either through personal devices or devices located at the roadside, as well as through in-vehicle systems and at public transport facilities such as bus stops and interchanges;
- ➢ The management of urban parking spaces used for freight deliveries so that they can be made available at pre-defined times for each delivery, with freight vehicles being directed to holding areas when the required parking space is not available;
- ➢ The management of more general parking with information being provided to drivers about car parks with available spaces.

The FRAME architecture also includes links that provide the exchange of data between the sub-systems in an Urban-ITS implementation and those in adjacent implementations and the sub-systems that manage inter-urban road networks. Functionality for managing any bridges and tunnels that may be included in urban road networks is also included in the FRAME Architecture.

K.2 UA Gap analysis between Use Cases and FRAME Architecture

Despite the comments in the previous section, as perhaps might be expected due to the continuous evolution of ITS services there is some lack of complete coherence between certain Use Cases and the FRAME Architecture. This can be summarised as follows:

- ➢ Lack of support in traveller trip planning for car and bicycle sharing and access to facilities that provide alternative fuels for vehicles;
- ➢ Some multimodal information is only provided to travellers on request, e.g. because it has been asked for as part of a trip plan, and is thus not always available for continuous output to travellers;
- ➢ Lack of coherence with some of the recent changes to Transmodel with respect to the way the public transport is managed, e.g. there is no specific provision for the analysis of public transport performance data against "contractual reporting" and "providing data for QoS analyses and processes";
- ➢ In some parts of the FRAME functionality it can be inferred that certain items of information are included in the outputs to travellers and sub-systems but it is not shown explicitly. Some examples of these are:

- the continuous output of travel related information such as weather conditions, incidents and multimodal services,
- providing bias towards public transport services in the creation and modification of trip plans,
- the use of ‘Flexible Transport Services’ (FTS) is treated as a separate service and is not included in trip planning,
- the downloading of configuration data to functionality that is likely to be provided by sub-systems and located at or near the roadside.

K.3 UA Standardisation needs and international harmonisation issues

K.3.1 UA Background

Before embarking on the discussion of standardisation and international harmonisation issues it is first necessary to consider ITS architectures in general. This consideration is centred on the concept of levels of architecture, which for simplification can be split into two: high level and low level. This is illustrated in the following diagram.

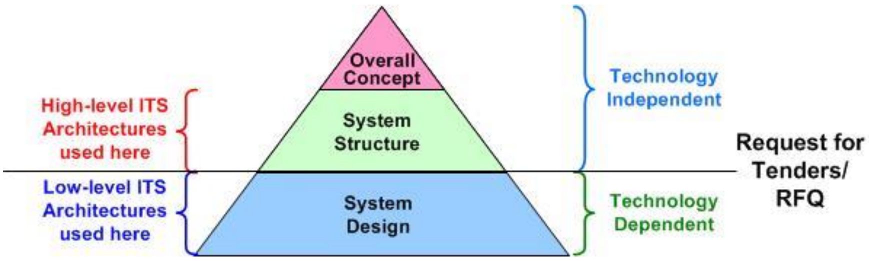


Figure K–1: Architecture- Overall concept

The "Overall Concept" normally describes the high level relationships between the various parts of the overall system. These can include business relationships, management/organisational relationships, or high-level structural/design characteristics (e.g. for graceful degradation in case of failure). The overall system itself is a very high-level view of what will be needed to provide the ITS services that the stakeholders would like to implement, as expressed in their "vision statement" and service descriptions.

The "System Structure" includes a more detailed description of what the stakeholders' wishes and a high-level description of how those wishes will be provided and are described in a high-level ITS architecture.

As a minimum the description will include "views" of the functionality that will be needed, how that functionality can be distributed between physical entities, usually expressed in the form of specifications and how the physical entities will communicate with each other and with the outside world. It is highly desirable that these specifications contain no references to any technologies that are to be used, since this may restrict the choice of design options later in the ITS implementation. Other "views" may be included such as a detailed organisational structure, plus the deployment strategy and analyses of costs, benefits and risks. The communications requirements should include an analysis of the required characteristics of the links between the physical entities, which will enable the appropriate standards to be identified, or a need for new/modified standards discovered.

At this point the stakeholders should be allowed to see what is proposed and to provide feedback about their views on the proposed physical entities, communications requirements and other "views". Once the stakeholders have provided their acceptance the specifications and communications requirements can be used as the technical part of "Request for Tenders" (sometimes called a "RFQ" – Request For Quotations") that can be sent to suppliers.

The "System Design" is produced by the successful suppliers and includes the detail of how the physical entities will be provided and the technology to be used. This is described in low-level ITS architectures, sometimes called "design level" architectures. The communications requirements are expressed in terms of the standards to which they conform, or a detailed description of the new and/or modified standards that need to be created. This will be supported by more detailed architectures that show precisely the communications links to which the standards apply, plus other detail including testing requirements, user interfaces, etc.

K.3.2 UA Standardisation

For both high-level and low-level Urban-ITS architectures, the need for standardisation is first manifest in the requirement to have a consistent way in which architecture descriptions are provided. There are a number of existing standards that are relevant to architecture descriptions, including the following:

ISO 14813-5	Intelligent transport systems – Reference model architecture(s) for the ITS sector – Part 5: Requirements for architecture descriptions in ITS standards
ISO TS 17427-1	Intelligent transport systems – Cooperative systems -- Roles and responsibilities in the context of Cooperative ITS based on architecture(s) for co-operative systems
ISO TR 24529	Intelligent transport systems – Systems architecture – Use of 'Unified Modelling Language' in ITS International Standards and deliverables
ISO TR 26999	Intelligent transport systems – Systems architecture – Use of Process Orientated Methodology in ITS International Standards and deliverables
ISO/IEC/IEEE 42010:2011	Systems and software engineering — Architecture description

Rc_PI08-The following standards should be used where appropriate in the creation and publication of all ITS architectures in Europe: ISO 14813-5 (ITS architecture description); ISO TS 17427-1 (roles and responsibilities in ITS); ISO TR 24529 (use of UML in ITS standards); ISO TR 26999 (use of process orientated methodology in ITS standards); ISO/IEC/IEEE 42010 (general architecture descriptions).

The main benefit of implementing this recommendation is that a set of both high and low level ITS architectures will be created that use the same terminology in a consistent way, which will help to make them easier for users to understand.

It is not recommended that an Urban-ITS architecture for use in Europe is created as a standard either in high-level or low-level form. This is because such a standard would be expensive and time consuming to create and maintain. In its high-level form it will simply replicate the existing FRAME Architecture and in its low (design)-level form it could also be seen to stifle innovation by suppliers.

However, use can and should be made of the existing standard that defines the scope and content of the ITS services that are currently available:

ISO 14813-1:	Intelligent transport systems – Reference model architecture(s) for the ITS sector – Part 1: ITS service domains, service groups and services.

Rc_PI09- : the use of ISO 14813-1 should be promoted for use across Europe to ensure commonality in the content and scope of ITS services.

An obvious benefit of adopting this recommendation is that it will make it easier for travellers to know that a particular service will provided with the same scope wherever it is implemented across Europe. But the content of the service descriptions provided by the standard will need to be kept up to date, which means that it will need to be frequently revised.

K.3.3 UA Harmonisation

Currently two of the more successful high-level ITS architectures in use world-wide: are the US National ITS Architecture and the European ITS Framework Architecture often called the FRAME Architecture.
The diagram used to characterise the FRAME Architecture shows the domains that it covers and is sometimes called the "metro" diagram, as shown here

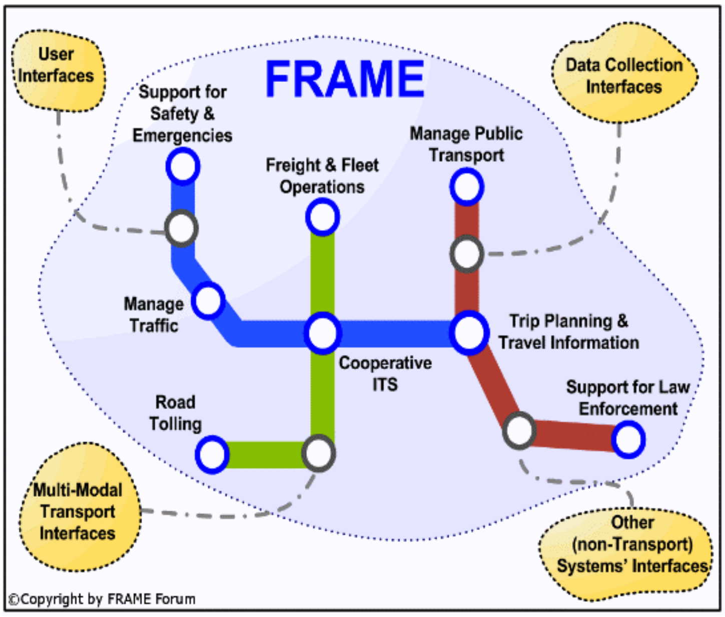

User Interfaces
FRAME
Data Collection Interfaces
Support for Safety & Emergencies
Manage Public Transport
Freight & Fleet Operations
Manage Traffic
Trip Planning & Travel Information
Cooperative ITS
Support for Law Enforcement
Road Tolling
Multi-Modal Transport Interfaces
Other (non-Transport) Systems' Interfaces
©Copyright by FRAME Forum

Figure K–2: FRAME architecture

In addition, there is the US "Connected Vehicle Reference Implementation Architecture" (CVRIA) which currently only describes the functionality needed to provide Cooperative-ITS (called Connected Vehicles in the US), which is already included in the FRAME Architecture. It is believed that the US DoT plans to merge the US National ITS Architecture with the CVRIA sometime during 2016 so that the resulting Architecture will support a wide range of ITS related services.

Europe also has another high-level ITS architecture called ARKTRANS, which has a greater emphasis on the multimodal aspects of travel and the movement of freight and which has found some use in several EC funded research projects. In addition, some EU nations have, or are developing their own high-level ITS architectures based on FRAME, such as ACTIF in France, ARTIST in Italy and NARITS in Romania and other countries such as Austria, Hungary and Poland are using, or have used FRAME in various ways. This was the intention behind the creation and promotion of FRAME by the EC and it was also intended that the results of these developments will be fed back into the future versions of FRAME for the benefit of all users. Other ITS architectures have been produced such as OTS in Germany and UTMC in the UK and the contents of these also need to be fed back into FRAME.

Harmonisation between the US and European high-level ITS architectures should not be considered, as some of the support they provide is for services with different scope and content, e.g. commercial vehicles and law enforcement. for some other services, e.g. traffic management, a degree of harmonisation has already been achieved unofficially (e.g. the US taking content from the FRAME Architecture) and there is little extra benefit that would accrue from further work.

However, harmonisation of the ITS architectures in Europe mentioned above should be considered in order to make sure that they are all compatible with each other. FRAME provides a good platform for this to be achieved in a way that makes the results freely available to users.

Rc_Ar01-the FRAME Architecture is modified to incorporate the best parts of other ITS architecture initiatives from across Europe and is made more user friendly to provide a high-level ITS architecture that is freely available for use throughout Europe.

There are at least two benefits that implementing this recommendation would provide to those creating and using high-level ITS architectures:

a) it would keep in place a freely available tool (FRAME) to help users reap the benefits from creating ITS architectures for their individual Urban-ITS deployments;
b) all the work of other ITS architecture initiatives previously identified will be captured and integrated into the support for other ITS related services (including Cooperative-ITS) already provided by the FRAME Architecture.

K.4 UA Actions required to speed up deployment of Urban-ITS

K.4.1 Enhancing tools to assist ITS deployments

K.4.1.1 Extending FRAME

As noted elsewhere, ITS is progressively evolving as the expectations of travellers for the availability of services ITS provides change, sometimes due to developments in other domains. One example of the way that ITS is evolving is the range of new services identified by the OPTICITIES project, whilst another is the UCC concept – see section I.2.1.1. Another strand to the evolution of ITS is in the way that existing services are managed and delivered, an example of which is the updates proposed for the TRANSMODEL public transport standard, as well as evolutionary changes to services such as those for road tolling, access management and of course the continued development of the services provided by Cooperative-ITS.

A further important way in which ITS is evolving is that some Urban Administrations are seeing ITS deployment as a business venture, particularly with the advent of Cooperative-ITS which will bring a broader range of actors into play. The FRAME architecture already provides a tool that supports the study of the relationships between businesses and organisations involved in ITS deployment and this needs to be enhanced so that it integrates with models such as those promoted by TOGAF and those used in enterprise architectures.

In order to assist the study of ITS deployment as a business, it is necessary to think more in terms of the physical entities that an ITS deployment will need, rather than just the functionality. Although FRAME enables such physical entities to be created, the choices made about their functional content are entirely up to its users which can lead to a wide disparity in the types and functional scopes of the physical entities.

This issue can be resolved by creating within the FRAME architecture a set of pre-defined physical entities, which would also have the benefit of speeding up the creation of ITS architectures. These pre-defined physical views should be divided into groups that are based on the four areas shown in the communications network diagram for Cooperative-ITS, i.e. central, personal, roadside and vehicle – see Figure J–7. A new tool will need to be created to enable users to select those physical views that are most appropriate for their ITS implementations. The physical entities included in these physical views will present ITS suppliers with a finite set of specifications for which they have to tender, leading to more commonality of components, be they hardware or software based. In some instances the basis for choice of these physical views could be the Use Cases already created by PT1701, but they should all be based on extensive consultation with a wide range of current and future stakeholders.

Rc_Ar02-: the FRAME Architecture is updated to ensure that it properly reflects the evolution of ITS and services travellers expect to be available, and includes the concept of physical entities plus aspects related to business issues.

K.4.1.2 Further architecture related assistance for ITS deployment

Some Urban Administrations may struggle with the new idea of needing to consider ITS deployment as a business opportunity and the extent of these struggles will vary from one EU nation to another as each has different way that they expect their local organisations to do business. This business approach needs to encompass such things as the life cycle of systems, the relationships between the various public and commercial organisations increasingly involved in ITS deployments and the "value chains" associated with data capture, processing and information dissemination, as well as the general administration needed for ITS services to be provided. However, some knowledge of how to do these things has already been gained by some Urban Administrations and it would be beneficial to all Urban Administrations in Europe if this knowledge could be captured and made available to other.

Rc_Ar03- A guidance document (Technical Report/Guide) is created to help Urban Administrations with factors, issues and best practices associated with the capture and identification of the life cycle, relationships, "value chains" and administrations of ITS services.

In addition to providing the benefits already mentioned, this document will also provide information for Urban Administrations should they wish to avoid getting into a "vendor lock-in" situation with some or all of their suppliers. It can also provide guidance on an alternative approach which is to buy in the complete provision of an ITS service from a single supplier for a limited period of time, e.g. a speed enforcement system.

K.4.2 Stakeholder engagement

The recommendations described in the preceding and following sections of this Appendix have been reviewed by representatives from both the FRAME and ARKTRANS communities. Where changes were suggested these have been incorporated to produce the current version. It is therefore expected that they will enjoy support from both these communities.

K.4.3 Common/Interoperable data

See F.1.5; J.1.3.

K.4.4 Multimodality

See E.3.4 and F.1.6

K.4.5 Creation of (multimodal) transport datasets

There are no specific recommendations for the creation of multimodal transport datasets, other than to endorse the recommendation made elsewhere in this report that a registry of data concepts is created for Europe. This should build on the work already being done within ISO TC204 to create a Central ITS Data Concept Registry (CIDCR) and it is envisaged that the European version could form a sub-set of a version that is more internationally focussed.

K.4.6 Multiple means of communication

See F.1.8

K.4.7 Creation of urban-interurban interfaces

As noted in section K.1, the FRAME architecture includes interfaces that are used to exchange data with sub-systems that mange the inter-urban road network. The purpose of these interfaces is to enable the preparation and implementation of traffic management strategies for both the urban and inter-urban road networks to be co-ordinated and for drivers to be provided with information about conditions in these road networks, particularly when entering them, so for example they can be forewarned of congestion and consequent travel delays.

The creation of standards for the messages sent across these interfaces will provide a useful benefit in that the sub-system designers will not what data needs to be exchanged. However, the standardisation should be biased towards a set of message types, e.g. incident waning, road conditions and parking availability, rather than having a single "do all" message. This will minimise the number of potentially blank (unused) fields in messages and make their processing much easier to achieve.

K.4.8 Use of open standards, architectures and specifications

See F.1.10

K.4.9 Enable rather than prescribe or proscribe

See F.1.11

K.5 UA Identified resources of expertise (individuals, organisations) to participate in this work

The work described in the previous sections needs to be carried out by people who are already familiar with the content of the FRAME and ARKTRANS architectures. Therefore, the aim should be for it to be done by a consortium drawn from those with the most relevant experience. The starting point for their identification should be the FRAME Forum from whose members these individuals and organisations will be drawn.

K.6 UA Consideration of optimum internal organisation to most effectively address these issues

The optimum internal organisation to effectively address these issues would be provided through a Support Action. It is recommended that such a 'Support Action' should be managed by a leading partner who has previous experience of using the FRAME architecture such as AustriaTech or the GDDKiA in Poland and have a timeframe of about two years. In addition to the 'Support Action' manager, five other partners will be needed in the support action.

K.7 UA Funding issues

As mentioned above a ‘Support Action’ will be needed to implement what has been described in the preceding sections on harmonisation and actions order to speed up Urban-ITS deployment. The total number of experts that will need to be involved has been suggested as being 6, which for a 2 year timeframe would necessitate provision being made for financial resources to support 12 person-years of work. In addition, because a large amount of stakeholder consultation will be needed, it is estimated that a travel budget of at least €150,000 will be needed. It will also be necessary to update the tool used to create and maintain the FRAME Architecture for which a budget of €60,000 needs to be allowed. (Note that the US DoT has been spending nearly €1.8M per year for most of the last 20 years keeping its National ITS Architecture up to date with the evolution of ITS.)

K.8 Requests for support actions

The ‘Support Action’ suggested above will need to start work as soon as possible and should be 100% funded. Discussions with stakeholders during the last several years suggest that it is expected that the FRAME architecture will be kept up to date and freely available at no cost to its users, as is the case for the US National ITS architecture.

Annex L Other identified issues for Urban-ITS (beyond span of CID)

L.1 Background

The provision of user-oriented seamless and continuous ITS-solutions/services requires cross-organisational links/cooperation of all bodies involved. This often proves difficult not due to technical challenges but because of lack of:

- political will (no willingness to adjust traditional roles and responsibilities; missing appreciation of the added value achievable only in cooperation);
- understanding of the real application and potential of new technologies (locating facilities, mobile communication and the pervasive facilities of information processing);
- the difficulty in providing a quantifiable business case;
- clarity in the operational implications (missing conceptual basis for thinking in processes, roles and business models and appropriate standards).

Partnerships of different stakeholder types need a common understanding of relevant aspects and also of obligations, risks and indeterminacies which are relevant for cooperation in the context of cross-organisational Urban-ITS.

L.2 The population is trending to cities

Sections C.2 and C.3.1.1 describe the trend towards living in cities. This trend has persisted for several centuries, and industrialisation and mechanisation will ensure it continues. The paradigm for the urban administration will therefore intensify and grow in its complexity. As cities grow ever larger and expand both horizontally and vertically, the complexity of moving ever larger populations around and between cities will intensify and grow. Urban-ITS will form an integral part of that paradigm.

However, introducing urban-ITS will not be like laying a new underground metro line, that once in place is there for the next century or so. It will not be a static once off step change. The CID will hopefully be instrumental in accelerating and better enabling the introduction and use of urban-ITS in European cities. But once its timespan is elapsed, this is not a step change that will have been completed. It is a process that will have been started. Urban-ITS is a way of communicating and thinking in order to use intelligence to improve the travel experience and efficiency. It will continue to develop and evolve, and as such, will require further study, evaluation and support.

Example: We can say with some certainty that the change of paradigm from vehicle owning, towards vehicle using will happen, but we cannot say to what extent, and while we can make some fancy simulations, we cannot yet predict whether this will increase or decrease the traffic volume on city roads; nor, despite 20 years of experience, are we able to yet fully comprehend the full effect of the communications revolution and internet will have on the place of work and need to travel.

In the past, cities have generally coped with transportation needs in arrears. Developing new travel means and modes only after the need is apparent, with the consequential delays, inconveniences, costs and inefficiencies that result from post event planning.

It will be interesting to observe how actively planned growth economies such as those that are now occurring in Singapore, China and the Middle East, better cope with transportation needs. Will their cities be so much better living spaces because of this forward planning, or will they create white-elephants as the paradigm of city living evolves in different directions? (In heavily populated China there are already whole city districts planned and built, but remain unoccupied because the actual need has not matched the planned need. In the 1800's railways were planned and introduced in anticipation of needs that were overtaken by the introduction of the automobile, and therefore never economically viable.)

What we can predict with some surety, is that the CID will need to be only the first of many measures needed to ensure that the changes to city living are matched dynamically by measures to study and support the evolutionary changes that will be required, and this will be a way of operating and developing, not a single measure (like the introduction of seat belts), and will require constant re-evaluation and initiatives, well beyond the lifespan of the CID.

L.3 Autonomous/Automated vehicles

This is a nascent technology with much hype and publicity, deemed to be imminent. Yet even the most optimistic. Section C.8 describes as much as we can predict at the moment.

We can be sure only of three things:

a) Automated/autonomous vehicles will become part to the urban environment
b) This will (probably quite disruptively) change the paradigm of moving around cities
c) The timescale of any significant penetration is well beyond the timespan of the CID.

We do not as yet know how deeply the automated vehicle will penetrate the urban transportation sector in Europe.

We do not, as yet, know the timescale in which this will occur.

But we think that we may reasonably assume that it will be as disruptive a change as the introduction of underground metro systems, the introduction of motorways and ring roads, and perhaps as disruptive even as the introduction of the internal combustion engine.

What is clear, however, is that this needs to be managed in advance, not arrears, if its potential is to be realised, and while this prestudy has, for this reason, recommended a project team to study these effects, it should be realised that this will be the first of many studies and projects that will be needed to enable the potential for automated vehicles to be achieved. Combined with the trend towards city living, described in L.2 above, the travelling/transportation paradigm will change.

The subject of automated/autonomous vehicles will therefore need to be an area of research and study and project support well beyond the span of the CID.

L.4 Transmodel, DATEX II and associated standards

Advocates of Transmodel believe it to be the core for multimodal travel around cities, and believe its proven achievements at the heart of improving public transportation provides a basis for the architecture of all transportation in cities.

Advocates of DATEX II believe that it is the core to delivering European transport policy enabling the coordination of traffic management and development of seamless pan European services, with the aim to support sustainable mobility in Europe, based on expansion of information exchange between traffic management centres and other parties which now also pushes the door wide open for actors from the wider traffic and travel information sector, and tend to see Transmodel as too public-transport centric.

Advocates of OCIT and UTMC tend to be somewhere in-between but with a clearer limitation to the scope of their domains.

The recommendation Rc_MI08 of this prestudy proposes to develop a link between DATEX II and Transmodel, and this is indeed an essential first step. But it is only a first step. This section of the prestudy is looking to identify needs beyond the lifespan of the CID. What is clear is that there needs to be a paradigm shift in the thinking of all parties, instead of just expanding their existing paradigm to engulf the other areas involved. One may think that linking to an overall system reference architecture may achieve this, but has to date singularly failed to do so, because any overall system architecture is at such a high level that it is not possible to realise at the lower implementation levels, or, as in the case of the US ITS architecture, is so prescriptive as to be inflexible to different paradigms.

The US CVRIA is an attempt to overcome this for the C-ITS sector, and the EU-ICIP proposed are first steps in the right direction in respect of urban-ITS and joining these jigsaws together.

However, these are first steps, and, both during and beyond the timespan of the CID, considerable efforts will be needed to encourage joint approaches rather than turf wars if the opportunities presented by urban-ITS are to be fully and effectively realised.

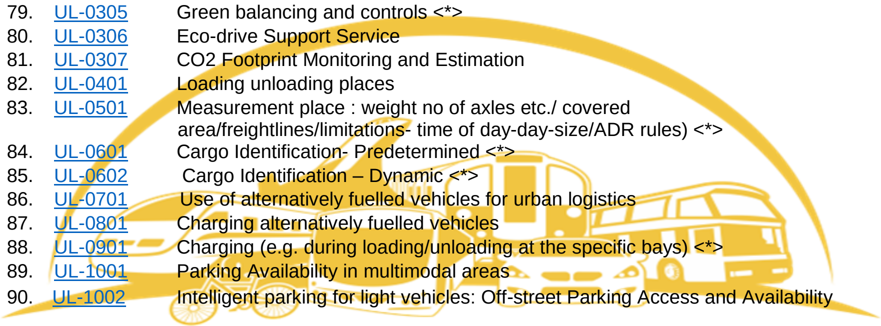
ANNEX M Use Cases Collated

List of Use Cases detailed in this Annex. These use-cases are collated from the analyses in the other Annexes to this report.

<*> indicates still under development

1.	GEN-0001	Urban-ITS Interoperable Location Referencing
2.	GEN-0002	Urban-ITS Location and Time Determination
3.	ULG-0001	EU-ICIP Use Case
4.	ULG-0002	Urban-ITS Interoperable Location Referencing
5.	MIS-0001	MIS Planned Data Retrieval
6.	MIS-0002	MIS Real-time Data Capture
7.	MIS-0002-1	MIS Operational Raw Data Provision
8.	MIS-0003	MIS Planned Data Processing
9.	MIS-0003-1	MIS Scheduled Trip Plan Provision
10.	MIS-0003-2	MIS Planned Data Updating
11.	MIS-0004	MIS Real-time Data Processing
12.	MIS-0004-1	MIS Real-time Data Updating
13.	MIS-0005	MIS Actual Trip Plan Provision
14.	MIS-0005-1	MIS Dynamic Car-pooling
15.	MIS-0005-2	MIS Driver Guidance
16.	MIS-0005-3	MIS Car Sharing
17.	MIS-0005-4	MIS Bicycle Sharing
18.	MIS-0005-5	MIS Demand Responsive Systems
19.	MIS-0006	MIS Information Structuring
20.	MIS-0007	MIS Information Dissemination
21.	MIS-0008	MIS Query Structuring
22.	MIS-0000	User Support
23.	TM-0001	TM Planning and system configuration data retrieval
24.	TM-0002a	TM Real-time Field Data Capture
25.	TM-0002b	TM External System Real Time Data Capture
26.	TM-0003	TM Planned Data Processing & Subsystem Configuration
27.	TM-0004	TM Real-time Data Processing
28.	TM-0005	TM Traffic Condition calculation and Event/Incident detection
29.	TM-0006	TM Decision and Measure Selection & Structuring
30.	TM-0007	TM Measure realization
31.	TM-0008	TM Information dissemination
32.	TM-0009	TM Procurement and maintenance of Traffic Management infrastructure
33.	UL-0101	Optimising Modal Choice <*>
34.	UL-0102	Providing Delivery Service
35.	UL-0103	Exchange information with other authorities in area of security <*>
36.	UL-0104	Exchange information with other authorities in area of environmental risk <*>
37.	UL-0105	Pre-trip planning – Freight
38.	UL-0106	Dynamic navigation <*>
39.	UL-0107	Embedded digital maps <*>
40.	UL-0108	Last mile parcel tracking <*>
41.	UL-0109	Freight Manager and driver assistant <*>

42.	UL-0110	Access to Traffic information
43.	UL-0111	Customer/Receiver databases
44.	UL-0112	Delivery vehicle real-time mapping/route optimisation
45.	UL-0113	Comply with regulations
46.	UL-0201	Access Control and Management
47.	UL-0202	Remote Tachograph Monitoring
48.	UL-0203	Emergency messaging system/eCall
49.	UL-0204	ADR management
50.	UL-0205	Driver Work Records Monitoring
51.	UL-0206	Vehicle Mass Measurement
52.	UL-0207	Mass information for control and enforcement
53.	UL-0208	Vehicle Speed Monitoring
54.	UL-0209	Consignment and location monitoring
55.	UL-0210	Vehicle Parking Management/Facilities
56.	UL-0211	Vehicle weigh-in-motion
57.	UL-0212	Vehicle enforcement using roadside sensors
58.	UL-0213	Urban Consolidation Centre Management
59.	UL-0214	Oversize management
60.	UL-0215	Scheduling infrastructure (restrictions – day- time of day- length of stay- other limitations)
61.	UL-0216	Description of freight offer <*>
62.	UL-0217	Monitor Compliance <*>
63.	UL-0218	ICT framework handling RT heterogeneous mobility resources <*>
64.	UL-0219	Network management (<*>
65.	UL-0220	Freight Fares <*>
66.	UL-0221	Freight Delivery schedule timetables
67.	UL-0222	Optimise Resources <*>
68.	UL-0223	Improve E2E Freight efficiency <*>
69.	UL-0224	Vehicle Technology <*>
70.	UL-0225	Innovative load units <*>
71.	UL-0226	Restriction Zones Information Harmonisation
72.	UL-0227	Intelligent Truck Parking and Delivery Areas Management (ITP/DAM)
73.	UL-0228.1	Priority and Speed Advice Service
74.	UL-0228.2	Priority and Speed Advice Service (Macro Approach)
75.	UL-0301	Emissions monitoring –General
76.	UL-0302	Urban Low Emission Zone Management
77.	UL-0303	Monitor Emissions Compliance in Urban Zone <*>
78.	UL-0304	Cross Border
79.	UL-0305	Green balancing and controls <*>
80.	UL-0306	Eco-drive Support Service
81.	UL-0307	CO2 Footprint Monitoring and Estimation
82.	UL-0401	Loading unloading places
83.	UL-0501	Measurement place : weight no of axles etc./ covered area/freightlines/limitations- time of day-day-size/ADR rules) <*>
84.	UL-0601	Cargo Identification- Predetermined <*>
85.	UL-0602	Cargo Identification – Dynamic <*>
86.	UL-0701	Use of alternatively fuelled vehicles for urban logistics
87.	UL-0801	Charging alternatively fuelled vehicles
88.	UL-0901	Charging (e.g. during loading/unloading at the specific bays) <*>
89.	UL-1001	Parking Availability in multimodal areas
90.	UL-1002	Intelligent parking for light vehicles: Off-street Parking Access and Availability



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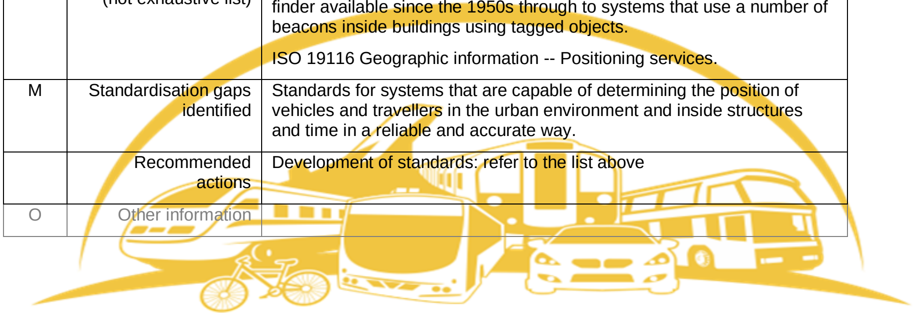
91.	UL-1003	Intelligent parking for light vehicles: On-street Parking Availability
92.	UL-1004	Intelligent parking for light vehicles: Parking spot internal access management
93.	UL-1101	intelligent parking for light commercial vehicles <*>
94.	UL-1201	Intelligent parking for heavy goods vehicles <*>
95.	UL-1301	Automated/autonomous vehicles in the Urban-ITS environment

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Urban-ITS Interoperable Location Referencing**
M	**Use Case reference /id**	**GEN-0001 v3 20151124**
M	Description	Provision of a real time continuous location referencing system for the Urban-ITS environment. The referencing system should allow for planned and real-time data.
M	Scenario	An ITS deployment needs to draw data (for MIS, TM or UL purposes) from different modal systems, possibly under the ownership and control of several different organisations. In order to be able to compare routes, vehicle positions and interchange locations/structures effectively, it needs a common location referencing system.
M	Scope	To be able to place planned and real-time data in a universal location referencing environment so that control systems for the various modes can interact to provide seamless services to the urban traveller.
M	Actors Involved	Public transport operators Traffic managers Trip planning service providers ‘travel information provider’s Car park operator Location referencing providers Location determination providers Freight shippers Other travel mode providers Road maintenance operators Geographic information providers
M	Stakeholders	EU and National governments Urban administrations Public transport authorities Road operators Travellers
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	That each element in the Urban-ITS chain is prepared to provide links to this universal location referencing system.

M	Identified standards (not exhaustive list)	ISO/EN 14819-3 Traffic and travel information (TTI) TTI messages via traffic message coding - part 3 location referencing for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT C . ISO/TS 21219 Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) - part 21,22, 23. CEN/TS 16157-2 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing. ISO 17572-3 Intelligent transport systems (ITS) -- Location referencing for geographic databases – Parts 1,2 and 3. ISO 19147:2015 Geographic information -- Transfer Nodes. ISO/TS 1910XX Geographic information. ISO 14825 Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0. Various Transmodel, SIRI and NeTEx – Locations. EN 12896 Transmodel v6- Part 1: Common Concepts (Location Model, Projection Model). TS16614-1; Network and Timetable Exchange — Part 1: Network Topology. CEN/ISO TS 19091, Intelligent Transport Systems - Cooperative-ITS - Using V2I and I2V Communications for Applications Related to Signalized Intersections (SPaT, MAP, SRM, SSM) . ETSI EN 302 637-1 Cooperative Awareness Message (CAM). ETSI EN 301 637 -2 Decentralised Environmental Notification Message (DENM).
M	Standardisation gaps identified	There is no shortage of standards in the location referencing arena, the problem is that many of the methodologies are not compatible. The gap here is to ensure that multiple systems can all describe locations in the urban setting in such a way that they can cooperate to provide ITS services.
	Recommended actions	Development of standards: refer to the list above. A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Urban-ITS Location and Time Determination**
M	**Use Case reference /id**	**GEN-0002 v3 20151124**
M	Description	Provision of a location and time determination system that will work in the urban canyon and provide positioning and timing information in enclosed spaces.
M	Scenario	ITS deployments generally need to determine the position of an ITS station to a high degree of accuracy and reliability within the urban area and within structures such as multi-storey car parks.
M	Scope	Satellite positioning systems work well in the inter-urban space where there is no shielding of satellites by trees or tall buildings. The positional accuracy is adequate for must travel applications with the exception positioning of autonomous vehicles. However, they do not work well in some urban environments where a reduced number of satellites in line of sight due to the shielding effects of tall buildings (the urban canyon). There will also be applications where positioning inside buildings such as multi-storey car parks requires location determination.
M	Actors Involved	Public transport operators Traffic managers Trip planning service providers 'travel information provider's Car park operators Location referencing providers Location determination providers Freight shippers Other travel mode providers Road maintenance operators Geographic information providers
M	Stakeholders	EU and National Governments Urban administrations Public transport Authorities Road Operators Travellers
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	That location determination systems are freely available.
M	Identified standards (not exhaustive list)	There are a number of standards in this area, most are for determination of the position of objects. These range for from the simple radio direction finder available since the 1950s through to systems that use a number of beacons inside buildings using tagged objects. ISO 19116 Geographic information -- Positioning services.
M	Standardisation gaps identified	Standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate way.
	Recommended actions	Development of standards: refer to the list above
O	Other information	



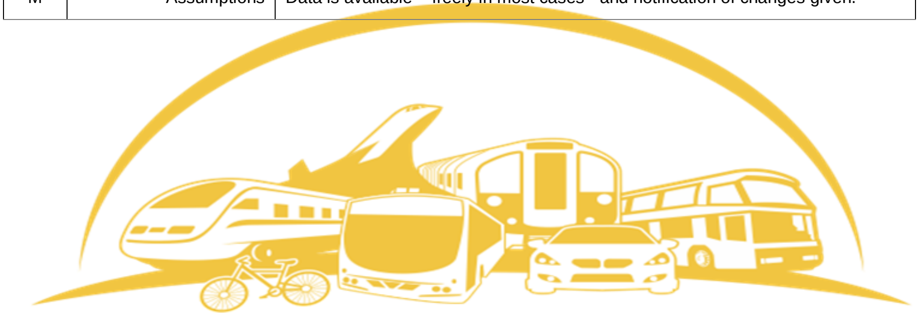
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**EU-ICIP**
M	**Use Case reference /id**	**ULG-0001 v1 20151110**
M	Description	European ITS communications and information protocols (EU-ICIP)
M	Scope	EU-ICIP will provide a basis for information and knowledge of what communications and data standards are available, especially in the context of Urban-ITS, and provide the basis for interoperability and regulated requirements for ITS in Europe, informing potential users of the compatibilities and incompatibility issues of various options, and provide the opportunity for training opportunities, and guidance to universities to assist training programmes for ITS experts.
M	Scenario	a) Section 1—Introduction providing a brief overview of EU-ICIP as well as a discussion of the motivations that led to the adoption of EU-ICIP supported standards and its objectives, and discuss the ethos and issues involved. b) Section 2—Understanding EU-ICIP – would provide a general purpose technical overview of EU-ICIP and the EU-ICIP Framework. c) Section 3—Procuring EU-ICIP would presents an overview of the procurement process and issues related to procurement within the EU context, and provide general guidelines for international use. d) Section 4—How to Use – would explain elements of EU-ICIP standards and how to use them in combination in the development and implementation of developing agency requirements and specifications. e) Section 5—Designing EU-ICIP compliant systems - would deal with issues facing those who have the task of designing the communications element of ITSs that use EU-ICIP protocols. It would address wired and wireless communications f) Section 6—Implementing EU-ICIP – would be directed at systems implementers, including software and hardware developers for Urban-ITSs, both vehicle facing systems and infrastructure facing systems; software and hardware developers and systems integrators. In particular, some of the lessons learned and common pitfalls encountered during actual deployments would be discussed and shared, with suggested solutions. g) Section 7 - Strategic level aspects h) Section 8 – Information level aspects i) Section 9 – Application level aspects j) Section 10 – Communications aspects k) Section 11 – Subnetwork aspects g) Section 12—EU-ICIP Testing - intended principally for test documentation developers, and conformance management, assessment and testing. While the FRAME architecture describes the 'what' is to be achieved, the EU-ICIP guide will provides the 'How' to best achieve at the current time (and will therefore be a living and hopefully regularly revised guide) EU-ICIP would be a natural follow on to the EU initiative of the C-ITS platform, and is envisaged as a living guide that would evolve and develop with the opportunities that technical evolution brings. As it would be a guide, and would not itself develop standards, the set-up and maintenance costs would be, in comparison to NTCIP, quite small.

.		Such an initiative would not only benefit Member States, but would be of benefit to those who wish to align their systems to those of EU, such as geographically adjacent states and prospective member states.
M	Actors Involved	All actors involved in Urban-ITS implementation
M	Stakeholders	All stakeholders involved in Urban-ITS implementation
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	There are many standards already available for communications and data to enable Urban-ITS, but they are not coordinated, and in many cases unknown to potential users
M	Standardisation gaps identified*	EU-ICIP Technical Specification or Technical Report, followed by an ongoing maintenance programme
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

·	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Urban-ITS Interoperable Location Referencing**
M	**Use Case reference /id**	**ULG-0002 v3 20151124**
M	Description	Provision of a real time continuous location referencing system for the Urban-ITS environment. The referencing system should allow for planned and real-time data .
M	Scenario	An ITS deployment needs to draw data (for MIS, TM or UL purposes) from different modal systems, possibly under the ownership and control of several different organisations. In order to be able to compare routes, vehicle positions and interchange locations/structures effectively, it needs a common location referencing system.
M	Scope	To be able to place planned and real-time data in a universal location referencing environment so that control systems for the various modes can interact to provide seamless services to the urban traveller.
M	Actors Involved	Public transport operators Traffic managers Trip planning service providers ‘travel information provider’s Car park operator Location referencing providers Location determination providers Freight shippers Other travel mode providers Road maintenance operators Geographic information providers
M	Stakeholders	EU and National Governments Urban administrations Public transport Authorities Road Operators Travellers
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	That each element in the Urban-ITS chain is prepared to provide links to this universal location referencing system.

M	Identified standards (not exhaustive list)	ISO/EN 14819-3 Traffic and travel information (TTI) TTI messages via traffic message coding - part 3 location referencing for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT C. ISO/TS 21219 Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) - part 21,22, 23 . CEN/TS 16157-2 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing. ISO 17572-3 Intelligent transport systems (ITS) -- Location referencing for geographic databases – Parts 1,2 and 3. ISO 19147:2015 Geographic information -- Transfer Nodes. ISO 6709 Standard representation of geographic point location by coordinates. ISO/TS 1910XX Geographic information. ISO 14825 Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0. Various Transmodel, SIRI and NeTEx – Locations? EN 12896 Transmodel v6- Part 1: Common Concepts (Location Model, Projection Model). TS16614-1; Network and Timetable Exchange — Part 1: Network Topology . CEN/ISO TS 19091, Intelligent Transport Systems - Cooperative-ITS - Using V2I and I2V Communications for Applications Related to Signalized Intersections (SPaT, MAP, SRM, SSM) . ETSI EN 302 637-1 Cooperative Awareness Message (CAM). ETSI EN 301 637 -2 Decentralised Environmental Notification Message (DENM).
M	Standardisation gaps identified	There is no shortage of standards in the location referencing arena, the problem is that many of the methodologies are not compatible. The gap here is to ensure that multiple systems can all describe locations in the urban setting in such a way that they can cooperate to provide ITS services.
	Recommended actions	Development of standards: refer to the list above. A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such away that the data associated with those references can be shared to provide Urban-ITS services.
O	Other information	

		CEN TC278 PT1701 Use Case
M	**Use Case Name**	**MIS Planned Data Retrieval**
M	**Use Case reference /id**	**MIS-0001 v6 20151119**
M	Description	To collect data about the planned status of the transport service offer for use in ‘Travel Information Provider’ systems.
M	Scenario	This Use Case refers to step 1 in the MIS value chain. It should be considered as a consequence of a simple traveller/user query, or - in case of data exchanges between systems – as a consequence of the request of another system such as a ‘Travel Information Provider’/ ‘Other Travel Mode Provider’, etc. This process draws data from multiple (possibly unknown) separate source systems which are procured, owned and operated by independent third parties.
M	Scope	This concerns the gathering of all multi-source and multimodal information, which is static in nature and based upon either longer term planned data (i.e. data valid until they enter in operation for a particular operating day) or data foreseen for particular operating days. Examples data: planned timetables, scheduled events, planned fares, planned road maintenance activities, expected car park occupancies, tolls and the network topology, points of interest, road/rail/waterways network, car-pooling areas, car sharing, bicycle sharing areas, cycling network, battery recharging areas (for electric vehicles), etc.
M	Actors Involved	Car park operators Public transport operators ‘travel information provider’s Freight shippers Other travel mode providers Geographic information providers Toll operators Road maintenance operators Road network operators Travellers
M	Stakeholders	EU and national governments Urban administrations Public transport authorities Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services, Urban Logistics (Parking)
M	Assumptions	Data is available – freely in most cases - and notification of changes given.

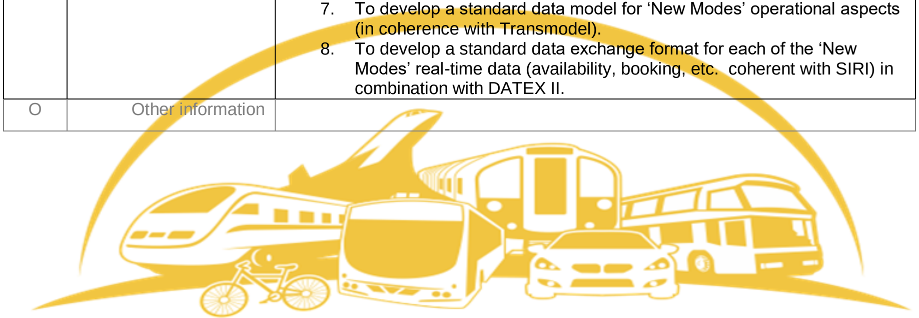


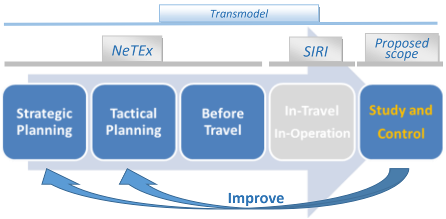
M	Identified standards (not exhaustive list)	*ITS Standards:* ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN12896 Transmodel v 5.1. CEN/TS 16614 Network and Timetable Exchange Part 1 to 3 (NeTEx) – for planned public transport data exchange. ISO 14825 Geographic Data Files 5.0. ISO 19147:2015 Geographic information -- Transfer Nodes. INSPIRE data models & associated data exchange formats (TN-ITS).
M	Standardisation gaps identified	1. No reference model for network topology for 'New Modes' (car/cycle sharing areas, car-pooling areas, battery recharging places). 2. No reference model for service description for 'New Modes' (booking, fares, etc.). 3. No reference model for cycling network. 4. No standard exchange format for 'New Modes' planned data (topology, service description and fares). 5a. Lack of coherence of Transmodel (fare collection part) and NeTEx – part 3 (NeTEx requires new types of public transport fares (pay-as-you go, etc. and more explicit parameters for fares description and usage)). 5b Transmodel v5.1 Fare Collection part (validation/control data) (being the basis for information concerning black lists, account status, etc.). is not coherent with the already issued Transmodel v6 Part 1-2-3. 6. No unique model for infrastructure description: there is an overlap GDF (guidance oriented) /INSPIRE (map oriented) in several areas: road, rail, waterway network, walking paths – to be checked the overlap other feature themes such as GDF administrative areas, named areas, etc.) 7. Lack of standard data exchange profiles for data retrieval (according to end-user (traveller/driver/travel information system) need): end-user queries may address specific types of data, e.g. stops in a certain zone, passing times at particular stop place or for a route, etc.; standard data exchange format is provided by standards like NeTEx, however, such data exchange formats define large data sets (e.g. the whole network topology). The definition of particular "generic" profiles for data retrieval (i.e. limiting the exchanges to some subsets of data to be exchanged, such as for example stop places) facilitates the usage of complex standards. 8. Precise parameters definition for data exchanges (i.a. for data retrieval), such as particular cardinalities or codes, often takes place between the partners involved in the exchanges. Publicly available parameters will ensure that data by a new user are accessible: such agreements are often not published.

.	Recommended actions	9. To develop a standard reference data model for network topology for 'New Modes' (car/cycle sharing areas, car-pooling areas, battery recharging places) in coherence with Transmodel V6. 10. To develop a standard reference data model for service description for 'New Modes' (incl. booking, fares, etc.) in coherence with Transmodel V6. 11. To develop a standard data model for cycling network in coherence with Transmodel V6 and GDF. 12. To develop a standard exchange format for 'New Modes' planned data (topology, service description and fares). 13. To develop Transmodel V6 – Part 5: Fare Management (incl. validation and control part). **14.** To specify a unique solution for the models as developed by GDF and INSPIRE in several overlapping areas: road, rail, waterway network, walking paths, administrative areas, named areas, etc.). **15.** To develop a standard method (and possibly tool) for the development of data exchange profiles based on NeTEx (e.g. stop place profile based on NeTEx) useful in the context of travel information and associated reference generic description for local agreements referring to the profiles. 16. To develop several of the most useful profiles based on NeTEx.
O	Other information	

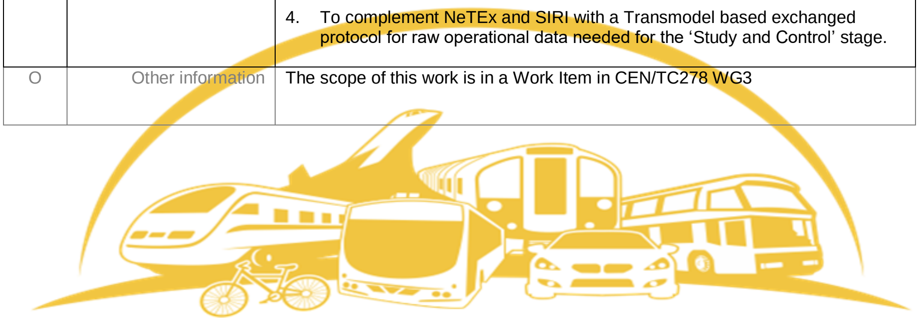
CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Real-time Data Capture**
M	**Use Case reference /id**	**MIS-0002 v6 20151119**
M	Description	To capture real-time data provided by public transport, road network operations and other mobility services for use in 'Travel Information Provider' systems.
M	Scenario	This Use Case refers to step 2 in the MIS value chain. This process draws data from multiple (possibly unknown) separate source systems which are procured, owned and operated by independent third parties. The data is likely to be in different time resolutions and have different business rules.
M	Scope	This concerns the capturing of raw real-time data from the different modes of transport and control in an urban area. Real-time data is intended as an input to 'Travel Information Provider' systems for the provision of actual information to the end-user (traveller, driver or other system) (i) either to express warnings (ii) or, in combination with planned data, to re-calculate trip plans, propagate changes in public transport offer, propose deviations to drivers in case of on-board route guidance, etc. Examples of data to be captured are: data from the road network and other modes, from vehicle embedded systems (cars, trams, buses, taxis, metro, trains etc.), status data from other modes, weather and road conditions, reports from travellers, the police etc., real-time passing times from various modes, car/cycle sharing availability, car-pooling availability, facilities' availability at stops and stations, etc.
M	Actors Involved	Car park operators Public transport operators Public transport vehicle Road maintenance operators Road network operators Toll operators Travellers Freight shippers Other travel mode providers Probe vehicles Geographic information providers Location reference service Connected vehicles Emergency service operators Inter-urban traffic management system
M	Stakeholders	EU and national governments Urban administrations Road operators Travellers EU and national government Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services, Urban Logistics (Parking), Traffic Management
M	Assumptions	Data is available – freely in most cases.

M	Identified standards (not exhaustive list)	*ITS standards:* ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. CEN TS 16157 DATEX II Parts 1 to 6. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN12896 Transmodel v5.1. EN15531 Part 1 to 4 Service interface for real-time information (SIRI): real-time public transport data. CEN/TS15531 Part 5 Service interface for real-time information (SIRI-FM Facility Management). ISO 14827-1 Data interfaces between centres for transport information and control systems. ISO 15784 Data exchange involving roadside modules ISO communication. ISO 19147:2015 Geographic information -- Transfer Nodes. INSPIRE data models & associated data exchange formats (TN-ITS)
M	Standardisation gaps identified	7. Requirements for real time public transport data (from SIRI (mostly situation exchange and facility management) are not taken into account in the standard reference model for public transport (Transmodel v5.1). 8. EBSF requirements for detailed control actions are not taken into account the reference data model for public transport (Transmodel V5.1). 9. No standard physical UML model for Transmodel real-time data (SIRI standard concerns messaging and is an XML implementation): real-time data may be stored in a data base for use e.g. of verification routines and thus retrieved from a data repository. The existence of a physical data model for SIRI data facilitates specification and development of verification routines. 10. DATEX overlaps with parts of Transmodel V5.1 real-time data domain (events, messages). 11. No standard model exists for 'New Modes' real-time data (car/ bicycle sharing availability, car-pooling options, etc.). 12. No standard data exchange format for 'New Modes' real-time data.
	Recommended actions	5. To develop Transmodel v6 – Part 4: Operations Monitoring and Control, i.e. the update of Transmodel 'Operations Monitoring and Control 'with the requirements of SIRI standard, EBSF project & align with DATEX part 3 (Situation Publication). 6. To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files). 7. To develop a standard data model for 'New Modes' operational aspects (in coherence with Transmodel). 8. To develop a standard data exchange format for each of the 'New Modes' real-time data (availability, booking, etc. coherent with SIRI) in combination with DATEX II.
O	Other information	



CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Operational Raw Data Provision**
M	**Use Case reference /id**	**MIS-0002-1 v3 20151220**
M	Description	To provide the necessary public transport raw data for the *Study and Control* stage. This stage follows the operations stage, i.e. it is the time when operators and authorities review the history of actual operations. This stage may lead to improvements through operational changes, or an optimization of strategic and tactical planning. The data concerned will only describe the recorded reality of operation, either through individual measurements at a given sampling interval, or through data aggregations (statistics). It concerns different kinds of information, based on the actual public transport service, for example: delays, cancelled vehicle journeys, passenger counts, but also data resulting from the control and validation of travel documents, origin/destination information, etc. The main stages of public transportation planning & operation are described below. From the authority and operator point of view, five main stages are to be considered to represent these activities as shown in the figure below. NeTEx and SIRI support the first four stages; the last stage is the additional scope to be covered by this Use Case.  Transmodel NeTEx SIRI Proposed scope Strategic Planning Tactical Planning Before Travel In-Travel In-Operation Study and Control Improve
M	Scenario	Different scenarios may be envisaged for further processing and exchange of this data: - Situation analysis. This Use Case group covers all the data exchange scenarios where the aim of the exchange is to provide data to examine and study the operating status (e.g. delays because of traffic lights, road construction, traffic jams, etc.). It requires some recording of aspects of the operational context and of events along with the real-time data performance. - Contractual reporting. This Use Case group covers data exchange where the actual service must be accounted towards the local, regional or national administration body responsible for providing public transportation. It requires some representation of the accounting of undertaken services. - Providing data for quality-of-service analyses and processes. Based on the planned timetables and the exchanged data, quality-of-service (QoS) analyses may take place, including delays and cancelled vehicle journeys. The purpose of the initial data exchange is not carrying the actual quality-of-service information, but only the input data from which such indicators can be computed.

·		- The above scenarios include data referring to driver performance on actual days of operation.
M	Scope	The focus of this Use Case is on actual and measured information, i.e. information that cannot be changed in the future. This information is mainly an output of the domain "*operations monitoring & control*" and of the domain *"driving personnel disposition"* as defined by Transmodel. The scope of this Use Case is to update the parts of Transmodel that refer to the provision of registered raw data for the study and control and to define a standard data exchange format.
M	Actors Involved	Public transport authority: to receive the data, either directly, either indirectly through service providers. Public transport operators: to provide the operational raw data as an output of their network monitoring. Software companies: to implement the data exchange.
M	Stakeholders	Any actor involved in public transport, from authority to the end user, up to consultancy companies, academic studies an urban planning. Indeed, possibly affected stakeholder are numerous, and proximity with contractual relation contained in quality-of-service requires a fine-tuning of the scope of a future Technical Specification. Furthermore, various existing studies on public transport QoS at the European and national work need to be taken into account in order to satisfy their data input needs.
M	MIS / TM / UL	Multimodal Information Services – Traffic Management (Public transport Operation)
M	Assumptions	The public transport network needs to be monitored (usually involves an AVMS, but dedicated system, like passenger counting, may also be required).
M	Identified standards (not exhaustive list)	EN 12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN 12896 Transmodel v5.1. CEN/TS 16614 Network & Timetable Exchange (NeTEx) Part 1-3. EN15531 Part 1 to 4 Service interface for real-time information (SIRI). CEN/TS15531 Part 5 Service interface for real-time information (SIRI-FM Facility Management).
M	Standardisation gaps identified	3. Transmodel v5.1 is to be updated with new requirements as regards raw data needs for the Study and Control. 4. No standard to support data exchange for the *Study and Control* stage.
	Recommended actions	3. To update Transmodel v6-Part 4: Operations Monitoring and Control Transmodel v6-Part 7: Driver Management, Transmodel v6- Part 8: Management Information. 4. To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw operational data needed for the 'Study and Control' stage.
O	Other information	The scope of this work is in a Work Item in CEN/TC278 WG3



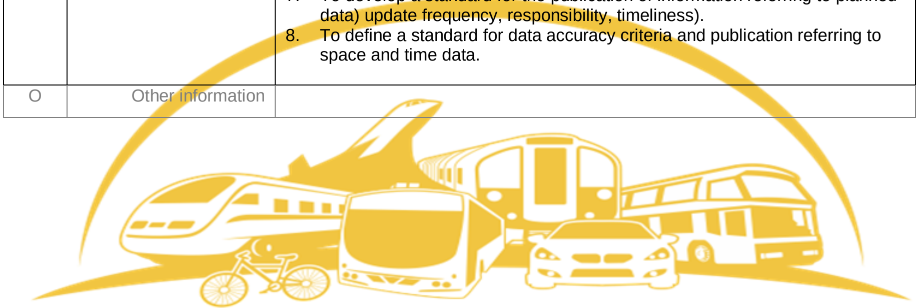
CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Planned Data Processing**
M	**Use Case reference /id**	**MIS-0003 v4 20151118**
M	Description	To collate, convert to a common standard format planned data representing the transport service offer and provide this for use in 'Travel Information Provider' systems.
M	Scenario	This Use Case refers to step 3 in the MIS value chain. The data has originated from multiple (possibly unknown) separate source systems which are procured, owned and operated by independent third parties, and must be put in such a form that it can be combined to provide a more complete picture.
M	Scope	Multisource data as retrieved (cf. UC MIS-0001) is not necessarily free of errors, inconsistencies and duplications and needs to be checked and validated according to predetermined criteria. This concerns the structuring of information in an agreed format so that it can be combined with information from other sources to put the information into context to provide information services.
M	Actors Involved	'Travel information provider's Public transport operators Car park operators Road maintenance operators Road network operators Toll operators Geographic information providers
M	Stakeholders	EU and national governments Urban administrations road operators travellers
M	MIS / TM / UL	Multimodal Information Services –Urban Logistics (Parking)
M	Assumptions	Availability of planned data as described in UC MIS-0001. Existence of well-structured physical models that include versioning and standard data source description to identify and to store the planned data.
M	Identified standards (not exhaustive list)	ITS standards ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. CEN TS 16157 DATEX II Parts 1 to 6. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6 EN12896): as reference semantic model (for public transport network). CEN/TS 16614 Network and Timetable Exchange (NeTEx).
M	Standardisation gaps identified	3. Lack of standard and unambiguous IDs for multi-source data for use of 'Travel Information Provider' systems. This concerns data referring to the same concept (e.g. stops in one mobility area etc.) and has as consequence, in many situations, that when collated, data duplication or confusion occurs. 4. No standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence.

.	Recommended actions	3. To develop a standard stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner. 4. To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence.
O	Other information	

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Scheduled Trip Plan Provision**
M	**Use Case reference /id**	**MIS-0003-1 v7 20151119**
M	Description	To compute trip plan options (i.e. spatial trip patterns and timing patterns) through the network, including detailed times and detailed guidance for making transfers between two services at an interchange.
M	Scenario	This Use Case refers to step 3 in the MIS value chain.
M	Scope	The trip planning algorithms use planned data only for this Use Case. The computation of trip plans takes into account end-user criteria that are part of end-user requests. For individual car drivers or freight shippers this Use Case concern park & ride scheduled options. Trip plans provided are composed (i) either by several alternative trip options (each option using a different mode) and/or (ii) by several inter-modal options. Optionally, trip patterns (i.e. the spatial component of a trip plan) are processed to be represented on maps.
M	Actors Involved	Traveller information providers Geographic information providers Travellers Drivers
M	Stakeholders	EU and national governments Urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services.
M	Assumptions	Availability of restructured planned data as described in UC MIS-0001 and UC MIS-0003: this means in particular: • the existence of well-structured physical models and associated standard data exchange formats that include versioning and standard data source descriptions to identify the planned data for use of trip planning applications. • the existence of standard and parameterised user queries that include criteria to be taken into account for journey planning algorithms.
M	Identified standards (not exhaustive list)	ITS standards None known
M	Standardisation gaps identified	1. This Use Case relies on UC MIS- 0001 & UC MIS-0003 and thus the gaps identified apply also here. 2. No standard end-user (traveller/driver/travel information system) query model for standard criteria for trip plan delivery. 3. When several trip planners have to be interconnected (this is the case, for instance, when the end-user query is beyond the boundary of a single trip planner), a standard interface for the interconnection of trip planners is missing: this facilitates extensions of such system composed of many multimodal information providers (e.g. interconnection of national trip planners to form a EU-wide trip planning system).

.	Recommended actions	*Same recommendations as for UC MIS- 0001, UC MIS-0003 & UC MIS-0003-2 apply, according to the modes taken into account by the Trip Planning function.* AND: 4. To develop Transmodel v6 – Part 6: Passenger Information: to model complex queries and filters as required by NeTEx-informative annex. (cf. UC MIS- 0008). 5. To develop standard APIs and/or query/ data exchange format for interconnection of journey planning systems in coherence with Transmodel v6 (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). 6. To develop a unique access point for urban data repositories, in particular an urban meta-data registry.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**MIS Planned Data Updating**
M	**Use Case reference /id**	**MIS-0003-2 v3 20151119**
M	Description	To define planned data update procedures.
M	Scenario	This Use Case refers to step 3 in the MIS value chain.
M	Scope	Planned data needs to be updated with a certain frequency to be operational and meaningful, e.g. roadworks may generate the necessity to close certain roads, public transport stops may be displaced for some time, etc. The data for use for Multimodal Information Service has to be as timely as possible.
M	Actors Involved	Traveller information providers Geographic information providers Travellers Drivers
M	Stakeholders	EU and national governments urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	Data is publicly available.
M	Identified standards (not exhaustive list)	ISO/TR 21707:2008 Intelligent transport systems -- Integrated transport information, management and control -- Data quality in ITSs.
M	Standardisation gaps identified	Data as provided by different actors is often not actual or its validity is unknown. There is: 3. No standard for data update procedures. 4. No standard for publication of meta-data on data validity and refreshment data/period/frequency/responsibility/accuracy. This is particularly the case (and of importance) for open data and for a multi-operator environment.
	Recommended actions	5. To develop standard data update procedures (for planned data for the usage of MIS) to be adopted in accordance to the existing standard (and adapted to the MIS context). 6. To develop a standard for update frequency, timeliness of data for MIS use. 7. To develop a standard for the publication of information referring to planned data) update frequency, responsibility, timeliness). 8. To define a standard for data accuracy criteria and publication referring to space and time data.
O	Other information	



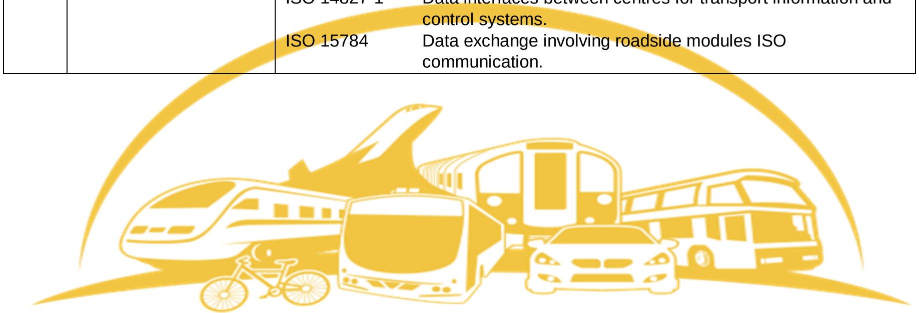
		CEN TC278 PT1701 USE CASE
M	**Use Case Name**	**MIS Real-time Data Processing**
M	**Use Case reference /id**	**MIS-0004 v4 20151119**
M	Description	To collate, convert to a common standard format real-time data and provide this for use in 'Travel Information Provider' systems. Examples of data: road status, road works, weather conditions, incidents, alarms, etc.
M	Scenario	This Use Case refers to step 4 in the MIS value chain.
M	Scope	Multisource real-time data as collected (MIS-0002) is not necessarily free of errors, inconsistencies and duplications and needs to be checked and validated according to predetermined criteria. This Use Case concerns structuring of information in an agreed format so that it can be combined with information from other sources to put the information into context to provide information services.
M	Actors Involved	'Travel information provider's Public transport operators Car park operators Road maintenance operators Road network operators Toll operators Geographic information providers
M	Stakeholders	EU and national governments urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	Real-time data is available and its source and version is identified as described in UC MIS-0002. Existence of well-structured physical models is supposed, that include versioning and standard data source descriptions to identify the real-time data for use of travel information services and possibly to store it for statistical analysis.
M	Identified standards (not exhaustive list)	ITS standards ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. CEN EN 15531 SIRI Part 1 to 4: Service interface for real-time information for public transport operations. CEN TS15531 Part 5 Service interface for real-time information (SIRI-FM Facility Management). CEN TS 16157 DATEX II Parts 1 to 6. CEN EN12896 Public Transport Reference Data Model Part 1 to 3. (Transmodel v6) EN12896 Transmodel v5.1.
M	Standardisation gaps identified	2. Automated data validation routines verifying semantic conformity to data standards (e.g. to SIRI XML files) do not exist as a standard.

.	Recommended actions	*Same recommendations as for UC MIS-0002 apply* AND To develop standard validation procedures and routines for real–time data (for the usage of MIS) verification (completeness, coherence and compliance to standard formats where they exist).
O	Other information	

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Real-time Data Updating**
M	**Use Case reference /id**	**MIS-0004-1 v3 20151114**
M	Description	To determine the update frequency and validity for real-time data dedicated to be used by MIS.
M	Scenario	This Use Case refers to step 4 in the MIS value chain.
M	Scope	In general, real-time data is meant to be used as soon as delivered. However, in several domains, e.g. in public transport, real-time data refer to the operations on a particular operating day and thus several updates of real-time data are delivered for an operating day. MIS delivery has to take into account the latest possible version of available data, which will provide the most accurate information service. MIS have to be aware of the frequency of real-time data provision, i.e. frequency of the different versions.
M	Actors Involved	'Travel information provider's Public transport operators Car park operators Road maintenance operators Road network operators Toll operators Geographic information providers
M	Stakeholders	EU and national governments Urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services – Urban logistics (parking) – Traffic Management.
M	Assumptions	Availability of real –time data.. Expressed will to reach agreement between the different parties.
M	Identified standards (not exhaustive list)	None known.
M	Standardisation gaps identified	Standards for frequency of update and provision of real-time data.
	Recommended actions	To develop standards for frequency of update and provision of real-time data for MIS use.
O	Other information	

		CEN TC278 PT1701 USE CASE
M	**Use Case Name**	**MIS Actual Trip Plan Provision**
M	**Use Case reference /id**	**MIS-0005 v5 20151119**
M	Description	To compute trip plan options (i.e. spatial trip patterns and timing patterns) through the network, including detailed connection times and detailed guidance (v) either for making transfers between two services over a connection based on *actual information* *(vi)* (ii) or as navigation or modal change assistance *during the trip.* The trip planning action may take place before or during a trip. Guidance for travellers concerns the part from the origin to the first location of public transport (first mile), between two places of a connection or from the last point of public transport service to the destination (last mile). Navigation assistance for drivers is provided to give optimum routes, avoiding road incidents, find the best route according to weather conditions, find parking to continue the trip (P&R) using public transport (e.g. bus, coach, rail, etc.) or 'New Modes' (e.g. car /cycle sharing, etc.).
M	Scenario	This Use Case refers to step 5 in the MIS value chain.
M	Scope	Trip planning occurs as part of Travel Information provider system either on a request of a traveller/driver of another system (in the context of interconnected journey planning systems). Depending on the capabilities of the journey planning system, either: (vii) *actual data* may be the basis of trip plan calculation (real-time journey planning system), or *(viii) planned data accompanied by warnings/announcements of real-time events.* Trip plans provided are composed: (iii) either by several alternative trip options (each option using a different mode) and/or (iv) by several inter-modal options. Optionally, trip patterns (i.e. the spatial component of a trip plan) can be represented on maps. *Guidance* may concern individuals transferring by foot or car drivers using on-board navigation systems during their trip. For car drivers this Use Case includes (see also UC MIS-0005-2): • information provision on the availability of P&R and on associated real time public transport (or interurban/long distance) options bringing him to his destination; • in the case of car-pooling services, the ability of a smartphone to communicate with the system on-board vehicle in order to continue driver guidance.
M	Actors Involved	'Travel information provider's Car park operators Road maintenance operators Road network operator Toll operators Geographic information providers

M	Stakeholders	EU and national governments Urban administrations Transport authorities Road operators Travellers
M	MIS / TM / UL	Multimodal Information Services –Traffic Management – Urban Logistics
M	Assumptions	*For truly real-time journey planners (i.e. which take into account actual data regarding the transport service offer) it is assumed that the real-time events have been taken into account by the transport system and the actual transport offering has been re-calculated (real-time passing times, delays, deviations, etc.).* In planning a multi-leg journey plan through a network, a journey planning system takes into account the transfer time needed to interchange between services at an interchange point. Depending on the sophistication of the journey planning system and the availability of data: -the individual timings required for transfers between different stop areas or stop points within an interchange may be taken into account, *considering actual delays;* -the individual paths required for transfers within an interchange using specifically identified navigation paths and accessibility needs may be given, *taking into account real-time changes in the walking paths and accessibility (e.g. non availability of equipment);* -fare information may be provided for the different trip options. A successful outcome of the recommendations of UC MIS-0001, UC MIS-0002, UC MIS-0003-1, UC MIS-0003-2, UC MIS-0004-1.
M	Identified standards (not exhaustive list)	ITS standards ISO 14813-1 Intelligent transport systems — Reference model architecture(s) for the ITS sector — Part 1: ITS service domains, service groups and services. ISO 14817 Intelligent transport systems — ITS central data dictionaries — Part 1: Requirements for ITS data definitions. CEN TS 16157 DATEX II Parts 1 to 6. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). CEN TS 16614 Network and Timetable Exchange (NeTEx). EN12896 Transmodel v5.1. CEN EN15531 Part 1 to 4 Service interface for real-time information (SIRI) : real-time public transport data. CEN TS15531 Part 5 Service interface for real-time information (SIRI-FM). ISO 14827-1 Data interfaces between centres for transport information and control systems. ISO 15784 Data exchange involving roadside modules ISO communication.

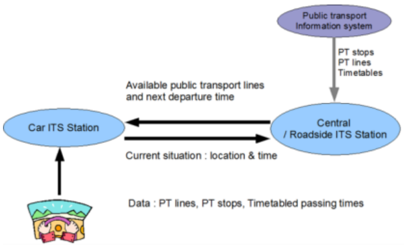
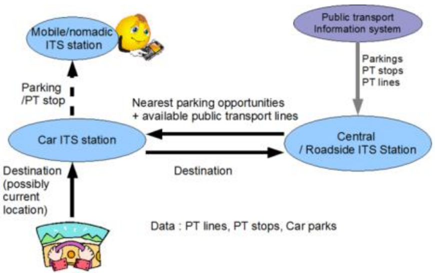


M	Standardisation gaps identified	*Same lists as for UC MIS-0001, MIS-0002, MIS-0003, MIS-0003-1,MIS-0003-2, MIS-0004, MIS-0004-1, MIS-0005-1, MIS-0008 appl.y* **They are summarised below**: *Cf.*UC MIS-0001: 1. No reference model for network topology for 'New Modes' (car/cycle sharing areas, car-pooling areas, battery recharging places). 2. No reference model for service description for 'New Modes' (booking, fares, etc.). 3. No reference model for cycling network. 4. No standard exchange format for 'New Modes' planned data (topology, service description and fares). 5a. Lack of coherence of Transmodel (Fare Collection part) and NeTEx – part 3 (NeTEx requires new types of public transport fares (pay-as-you go, etc. and more explicit parameters for fares description and usage)). 5b Transmodel v5.1 Fare Collection part (validation/control data) (being the basis for information concerning black lists, account status, etc.). is not coherent with the already issued Transmodel v6 Part 1-2-3. 6. No unique model for infrastructure description, useful for instance for walking paths identification; there is an overlap GDF (guidance oriented) /INSPIRE (map oriented) in several areas: road, rail, waterway network, walking paths – to be checked the overlap other feature themes such as GDF administrative areas, named areas, etc.). 7. No unique model for parking places and parking fares (overlap DATEX/ Transmodel- NeTEx). 8. Lack of standard data exchange profiles for data retrieval (according to end-user (traveller/driver/travel information system) need. *Cf.*. UC MIS-0002: 15. New requirements for real time public transport data (from SIRI (mostly situation exchange and facility management) are not taken into account in the standard reference model for public transport (Transmodel v5). 16. EBSF requirements for detailed control actions are not taken into account the reference data model for public transport (Transmodel V5.1). 17. No standard physical UML model for Transmodel real-time data (SIRI standard concerns messaging and is an XML implementation). 18. DATEX overlaps with parts of Transmodel V5.1 real-time data domain (events, messages). 19. No standard model exists for 'New Modes' real-time data (place/vehicle availability, etc.). 20. No standard data exchange format for 'New Modes' real-time data Lack of standard continuous, multimodal and real-time location referencing in urban areas.

•	Standardisation gaps identified (continued)	*Cf.* UC MIS-0003: 17. Lack of standard and unambiguous IDs for multi-source data for use of 'Travel Information Provider' systems. This concerns data referring to the same concept (e.g. stops in one mobility area etc.) and has as consequence - in many situations - that when collated, data duplication occurs. 18. No standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence. *Cf.* UC MIS-0003-1: 19. No standard end-user (traveller/driver/travel information system) query model for standard criteria for trip plan delivery. 20. No standard APIs and/or query/ data exchange format for interconnection of Journey Planning Systems *in coherence with Transmodel* and NeTEx (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). *Cf.* UC MIS-0004: 21. No standard validation routines verifying conformity to data standards (e.g. to SIRI XML files), data completeness and coherence. and An additional gap (identified by the OPTICITIES project): 22. No standard for continuous, multimodal and real-time location referencing in urban areas. 21. No connection between GDF (infrastructure network data model) and Transmodel v6 (public transport network).
	Recommended actions	*Same recommendations as for UC MIS-0001, MIS-0002, MIS-0003, MIS-0003-1,,MIS-0003-2, MIS-0004, MIS-0004-1, MIS-0005-1, MIS-0008 apply* AND 3. To develop a standard for continuous, multimodal and real-time location referencing in urban areas. 4. To develop GDF 5.1 in order to connect and harmonise it with Transmodel V6 (Public Transport Network Topology).
O	Other information	

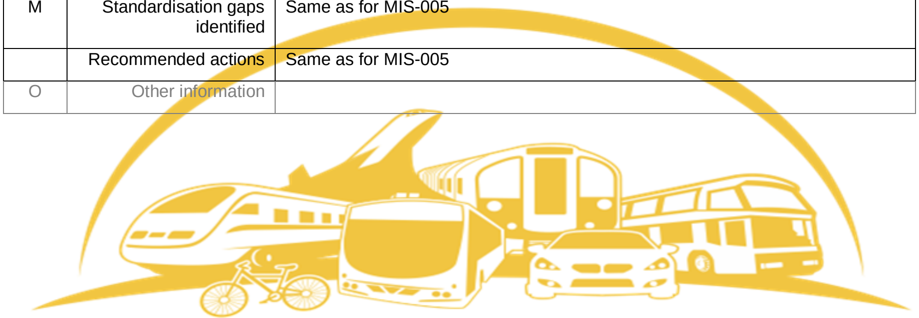
CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Dynamic Car-pooling**
M	**Use Case reference /id**	**MIS-0005-1 v3 20151119**
M	Description	To bring in contact in real-time car drivers and travellers using a mobile phone and the on-board car system, in order to continue a common trip. Two main sub-Use Cases are to be considered: • to provide a car-pooling service to a traveller in real-time: the driver profile and related information is defined via a smartphone (or a computer) and this information is exchanged with the on board car system. When a possible traveller is identified, the information is displayed by the car system, the driver accepts (or refuses it) and then gets the corresponding routing information to pick-up the traveller and to carry him to the proper place. The exchange also says whether the vehicle is available, busy or full. • to address a request for a vehicle by a traveller for a specific destination: the traveller gets information whether a driver has accepted it and about the location and time he will be picked-up (and an estimated arrival time to destination).
M	Scenario	This Use Case refers to step 4 in the MIS value chain. It can also be part of a trip plan based on real-time information (MIS-0005).
M	Scope	Once the traveller is located, information between the traveller's mobile phone and the nearest available suitable car(s) their trip details are exchanged. This Use Case concerns mainly a common interface as regards: • information exchange between on-board units on individual cars and travellers' mobile phones; • information exchange between on-board units on individual cars and the car-pooling system (possibly through the mobile phone); • information exchange between the traveller's mobile phone and the car-pooling system; • information exchange between the driver's mobile phone (when not in the car) and the car-pooling system.
M	Actors Involved	Drivers Travellers 'Travel Information Provider's (for possible connexion with public transport and possible public transport leg in the traveller trip) Connected vehicles
M	Stakeholders	Automobile manufacturers Software suppliers Public transport authorities (for possible connexion with public transport and possible public transport leg in the traveller trip) EU and National governments Urban administrations Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	The car-pooling service is dedicated to be one part (leg) of the traveller's trip pattern (beginning, end or even middle). Therefore, all the public transport information (especially the real-time) is expected to be available on the corresponding area. The car-pooling system is expected to be able to manage public transport data or to be connected to public transport services.

M	Identified standards (not exhaustive list)	ITS standards CEN TS 16157 DATEX II Parts 1 to 6. EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN12896 Transmodel v5.1. CEN/TS 16614 Network and Timetable Exchange (NeTEx). CEN EN15531 Part 1 to 4 Service interface for real-time information (SIRI).
M	Standardisation gaps identified	2. Interfaces for car-pooling service.
	Recommended actions	3. To develop a standard interface between on-board equipment and mobile devices for dynamic car-pooling. 4. To develop a standard service interface between mobile devices and car-pooling back office system (neutral to the car-pooling algorithm itself).
O	Other information	

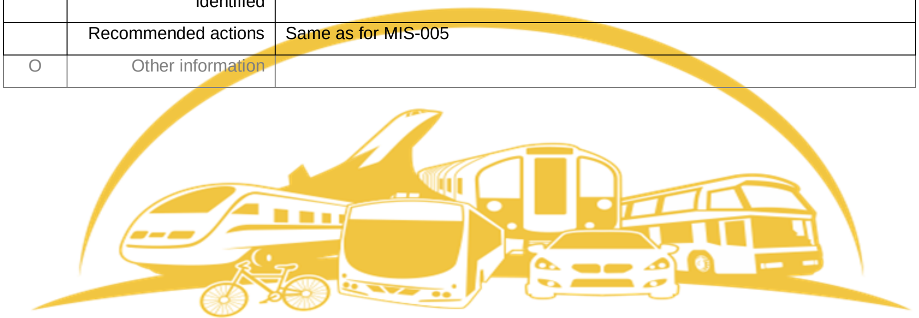
CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Driver Guidance**
M	**Use Case reference /id**	**MIS-0005-2 v3 20151124**
M	Description	To provide assistance regarding the optimal route and information on public transport availability in the driver's vicinity.
M	Scenario	This Use Case refers mainly to step 5 as the most successful information and guidance is provided using real-time data. If only planned data is taken into account, this may reduce the driver's confidence. This Use Case is particularly useful when there are incidents on the route. Scenario 1: Once a driver is located, passive information is provided on the availability of public transport services in the vicinity of the driver.  Public transport Information system PT stops PT lines Timetables Available public transport lines and next departure time Car ITS Station Central / Roadside ITS Station Current situation : location & time Data : PT lines, PT stops, Timetabled passing times Scenario 2: Once the driver is located, not only the availability of public transport to the driver's destination is provided (nearest stop, line(s) and next departure times to his destination), but also the possibility of using a park and ride service together with information on the availability of spaces. In this case, the driver is guided to the car park and from the car park to the public transport stop.  Mobile/nomadic ITS station Public transport Information system Parkings PT stops PT lines Parking /PT stop Nearest parking opportunities + available public transport lines Car ITS station Central / Roadside ITS Station Destination (possibly current location) Destination Data : PT lines, PT stops, Car parks
M	Scope	This Use Case is primarily aimed at private car drivers. It may be seen in connection to UC MIS-0003-1 "Scheduled Trip Plan Provision" or UC MIS-0005 "Actual Trip Plan Provision" (i.e. in cases when the origin and the destination of the trip is known) but such assistance may be provided to drivers at any point of the trip. If the final destination is known, scenario 2 is possible. For this Use Case the connection between the road network data and public transport network data is necessary in order to find the available public transport service and to visualise information on a map.
M	Actors Involved	'Travel Information Provider's, car park operators, road maintenance operators, road network operators, geographic information providers.

M	Stakeholders	Car and equipment manufacturers software suppliers public transport authorities (enabler of the connection between central/roadside station and the 'travel information provider's) EU and National governments urban administrations drivers.
M	MIS / TM / UL	MIS – TM (traffic and incidents) – UL (parking)
M	Assumptions	Availability of (real-time) public transport information and links to the road network data.
M	Identified standards (not exhaustive list)	EN12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN12896 Transmodel v5.1. CEN/TS 16614 Network and Timetable Exchange (NeTEx). CEN EN15531 Part 1 to 4 Service interface for real-time information (SIRI). ISO 14827-1 Data interfaces between centres for transport information and control systems. ISO 15784 Data exchange involving roadside modules ISO communication. ISO 14825 Geographic Data Files 5.0 (GDF). ISO/EN 14819-3 Traffic and travel information (TTI) TTI messages via traffic message coding - part 3 location referencing for Radio Data System - Traffic Message Channel (RDS-TMC) using ALERT C. ISO/TS 21219 Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) - part 21,22, 23. CEN/TS 16157-2 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing. CEN/TS 16157-3 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 3: Situation publication. CEN/TS 16157-6 Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 6: Parking publication. ISO 17572-3 Intelligent transport systems (ITS) -- Location referencing for geographic databases – Parts 1,2 and 3. ISO 19147:2015 Geographic information -- Transfer Nodes. ISO 6709 Standard representation of geographic point location by coordinates. ISO/TS 1910XX Geographic information.
M	Standardisation gaps identified	1. GDF v5.0 is currently being extended to cover the connection between public transport reference data model (Transmodel v6) and GDF data model is drafted, not finalised. This is planned to be achieved in GDF 5.1. 2. GDF has not been updated as regards data exchange format for v5.1. 3. Links between road data exchanged with DATEX II and Transmodel have to be established.
	Recommended actions	4. To develop GDF 5.1 data model covering the connection between Transmodel and GDF 5. To develop the updated data exchange format aligned with GDF V5.1 data model. 6. To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4)
O	Other information	This UC concerns activities of ISO TC204 WG3 (Geographic Data Bases).

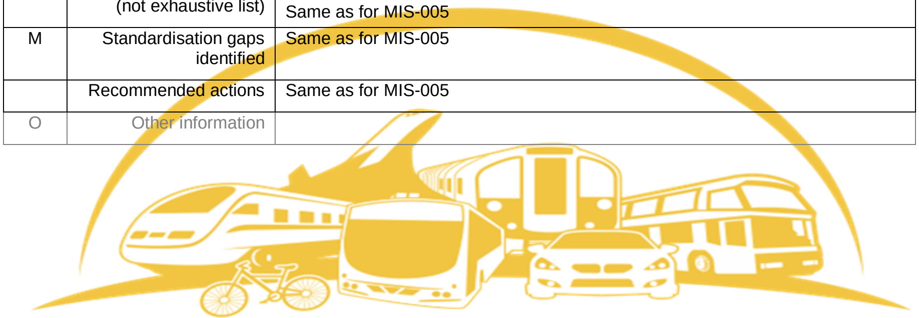
CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Car Sharing**
M	**Use Case reference /id**	**MIS-0005-3 v1 20151202**
M	Description	To inform travellers of the availability of car-pools and location of car-sharing locations. The location can be where the car was left after its previous location or in a designated area.
M	Scenario	This Use Case refers to step 4 in the MIS value chain. It can also be part of a trip plan based on real-time information (MIS 0005). A traveller arrives in an urban area by other modes or is already present in the urban area and wishes to use a car-pool. By request, Information of suitable vehicles and the nearest location to either the traveller's location or to an interchange will be given.
M	Scope	This UC is limited to the collection of car pool status data and providing it on request to travellers. The main impact of this new mode will be that provision must be made in the data models for the car-sharing data. This UC does not cover the contractual arrangements or financial transactions beyond the collection and storage of the arrangements to act as information to the traveller.
M	Actors Involved	Drivers Travellers 'Travel Information Provider's (for possible connexion with public transport and possible public transport leg in the traveller trip) Connected vehicles
M	Stakeholders	Car-pool suppliers Software suppliers Public transport authorities (for possible connexion with public transport and possible public transport leg in the traveller trip) EU and National Governments Urban administrations Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	The car sharing provider is prepared to share information into a MIS.
M	Identified standards (not exhaustive list)	ITS standards Same as for MIS-005
M	Standardisation gaps identified	Same as for MIS-005
	Recommended actions	Same as for MIS-005
O	Other information	



CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Bicycle Sharing**
M	**Use Case reference /id**	**MIS-0005-4 v1 20151202**
M	Description	To inform travellers of the availability of pooled bicycles and the location of bicycle-sharing locations. The location will be in a designated area.
M	Scenario	This Use Case refers to step 4 in the MIS value chain. It can also be part of a trip plan based on real-time information (MIS 0005). A traveller arrives in an urban area by other modes or is already present in the urban area and wishes to use a pooled bicycle. By request, Information of an available bicycles and the nearest location to either the traveller's location or to an interchange will be given.
M	Scope	This UC is limited to the collection of bicycle pool status data and providing it on request to travellers. The main impact of this new mode will be that provision must be made in the data models for the bicycle-sharing data. This UC does not cover the contractual arrangements or financial transactions beyond the collection and storage of the arrangements to act as information to the traveller.
M	Actors Involved	Drivers Travellers 'Travel Information Provider's (for possible connexion with public transport and possible public transport leg in the traveller trip) Connected vehicles
M	Stakeholders	Bicycle pool suppliers Software suppliers Public transport authorities (for possible connexion with public transport and possible public transport leg in the traveller trip) EU and National governments Urban administrations Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	The bicycle-sharing provider is prepared to share information into a MIS.
M	Identified standards (not exhaustive list)	ITS standards Same as for MIS-005
M	Standardisation gaps identified	Same as for MIS-005
	Recommended actions	Same as for MIS-005
O	Other information	



CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Demand Responsive Systems**
M	**Use Case reference /id**	**MIS-0005-5 v1 20151202**
M	Description	To inform travellers of the availability of on-demand transport and their location. Additionally, the destination of available transport could be made available so that journeys could be shared for cost savings and environmental benefits.
M	Scenario	This Use Case refers to step 4 in the MIS value chain. It can also be part of a trip plan based on real-time information (MIS 0005). A traveller arrives in an urban area by other modes or is already present in the urban area and wishes to use an on-demand transport mode. By request, Information of suitable transport and the nearest pickup location to either the traveller's location or to an interchange will be given.
M	Scope	This UC is limited to the collection of on-demand transport status data and providing it on request to travellers. The main impact of this new mode will be that provision must be made in the data models for the on-demand transport data. On demand transport can be on a number of modes, buses, minibuses, taxis etc. This UC does not cover the contractual arrangements or financial transactions beyond the collection and storage of the arrangements to act as information to the traveller.
M	Actors Involved	Drivers Travellers 'Travel Information Provider's (for possible connexion with public transport and possible public transport leg in the traveller trip) Connected vehicles
M	Stakeholders	Car-pool suppliers Software suppliers public transport authorities (for possible connexion with public transport and possible public transport leg in the traveller trip) EU and National governments Urban administrations Travellers
M	MIS / TM / UL	Multimodal Information Services
M	Assumptions	The on-demand transport provider is prepared to share information into a MIS.
M	Identified standards (not exhaustive list)	ITS standards Same as for MIS-005
M	Standardisation gaps identified	Same as for MIS-005
	Recommended actions	Same as for MIS-005
O	Other information	



CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Information Structuring**
M	**Use Case reference /id**	**MIS-0006 v4 20151119**
M	Description	To bring together all the information available and meld them into a value added service to the end-user.
M	Scenario	Refers to step 6 in the value chain: information provided by data processing becomes the basis for the dissemination to the end-user.
M	Scope	This concerns the assembly of information into a format which is suitable for dissemination via a number of media to a number of types of display devices. Information concerned is for example: trip plan (trip pattern and timing information, routing through the road network, stop-centric planned and real-time timetables, traveller messages on special events, etc. The scope includes pre-trip and on-trip messaging. In the context of public transport, this Use Case concerns the problem of how to avoid to provide to end-users biased ranked solutions (possibly eliminating some or giving to some of them a high priority).
M	Actors Involved	Freight shippers Geographic information providers Mobility service providers Public transport operators Traveller assistance providers 'travel information provider's Trip planning providers
M	Stakeholders	EU and National governments urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Travel Services
M	Assumptions	All the data is in a form where it can be amalgamated seamlessly.
M	Identified standards (not exhaustive list)	ISO EN 14819 RDS-ALERT C parts 1 -3. ISO TS 18234 -5 TPEG Public Transport Information (PTI) application . ISO TS 21219 TPEG2 Parts 1-25. CEN TS 16157 DATEX II Parts 1 to 6. EN 12896 Public Transport Reference Data Model Part 1 to 3 (Transmodel v6). EN 12896 Transmodel v5.1. CEN/TS 16614 Network and Timetable Exchange (NeTEx). EN15531 Part 1 to 4 Service interface for real-time information (SIRI) .
M	Standardisation gaps identified	Information provision referring to MIS-0005-1 and MIS-0005-1 does not have to be partial nor biased: there is no standard as regards the number of trip options to be provided, nor criteria as regards trip options' characteristics if competitive options are possible,
	Recommended actions	To develop a standard specification of the characteristics of trip options and modal choices to be provided by trip planners.
O	Other information	

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Information Dissemination**
M	**Use Case reference /id**	**MIS-0007 v3 20151118**
M	Description	To disseminate Urban Multimodal Traveller Information to a variety of media and locations.
M	Scenario	This Use Case refers to stage 7 in the MIS value chain.
M	Scope	This concerns the dissemination of structured urban multimodal traveller information to a variety of display media and locations. The information can be disseminated continuously or on demand. Output types may be metadata, text, speech, maps. The scope includes pre-trip and on-trip messaging.
M	Actors Involved	Telecoms providers Freight shippers Geographic information providers Mobility service providers Public transport operators Traveller assistance providers ‘travel information provider’s Trip planning providers Location reference service Vehicle Connected vehicle Driver Other travel providers Traveller
M	Stakeholders	EU and National governments Urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Travel Services
M	Assumptions	The location referencing at the originator can be understood at the receiving party.
M	Identified standards (not exhaustive list)	*ITS standards* CEN TS 16157 DATEX II Parts 1 to 6. CEN EN12896 Transmodel. CEN/TS 15531 SIRI -Service interface for real-time information relating to public transport operations. ISO 14827-1 Data interfaces between centres for transport information and control systems. ISO 15784 Data exchange involving roadside modules ISO communication. ISO EN 14819 RDS-ALERT C parts 1 -3. ISO TS 18234- TPEG1 – Public Transport Information. ISO TS 21219 TPEG2 Parts 1-25.
M	Standardisation gaps identified	No standard for continuous, multimodal and real-time location referencing in urban areas.
	Recommended actions	To develop a standard for continuous, multimodal and real-time location referencing in urban areas.
O	Other information	

CEN TC278 PT1701 USE CASE		
M	**Use Case Name**	**MIS Query Structuring**
M	**Use Case reference /id**	**MIS-0008 v3 20151118**
M	Description	Queries of end-users (drivers/travellers), Information providers are structured requests. Requests for multi-modal Information are based on several criteria that allow information processing activities to retrieve and/or process information so that the user gets the answer according to his expectations. The criteria may refer ➢ to topology-related concepts like 'origin/destination', a specific location (e.g. stop point), line, etc.; ➢ to time-related concepts, i.e. timetable, etc.; ➢ to information filtering criteria referring to fare, mode, etc. (such as: 'lowest fare', 'only bus', 'shortest walking', etc.). Different types of queries that are possible, each may be further characterised by a range of further parameters (to allow retrieval of the right information from data repositories or ask for information from other travel information systems).
M	Scenario	This Use Case refers to step 8 in the MIS value chain. It is assumed that a query is addressed explicitly or implicitly (for passive information provision).
M	Scope	The objective is to clearly structure possible queries to allow an automatic processing, e.g. for the specification/implementation of end-user HMI or in the case of the interconnection of Travel Information systems queries may be automatically coded by one system and decoded by another.
M	Actors Involved	Telecoms providers Freight shippers Geographic information providers Mobility service providers Public transport operators Traveller assistance providers 'travel information provider's Trip planning providers Location reference service Vehicle Connected vehicle Driver Other travel providers Traveller
M	Stakeholders	EU and National governments urban administrations Road operators Travellers
M	MIS / TM / UL	Multimodal Travel Services
M	Assumptions	End-user addresses a query to a Multimodal Information system
M	Identified standards (not exhaustive list)	ITS standards EN12896 (Transmodel v5.1). CEN TS16614-3 (NeTEx –Part 3: Fare Exchange) / informative annex.

M	Standardisation gaps identified	1) No agreed profiles for formatting user queries to a trip planning and information service. 2) No agreed methodology for real-time location referencing in urban areas.
	Recommended actions	3. To develop Transmodel v6- Part 6: Passenger Information) to take into account more complex queries and filters as requested by NeTEx -informative annex. 4. To develop a standard for continuous, multimodal and real-time location referencing in urban areas.
O	Other information	

CEN TC278 PT1701		
M	**Use Case Name**	**User Support**
M	**Use Case reference /id**	**MIS-0000 v2 20151125**
M	Description	CEN has developed NeTEx and SIRI, both based on Transmodel, to provide a standardised way of exchanging data between many of the information systems involved in public transport (passenger information, AVMS, scheduling, fare management and analysis and design systems), paving the way to cost effective, reusable, scalable, modularised and sustainable public transport systems in an approach that is compatible with continuing open competition and innovation in digital technology. NeTEx and SIRI specify communication protocols based on open technologies (XML, XSD, UML, SOAP and REST) and enable operators and organizing authorities to represent public transport data anywhere in Europe using common formats, standard rules, and uniform protocols. Transmodel provides a global data model, on which SIRI and NeTEx are based, covering all the business fields of public transport. CEN working groups (TC278-WG3-SG7 and SG9) developed NeTEx and SIRI, both based on the results of TC278-WG3-SG4; their work ends once the specification document for the standard is available. This is mainly the situation now as SIRI has been adopted as EN and NeTEx has just started its TS phase (for 3 to 6 years). However, NeTEx and SIRI comprise not only the standardisation document, but also a set of technical artefacts (mainly XSD, WSDL schema (for NeTEx and SIRI) and accompanying UML files for NeTEx, SIRI and Transmodel) that are required to implement the standard exchange protocol and which will be used by developers as software artefacts. Developers typically will need some support in using these products. Furthermore, since the standards cover a large and complex subject area, advice on best practice, available technologies and working examples are needed to facilitate uptake and reduce the costs to implementers. SIRI 1.0 was released as a TS in 2006, and the ten years of its widespread use have shown that the support of these technical files is essential and critical.
M	Scenario	
M	Scope	In order to support the deployment of standards and provide best practices to implement them, the following are the main aspects that are helpful for using the technical artefacts: ➢ Technical artefacts maintenance — To support the tuning of XSD and WSDL for specific tools (each technical operating system like Java, Ruby, .NET, Apple, IOS, Android, etc. may have some specific requirements requiring some tuning and optimisation of the XSD without changing the messages themselves); the bindings of a specific language can also be shared informally; — To update and possibly debug the technical artefacts when necessary (technical files can be updated or corrected without implying any change to the standard itself); ➢ Validation tools and test platform — To provide validation tools: validation of conformance is one of the biggest issues for developers (ensuring an implementation is inputting or outputting data in a standard format) and an open-source validation tool is probably the best way to solve such issues; users can then validate their product against a common benchmark, saving time and effort and ensuring consistency across different company offerings. — To provide validation platform hosting online the validation tools to allow an easy validation without the need to install any software;

		➢ Technical expertise — To provide support for writing profiles: Implementations of standards typically implement only a subset of the standard to meet a particular business need and within a specific context of modes and region(s). A profile is used to define this subset, specifying which elements and name spaces are needed; such profiles need to be carefully defined; sharing profiles may also be a very good way to save time and money; — To share experience and best practices between developers and experts; — Provide teaching courses, training sessions and introductory material to help learn and using Transmodel, NeTEx and SIRI; — Initiate, maintain and publish possible updates of the standard to keep track of new needs, new requests, and possible corrections in order to facilitate the process of the renewal of the standards SIRI/NeTEx (or conversion to EN) and to guarantee coherence with other related standards (i.e. Transmodel – EN12896).
M	Actors Involved	See below
M	Stakeholders	UITP, CEN or the EU Commission, ERA - open to a wide range of stakeholders, such as authorities, software companies, start-ups, operators, consulting companies or educational institutions (universities, etc.).
M	MIS / TM / UL	Mainly MIS
M	Assumptions	-
M	Identified standards (not exhaustive list)	Mainly: NeTEx, SIRI, Transmodel
M	Standardisation gaps identified	No supporting organization for standards maintenance, dissemination, implementation.
	Recommended actions	To financially and institutionally support the creation and existence of an organisation (connected as much as possible to organisations such as UITP, CEN or the EU Commission, ERA, and open to a wide range of stakeholders, such as authorities, software companies, start-ups, operators, consulting companies or educational institutions (universities, etc.)) in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the deployment of these standards.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Planning and System Configuration data Retrieval**
M	**Use Case reference /id**	**TM-0001-v1-20151117**
M	Description	Collection and provision of planning and configuration data for the TM-subsystems on central level (*instations*; i.e. traffic engineer planning systems, traffic management and traffic control centres…) and on field level (*outstations*; i.e. traffic signal controllers, dynamic parking signs, Variable message signs…) with focus on route and intersection topography, topology and planning control data.
M	Scenario	This Use Case refers to step 1 in the TMS process chain. Distributed and mixed vendor TM system architectures require at any time and in all subsystems involved the availability of coherent, consistent and up-to-date planning and configuration data in order to realize a common and consistent traffic management and traffic control result for the road-user. Planning and configuration data path through a chain of different planning and configuration processes, in which the data - building up on each other – have to be enriched and distributed to the subsystems: • topological data and planning control data are necessary to cover requirement as well of safety as of macroscopic and microscopic control; • geographical data gain importance in the context of urban C-ITS (i.e. SPaT/MAP application).
M	Scope	Securing of system-connectivity and enabling of mixed vendor environments in the traffic management and traffic control domain. Provision of coherent, consistent and up-to-date planning and configuration data for all TM-subsystems on central and field level. Examples for traffic signal control: • Intersection topology (lanes including driving direction and turning possibilities, stop lines and their location, signal head positions …); • Equipment of a signal control (loops and other sensors, actuators, …, incl. the accurate location of all components); • *Outstations* detection and control properties (traffic data types, fixed time and traffic adapted signal plans, …);
M	Actors Involved	• Traffic planner and engineer • System architect • System configurator • System operator • Asset managers
M	Stakeholders	• Local authorities in the role of system architect (specification) and purchaser (procurement) • Engineering and consultant companies • Suppliers
M	MIS / TM / UL	TM, MIS and UL
M	Assumptions	Availability of a common agreed TM-system reference model

M .	Identified standards (not exhaustive list)	- Regional: OCIT-*Instations*/OTS system model (architecture) - Regional: OCIT-*Instations* VD - OCIT-I_VD-DM-LSA - Regional: OCIT-C VD, intersection_config_data - Regional: UTMC objects registry Common IT/ICT standards (See C.1)
M	Standardisation gaps identified	- Comprehensive TM-system reference model (architecture). - Comprehensive geographical (route and intersection) and topological European data model for all TM-subsystems on central and field level (*instations* and *outstations*). - Comprehensive, consistent, bidirectional (centre to field, field to centre) and supplier independent European configuration data model for all TM-subsystems and configuration methods.
	Recommended actions	- Development of a common agreed European TM-system reference model (architecture). - Development and provision of a comprehensive topographical (route and intersection) and topological European data standard for all TM-subsystems on central and field level (*instations* and *outstations*). - Development and provision of a comprehensive, consistent, bidirectional (centre to field, field to centre) and supplier independent European configuration data model for all TM-subsystems.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	Use Case Name	**TM Real-time Field Data Capture**
M	Use Case reference /id	**TM-0002a v1 20151118**
M	Description	Field level subsystems (*outstations*) collect raw data (traffic data, operational data and messages, …) in real-time.
M	Scenario	This Use Case refers to step 2 in the TMS process chain. Day-to-day and event/incident responding traffic management and control require permanent collection and aggregation as well of traffic data as of operational data and messages. These data are a crucial basis to • enable the calculation of the actual traffic states and conditions; • forecast traffic states and conditions; • realize traffic management and control strategies both manually and automatically; • guarantee a high degree of infrastructure availability and a quick and effective fault recovery. In addition, these data are the basis for planning and quality assurance.
M	Scope	Field level subsystems (*outstations*) collect and aggregate raw data and provide them to TM-subsystems on central level (*instations*). *Outstations* must be able to collect data dependant on the traffic management and control up-to-dateness requirements including the capabilities of the transmission infrastructure. Real-time traffic data are i.e.: • raw data motor car traffic: occupancy, speed, vehicle length, FCD…; • raw data public transport vehicles (bus and tram priority); • signal control raw data (red, green, amber). In addition to traffic data, operational data and status change and fault messages are collected in order to monitor the infrastructure (operational status of subsystem, i.e. on-off, operational messages, i.e. system fault information).
M	Actors Involved	• Traffic planner and engineer • System architect • System configurator • System operator
M	Stakeholders	• Local authorities in the role of system architect (specification), purchaser (procurement) and road operator (traffic control and management) • Engineering and consultant companies • Suppliers
M	MIS / TM / UL	TM, MIS and UL
M	Assumptions	Availability of a common agreed TM-system reference model (architecture) • definition of the requirements with respect to the data to be collected;

		• definition of the relevant and required subsystems and their system borders; • sensor systems for the collection of the required data equipped with required capabilities (properties);
M	Identified standards (not exhaustive list)	• Regional: OCIT-*Instations*/OTS system model (architecture) • Regional: OCIT-*Instations*/OTS PD - OCIT-I_PD-DM-LSA • Regional: OCIT-C, intersection_raw_data, traffic_data, detector_ext, publictransport_data, CCTV, environment_sensor, infopoint_data, parking, … • Regional: OCIT-*Outstations* • Related DATEX II profiles, if applicable Common IT/ICT standards (See C.1)
M	Standardisation gaps identified	• Comprehensive TM-system reference model (architecture). • Comprehensive traffic data standard for urban traffic control & management and TM quality assurance. • Comprehensive system status and fault messages standard for urban TM infrastructure (preferable subsystems in the field level.
	Recommended actions	• Development of a common agreed European system reference model (architecture) for urban TM. • Development and provision of a comprehensive European traffic data standard for urban traffic control & management and TM quality assurance. • Development and provision of a comprehensive European system status and fault messages standard for urban TM infrastructure (particularly for the subsystems in the field level). • Development of suitable and affordable migration paths as part of the standardisation process for the vast bulk of legacy TM systems in the field.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM External System Real-time Data Capture**
M	**Use Case reference /id**	**TM-0002b v1 20151118**
M	Description	Traffic Management *Instation* systems collect real time data from other sources to help with both automated and manual tactical decision-making.
M	Scenario	This Use Case refers to step 2 in the TMS process chain. Day-to-day and event/incident responding traffic management and control require permanent collection and aggregation of external data. These data are a crucial basis to: • enable the third party reporting of incidents; • input other factors into incident responses; • have an awareness of traffic incidents and flow on other administrations road networks (urban or interurban).
M	Scope	Traffic management data sources come from wider than their own sensor network, and other real-time data is used in decision making such as: • Weather • Pollution (link to UC in UL) • Emergency services incident reports • Social media incident reports • Interurban or adjacent administration data • Floating car data feeds • CCTV • Media/news
M	Actors Involved	• Traffic planner and engineer • System architect • System configurator • System operator • Third party system suppliers • Adjacent traffic management centres • Emergency services
M	Stakeholders	• Local authorities in the role of system architect (specification), purchaser (procurement) and road operator (traffic control and management). • Engineering and consultant companies. • Suppliers.
M	MIS / TM / UL	TM, MIS and UL
M	Assumptions	• Availability of a common agreed TM-system reference model (architecture). • definition of the requirements with respect to the data to be collected. • definition of the relevant and required subsystems and their system borders . • Standards would be adopted by other third parties (e.g. emergency services) for interoperability.

M .	Identified standards (not exhaustive list)	• DATEX II profiles • Regional - UTMC object registry Common IT/ICT standards (See C.1)
M	Standardisation gaps identified	• Comprehensive TM-system reference model (architecture). • Messaging standards for provision of external data into traffic management.
	Recommended actions	• Identification of key external data needed for the operation of traffic management. • Engagement with third party systems to understand what open message standards exist in their industry (e.g. emergency services command & control). • Develop messaging protocols for key areas.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Planned Data Processing & Subsystem Configuration**
M	**Use Case reference /id**	**TM-0003 v1 20151118**
M	Description	Compilation of planning and configuration data and provision for the download/configuration of all relevant subsystems.
M	Scenario	This Use Case refers to step 3 in the TMS process chain. Planning and configuration data which were gained in the frame of the Use Case "Planning and System Configuration Data Retrieval" are provided to different administration units. These units adapt and complement the data in accordance to the requirement of the target systems they are responsible for and finally download data to subsystems respectively use them for purpose of subsystem configuration. The activation of the data is coordinated, partly timely synchronized by automated or half-automated processes.
M	Scope	In order to function and interwork properly in the frame of a distributed organised urban TM-systems both *instations* and *outstations* require: • commonly used planning and configuration data; and • in addition, always the contribution of logical supplier independent objects and interfaces to physical, supplier and operating system dependant hardware-/firmware-objects and interfaces.
M	Actors Involved	• System configurator • System operator
M	Stakeholders	• Local authorities in the role of road operator (traffic control and management) • System supplier
M	MIS / TM / UL	TM, MIS and UL
M	Assumptions	Use Case TM planned data and system configuration data retrieval. Availability of a common agreed TM-system reference model (architecture): • definition of all relevant and required subsystems and their system borders • definition of requirements with respect to the data to be downloaded/configured. Identification and responsibilities of road operator departments/units.
M	Identified standards (not exhaustive list)	• Regional: OCIT-*Instations*/OTS system model (architecture) • Regional: OCIT-*Instations* VD - OCIT-I_VD-DM-LSA • Regional: OCIT-C, intersection_config_data • Regional: OCIT-*Outstations* Common IT/ICT standards (See C.1)

M .	Standardisation gaps identified	- Property describing system reference model (architecture) for *outstation*s data objects (sensors, actuators, typical functionalities…). - System reference model (architecture) for traffic signal controllers and their configuration (in order to reduce the amount of supplier specific configuration data and parameter and to prove configuration consistency). - Standards (incl. standards for quality assurance) for an automatable configuration of all subsystems, which use an identical data pool in the frame of an interconnected TM-assemblage of TM-subsystems. - Signal controller functionality standard to guarantee consistent behaviour of signal controllers of different suppliers in mixed vendor environments. - Signal controller interface standard to integrate widely used traffic adapted control and data processing methods for a vendor independent use in mixed vendor environments.
	Recommended actions	- Development and provision of Common agreed European property describing system reference model (architecture) for *outstation*s data objects (sensors, actuators, typical *outstation*s functionalities, particularly for signal controllers) and their configuration (in order to reduce the amount of supplier specific configuration data and parameter and to prove configuration consistency). - Common agreed European standards (incl. standards for quality assurance) for an automatable configuration of all subsystems, which use an identical data pool in the frame of an interconnected TM-assemblage of TM-subsystems. - Common agreed European signal controller interface standard to integrate widely used traffic adapted control and data processing methods for a vendor independent use in mixed vendor environments.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Real-time Data Processing**
M	**Use Case reference /id**	**TM-0004 v1 20151118**
M	Description	Validation and fusion of raw data and further processing to high value and map related traffic data. Aggregation of operational data (operational status of subsystem, i.e. on-off, operational messages, i.e. system fault information) of all subsystems. Provision and dissemination of high value traffic information and operational data to cover the demand of other TM-subsystems.
M	Scenario	This Use Case refers to step 4 in the TMS process chain. Raw traffic and operational data and messages, gained from subsystems on field level and from external sources, are aggregated and archived in dependence of their nature and purpose and are provided as well as real-time information as historical data in a manner which is required by other TM-subsystems.
M	Scope	TM-subsystems on control and traffic management level require in dependence of their functionality high level real-time and historical traffic data. Raw data of the filed level are to be processed in a way that they fulfil these requirements. Typical information on that level are: ➢ Aggregated and vehicle type classified data • traffic volume, • occupancy rates, • average speed • pedestrian and bicycle density • … ➢ Operational data and information In addition to traffic data, operational data and status change and fault messages are to be aggregated and provided to enable to monitor the infrastructure (operational status of subsystem, i.e. on-off, operational messages, i.e. system fault information).
M	Actors Involved	• System operators • Traffic managers
M	Stakeholders	Road operators
M	MIS / TM / UL	TM MIS / UL
M	Assumptions	Use Case TM Real-time Data Capture Availability of a common agreed TM-system reference model (architecture) • definition of all relevant and required subsystems and their system borders • definition of traffic condition and event information
M	Identified standards (not exhaustive list)	• Regional OCIT-*Instations*/OTS system model (architecture Regional: OCIT-*Instations* VD - OCIT-I_PD-DM-LSA • Regional: OCIT-C • Regional: OCIT-*Outstations* • DATEX II profiles, if applicable Common IT/ICT standards (See C.1)

M .	Standardisation gaps identified	• Standards (incl. standards for quality assurance) for aggregated and vehicle type classified data: o traffic volume, o occupancy rates, o average speed o … . • Standards (incl. standards for quality assurance) for operational data and information.
	Recommended actions	Development and provision of agreed European standards (incl. standards for quality assurance) for: ➢ Aggregated and vehicle type classified data • traffic volume, • occupancy rates, • average speed • … . ➢ Operational data and information.
O	Other information	

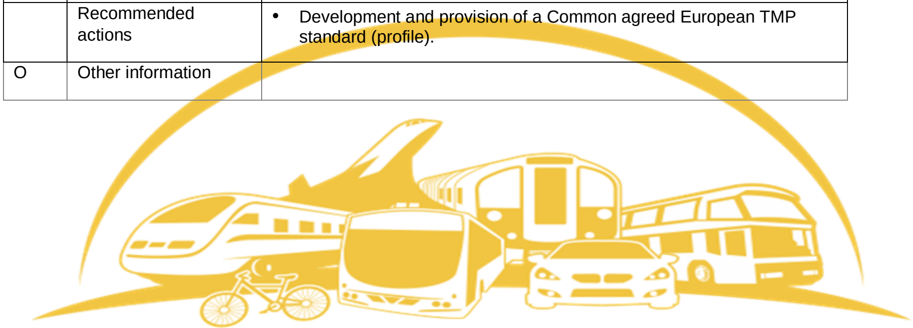
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Traffic Condition calculation and Event/Incident detection**
M	**Use Case reference /id**	**TM-0005 v1 20151118**
M	Description	Validation and fusion of high value traffic data and further processing traffic status and traffic condition information (i.e. current and forecasted LoS & travel times…). Aggregation of operational data (operational status of subsystem, i.e. on-off, operational messages;. system fault information) of all subsystems, including data from external systems and sources. Provision and dissemination of high value traffic information and operational data to cover the demand of other TM-subsystems and for feedback for traffic signal timings.
M	Scenario	This Use Case refers to step 5 in the TMS process chain. High value traffic operational data and messages, gained from Use Case real-time data processing further processed in dependence of their nature and purpose and are provided as well as real-time information as historical information in a manner which is required by other TM-subsystems.
M	Scope	TM-subsystems on control and traffic management level require in dependence of their functionality high level real-time and forecasted traffic and traveller information. Typical information on that level are: ➢ *Traffic condition (LoS) Information* Merging and aggregating data from different sources (data-fusion) is the basis of LoS calculation. Within Europe different methodologies and traffic models exist to aggregate the real-time and predictive traffic condition and travel time information.; The result is the so called Level of Service, which consists of different traffic states and which usually is depicted in a map by colouring route segments or links; ➢ *Travel time Information* Travel time information is easy to understand but it is more complex to calculate. Indeed, various algorithms are commonly used in the process of travel time calculation. Travel times have to be consolidated before use by other systems and dissemination to ensure information consistency for the end user. Final information consistency is both conditioned by the reliability of the input raw data and the accuracy of the calculation model; ➢ *Events* Expected and unexpected event information (estimated impact on traffic situation, start and estimated end, position (location code) and estimated spatial dimension, type, cause, information source where this is being calculated from sensor data as opposed to explicit information from third parties; ➢ *Operational data and information* In addition to traffic data, operational data and status change and fault messages are to be aggregated and provided to enable to monitor the infrastructure (operational status of subsystem, i.e. on-off, operational messages, i.e. system fault information).
M	Actors Involved	• System operators • Traffic managers

M .	Stakeholders	Road operators
M	MIS / TM / UL	TM MIS / UL
M	Assumptions	Use Case TM 'Real-time Data Capture' Availability of a common agreed TM-system reference model (architecture) • definition of all relevant and required subsystems and their system borders • definition of traffic condition and event information
M	Identified standards (not exhaustive list)	• Regional: OCIT-*Instations*/OTS system model (architecture) • Regional: OCIT-*Instations* VD - OCIT-I_PD-DM-LSA • Regional: OCIT-C • Regional: OCIT-*Outstations* • DATEX II profiles Common IT/ICT standards (See C.1)
M	Standardisation gaps identified	• Standards (incl. standards for quality assurance) for traffic condition (los), travel times and events.
	Recommended actions	Development and provision of agreed European standards (incl. standards for quality assurance) for: • Traffic condition (LoS) • Travel times • Events
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	Use Case Name	**TM Decision and Measure Selection & Structuring**
M	Use Case reference /id	**TM-0006 v1 20151118**
M	Description	Decision about the appropriate traffic management strategy (TMP – Traffic management plan) as response to current traffic conditions (i.e. peak hours) or an upcoming planned or unplanned event/incident. A TMP is based and contains a set of appropriate traffic control and route guidance measures to be realised and to be deployed on the urban road network (including interfaces to the motorway and to neighbouring cities) by the interconnected downstream systems and to be disseminated as information to third parties.
M	Scenario	This Use Case refers to step 6 in the TMS process chain and includes the following permanent tasks: • Management of day-to-day traffic flow (assuming no abnormal incidents); • Management of planned and unplanned events and incidents on the urban road network (including weather); • Links to neighbours (including interurban) and to third parties.
M	Scope	A TMP is the pre-defined allocation or by a higher level intelligent *instation* on demand generated set of measures to a specific situation in order to control and guide traffic flows as well as to inform road-users in real-time and provide a consistent and timely service to the road user. Initial situations can be unforeseeable (incidents, accidents) or predictable (recurrent or non-recurrent events. The measures are always applied on a temporary basis. TMPs can be based upon the full range of feasible traffic control, route guidance and traveller information measures, not only depending on the initial situation but also on available facilities. TMPs are typically profiled as follows: • List of incidents/events • Incident/event name • Incident/event type • Incident/event location (section, direction) • Expected duration, traffic impact or congestion length if available • Spatial dimension (area and network affected by) • List of measures • Name of measure • Implementing organisation(s) • List of actions (Name of action, definition of action) • List of scenarios (to respond) • Scenario name • Spatial application (area and network) • Thresholds for activation/deactivation • List of associated measures • Expected maximum response times • Organisational chain (list of involved organisations and competences) • Prioritization
M	Actors Involved	Urban and interurban traffic managers
M	Stakeholders	Urban and interurban road operators

M	MIS / TM / UL	TM / MIS / UL
M	Assumptions	- Common agreed European TMP Standard (profile). - Predefined TMPs are agreed with neighboured road operators and public and private traveller information service providers.
M	Identified standards (not exhaustive list)	Common IT/ICT standards (See C.1)
M	Standardisation gaps identified	TMP standard (profile) consistent as well to urban and inter-urban road operators as to private service providers.
	Recommended actions	Development and provision of a common agreed European TMP standard (profile).
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Measure realization**
M	**Use Case reference /id**	**TM-0007 v1 20151118**
M	Description	As result of the selected TMP the according traffic control and route guidance measures are realised and deployed on the urban road network (including interfaces to the motorway and to neighbouring cities) by the interconnected downstream systems.
M	Scenario	This Use Case refers to step 6 in the TMS process chain. As such independent traffic signal control, route guidance systems and access control systems are used to realize a selected TMP by for example following measures: • signal plan selection • re-routing • access control plan selection • …
M	Scope	The following control and route guidance systems are in scope of these uses case: • traffic signal control • Parking-guidance • Route guidance system (by VMS) • Access control system • …
M	Actors Involved	• System operators • Traffic managers
M	Stakeholders	• Road operators • End-users
M	MIS / TM / UL	TM / MIS / UL
M	Assumptions	Traffic signal control, parking and route guidance systems and access control systems are available and in operation.
M	Identified standards (not exhaustive list)	Common IT/ICT standards (See C.1)
M	Standardisation gaps identified	• TMP standard (profile) consistent as well to urban and inter-urban road operators as to private service providers.
	Recommended actions	• Development and provision of a Common agreed European TMP standard (profile).
O	Other information	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Information dissemination**
M	**Use Case reference /id**	**TM-0008 v1 20151118**
M	Description	As result of the TMP decision the information about the selected measures and their consequences are published to third parties.
M	Scenario	This Use Case refers to step 6 in the TMS process chain. To support the selected TMP the following information is circulated to third parties: • re-routing plans • access restrictions • Incident Information • Planned event information (inc. roadworks) • Traffic congestion/journey time information • …
M	Scope	Traffic and traveller information services which compile the provided information within their own scope.
M	Actors Involved	• Road operator • Service operators and providers • Other urban travel management systems • Public transport operators • Road maintenance operators • 'Travel Information Provider's
M	Stakeholders	• Road operators • Traveller
M	MIS / TM / UL	MIS / TM / UL
M	Assumptions	Appropriate interfaces/platforms to third parties are available (National access points)
M	Identified standards (not exhaustive list)	• Partly applicable DATEX II standards (i.e. for parking). • TPEG. Common IT/ICT standards (See C.1)
M	Standardisation gaps identified	• Applicable DATEX II standards for TMPs, Re-Routing… considering also subsequent standards (TPEG, ALERT-C…) in the information chain.
	Recommended actions	• Development of DATEX II standards for TMPs, Re-Routing and access control.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**TM Procurement and maintenance of Traffic Management infrastructure**
M	**Use Case reference /id**	**TM-0009 v1 20151118**
M	Description	Beneath the actual operational traffic management, the procurement and maintenance of an appropriate traffic management infrastructure is second main task of local authorities. As today urban traffic management systems cannot any more regarded as a "single monolithic system" but have grown over years and have evolved along long lasting integration and migration paths to more or less distributed system landscapes the renewal of exiting parts or the integration of new parts is a major challenge for local authorities.
M	Scenario	Mixed-vendor system environments Urban public bodies, which finance their systems or system parts by public money, in the end must ensure that they tender and procure those parts according to the regulations of public procurement law. This requirement can lead to a split of the tender into various lots, to achieve the best price/performance ratio and results finally over years in a mixed-vendor system environment. Hence, for public systems operators a mixed vendor environment results primarily out of the obligation to comply with public law, which requires for and the introduction of competition, or through the urban administrators choice. Separate lots must be specified in a way that potential suppliers are enabled to offer a solution independently, even if the lot has a functional dependence on other lots or to existing systems. This becomes only possible if standards, mainly communication standards, are available to cut a whole system into subsystems which then can become the issue of a lot and which can be tendered separately.
M	Scope	Integrating disparate ITS products will become essential for future Urban-ITS. The availability, and market adoption, of standards is crucial to enable public sector organisations to procure interoperable ITS in accordance with the Procurement Directive. They are necessary to enable incremental procurement of systems, systems migration, and component replacement. This is particularly challenging where there is significant deployment of legacy systems which are 10 or even 20 years old, alongside newer systems. ➢ *System procurement* By the availability of standards, procurement processes are simplified and shortened significantly and the creation of mixed-vendor environments (with other words prevention from vendor lock-in) is fostered. ➢ *System maintenance* Interface standards lead to the development of test- and measure-utilities, which support effective maintenance. Thus maintenance processes become more effective and maintenance quality increases. ➢ *Asset management system* Many urban administrators have a desire to operate a single 'Asset Management System' to monitor and manage all their assets (e.g. structures, street lamps, VMS signs, ducting) and therefore it is more common for such as asset management system to sit outside of the TM

		area, but must communicate and exchange data with the TM systems, including both static data and dynamic data.
M	Actors Involved	• System architect • Procurement unit • System configurator • System operator • System maintenance • System suppliers
M	Stakeholders	• Local authorities – procurement unit • System supplier
M	MIS / TM / UL	TM / MIS / TL
M	Assumptions	• Availability of a common agreed TM-system reference model (architecture) • Availability of common agreed interface standards
M	Identified standards (not exhaustive list)	• regional OTS/OCIT system reference model • regional OCIT/OTS interface standards • regional UTMC Common IT/ICT standards (See C.1)
M	Standardisation gaps identified	• TM-system reference model (architecture). • Interface standards. • Certification standards. • TM-system procurement standards. • Maintenance standards.
	Recommended actions	• Development of common agreed European TM-system reference model (architecture). • Development of Common agreed European interface standards. • Development of Common agreed certification standards. • Development of Common agreed TM-system procurement standards. • Development of Common agreed maintenance standards.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Optimising Modal Choice**
M	**Use Case reference /id**	**UL-0101 v1 20151120**
M	Description	Optimising Modal Choice for last mile freight movements/deliveries
M	Scope	?more input from opticities needed. Identifying and codifying option parameters and assessment criteria; codifying available information and identifying and specifying information sources.
M	Scenario	There may exist a range of options for delivery of freight within cities. These modal choices are based on different criteria than those made for passenger journey modal choices. They are dependent on services available (own delivery, own consolidation, shared consolidation, courier delivery, postal delivery), fulfilment centre, access constraints (type of vehicle, time of access, etc.) etc.
M	Actors Involved	Freight carriers, urban administrations, recipients/despatchers, drivers
M	Stakeholders	Recipients/despatchers, urban administrations, freight operator
M	MIS / TM / UL	UL and probably MIS
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Recommended Actions	
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Providing Delivery Service**
M	**Use Case reference /id**	**UL-0102 v1 20151120**
M	Description	Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	Organising and providing commercial deliveries in urban areas (Project Co-Logistics) The freight transportation industry must achieve high performance levels in terms of economic efficiency and quality of service to optimise and increase the efficiency of the cargo transport operations (minimizing costs, times and use of resources like space and equipment) taking advantage of the data visibility from the logistic services (e.g. proof of delivery, route planning, track and trace...) and cooperative systems. The last mile of the cargo transportation process (cargo delivery) is a crucial step in the overall process and its proper monitoring can guarantee increased quality of service and improvements on exception handling or avoidance of possible errors on deliveries. See also UL-0213
M	Actors Involved	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	MIS / TM / UL	UL and possibly MIS
M	Assumptions	Closely related to interurban movements of product are channelled to a UCC, consolidated, and driven 'the last mile' in a low emission vehicle, properly loaded to maximise delivery efficiency, and the same vehicles could effect collection rounds, delivering the collected items to the UCC from where they can make a modal shift to other transport means for the next stage of their journey.
M	Stakeholders	Urban administration Freight centre manager Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available

M	Identified standards (not exhaustive list)	*ISO 26683-1 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 1: Context, architecture and referenced standards* *ISO 26683-2 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 2: Application interface profiles* **Universal Post Corporation Standards** a) Barcode symbology for postal items b) Barcode symbology for postal receptacles c) Communication of postal information using two-dimensional symbols d) Data presentation in ASN.1 **IPC Identification/codification standards** a) Air carriers. identification/codification of b) Airports. identification/codification of c) Countries. identification/codification of d) Data constructs for the communication of information on postal items, batches and receptacles e) FACT-Based licence plates for parcels f) FACT-Based representation of postal information and identifiers g) Framework for communication of information about postal items. batches and receptacles h) Communication of postal information using two-dimensional symbols ID-Tagging of letter mail items i) Placement area definitions; UPU EDI Message Development Guide j) RFID and RDC - Air interfaces: Communications and interfaces Part A: Parameters k) RFID- Reference architecture and terminology l) RFID - System requirements and test procedures p) Item tracking events, identification/codification of n) Office of exchange, identification/codification of o) Postal consignments, identification/codification of p) Postal despatches, identification/codification of q) Postal items, identification/codification of r) Postal receptacles. identification/codification of IPC EDI Messages standards a) Format of message exchanges b) Standard messages for consignments c) Standard messages for despatches d) Standard messages for items e) Standard messages for transport
O	Relationships to other "Use Case(s)"	(A subset of UL 0213)
	Standardisation gaps identified	IPC has designed interoperable codification and message standards for every likely operational scenario that a UCC is likely to face. Although designed for national postal sorting and delivery organisations, by substituting the word 'collection/delivery', in place of 'postal', they meet all the requirements that a UCC is likely to face in its operations in respect of identification and messaging. They have been proven in use by the international postal community over a quarter of a century, in some cases since the end of WW2. ISO 26683 provides methodology for the UCC consolidation and final round process. **It may therefore be concluded that:**

•		**There are already adequate standards available to enable a fully interoperable UCC operation (and solutions that can co-exist interoperably with the international postal sector).**
	Recommended Actions	No further actions recommended at this point in time
	Template Version	151021 PT1701 consensus
O	Open Issues	

·	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Exchange information with other authorities in area of security**
M	**Use Case reference /id**	**UL-0103 v1 20151120**
M	Description	Requires information from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
	Template Version	151021 PT1701 consensus
O	Open Issues	

	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Exchange information with other authorities in area of environmental risk**
M	**Use Case reference /id**	**UL-0104 v1 20151120**
M	Description	Requires information from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

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CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Pre-trip planning – Freight**
M	**Use Case reference /id**	**UL-0105 v1 20151124**
M	Description	Requires information from Opticities Objective and textual description
M	Scope	Pre-trip planning/scheduling of movement of freight to an in-house or commercial consolidation centre/sorting office and then scheduling to last mile delivery
M	Scenario	Planning the movement of freight for delivery into an urban zone Closely related to UL 0102 and UL 0213
M	Actors Involved	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	MIS / TM / UL	UL potentially also MIS
M	Assumptions	Pre-trip planning for freight uses significantly different criteria than that for personal transit Pre-trip planning is part of any consolidation and last mile delivery scheduling (be it UCC, in-house, courier, postal delivery services, fulfilment centre)
M	Available Standards	
M	Standardisation gaps identified*	Delivery scheduling will only *require* standards where it is being organised via a shared resource (UCC, postal delivery service, courier service, fulfilment centre. In house solutions or contracted courier services can use in-house standards. The postal sector, and postal/courier exchange systems are already well covered by IPC/UPU standards. **No gaps are therefore identified**
	Recommended Actions	No further actions required at this point in time
O	Relationships to other "Use Case(s)"	UL 0213, UL 0102
	Template Version	151021 PT1701 consensus

CEN TC278 PT1701 USE CASE TEMPLATE

M	**Use Case Name**	**Dynamic navigation**
M	**Use Case reference /id**	**UL-0106 v1 20151120**
M	Description	Requires information from opticities as to why this is a special case for urban freight… otherwise this is an MIS Use Case Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL/MIS
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	RRecommended action	Please see MIS Use Case
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

·	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Embedded digital maps**
M	**Use Case reference /id**	**UL-0107 v1 20151120**
M	Description	Requires information from opticities as to why this is a special case for urban freight… otherwise this is an MIS Use Case
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL/MIS
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

·	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Last mile parcel tracking**
M	**Use Case reference /id**	**UL-0108 v220160416**
M	Description	See UL-0213, UL-0102 This is a subset of UL 0213
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	See UL 0213
O	Relationships to other "Use Case(s)"	Subset of UL 0213
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
	Template Version	151021 PT1701 consensus
O	Open Issues	

·	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Freight Manager and driver assistant**
M	**Use Case reference /id**	**UL-0109 v1 20151120**
M	Description	Requires information from opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

·	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Access to Traffic Information**
M	**Use Case reference /id**	**UL-0110 v1 20151120**
M	Description	Provision of relevant traffic information- congestion; green wave; etc. data.
M	Scope	Information relevant to enable vehicle to time and route their journey effectively. Closely related to “Optimise Delivery” UL0112.
M	Scenario	Freight vehicles get access to dynamic congestion, green wave information, etc. so they can increase the efficiency of travel though the urban zone.
M	Actors Involved	Urban authority, TM
M	Stakeholders	Urban authority Freight drivers Freight operators Route planners/schedulers/managers
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	Provision of relevant traffic information- congestion; green wave; etc. data GAP: Information in a standard form from Urban Authority TMs Although this could be of significance in reducing urban pollution and reducing congestion, this subject is nowhere near standardisation. A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update would seem the appropriate way to take this work forward
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

·		CEN TC278 PT1701 USE CASE TEMPLATE
M	**Use Case Name**	**Customer/Receiver databases**
M	**Use Case reference /id**	**UL-0111 v1 20151120**
M	Description	Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	By understanding the receiver of the item, UCCs and deliveries can be coordinated to reduce incomplete deliveries thus keeping, this can be achieved through real time updates of receivers' location and ability to receive the item.
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	After discussions we conclude that while it would be nice for the urban authority to have access to this data, it is commercially sensitive and there is likely to be significant resistance to making this data available, and the benefit is not quantifiably significant.
M	Available Standards	
M	Standardisation gaps identified*	Standardisation not appropriate at this stage
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Delivery vehicle real-time mapping/route optimisation**
M	**Use Case reference /id**	**UL-0112 v3 20160416**
M	Description	Geofencing and controlling routes that trucks or certain classes of trucks can use; direct along freight routes and corridors, manage adaptable restrictions
M	Scope	Real-time mapping/route control/route optimisation for freight vehicles Closely related to-UL 0106 and related to UL-0113 and UL-0108
M	Scenario	Urban administrations wish to control routes that commercial vehicles take through the urban zone. In many cases this involves freight corridors to manage congestion and pollution, and these corridors may be dynamic dependant on time of day or congestion. Truck operators need to use these restrictions dynamically and have access to information in a standard format. *Geofencing* Uses GNSS systems to create a virtual zone around a particular location which activates the electric mode of hybrid vehicle buses with extended zero emission capability and other hybrid vehicles when they enter the ultra low emission zone or other zones. TfL are trialling this on hybrid buses. This can be configured to allow 'hard zones', where buses certain vehicles/taxis must always run in electric mode and 'soft zones' where they run in electric mode if there is enough battery charge remaining. The technology could also be used in low emission neighbourhoods and other roads with high concentrations of NOx and high levels of pedestrian activity. The technology could also extend to taxis although the lack of planned routeing introduces difficulties in knowing when charging will be needed. Further research into he feasibility of taxis using geofencing is needed.
M	Actors Involved	Commercial vehicle busses, taxis drivers; urban administrations and their agents
M	Stakeholders	Urban administrations, owners of affected vehicles
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) Standard format for information made available from urban authority to truck operators/drivers (this would be quite a complex information matrix). 2)*Question. If the data is available in a standard format, is there any need for standards regarding real-time mapping and route optimisation, or is that a marketplace product (using the standardised data)* 3) Standardising Geofencing protocols etc.
	Recommended Action	Standard format for information made available from urban authority to truck operators/drivers. A project team is probably required in order to develop such a matrix in order that it could apply across EU Geofencing. A project team is probably required in respect of standardising geofencing protocols

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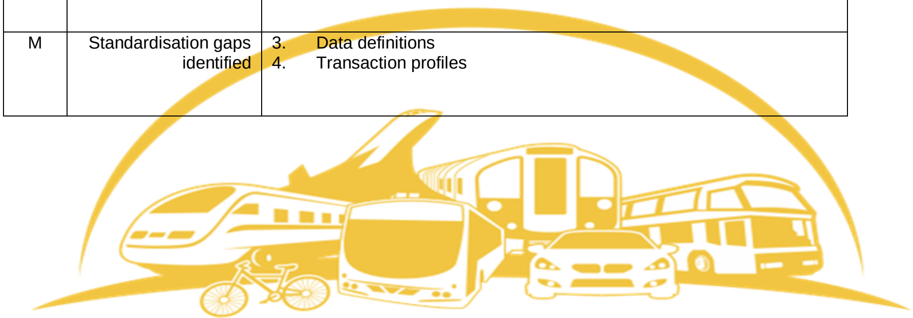
O	Relationships to other "Use Case(s)"	UL 0106, UL 0113
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	**Expected Outcomes**	**TS on standard format for information regarding freight corridors, access restrictions and times** **TS on Geofencing**
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

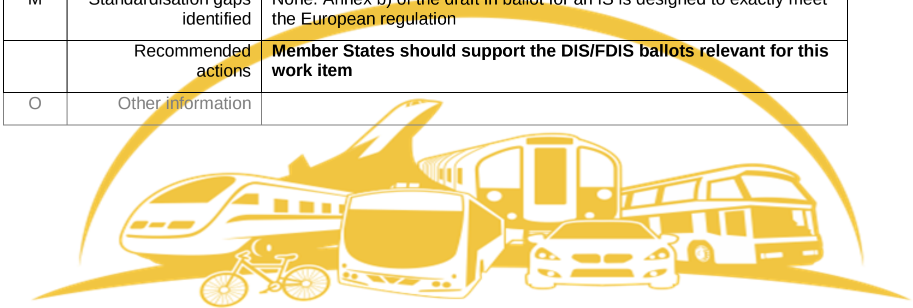
	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Comply with regulations**
M	**Use Case reference /id**	**UL-0113 v1 20151120**
M	Description	This is a provision in the FRAME Architecture
M	Scope	Use of standards to enable/enforce regulation
M	Scenario	Vehicles operating within an urban zone need to comply with regulations
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	The Use Cases UL0201 – to UL 0212, UL 0214, and UL 0300 series provide means to achieve this Use Case.
M	Standardisation gaps identified*	See Use Cases UL 0201 – UL 0212, UL 0214, and UL 0300 series
O	Relationships to other "Use Case(s)"	The Use Cases UL0201 – to UL 0212, UL 0214, and UL 0300 series provide means to achieve this Use Case.
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle access management and monitoring**
M	**Use Case reference /id**	**UL-0201 v1 20151101**
M	Description	Control of commercial vehicle access to and management within Urban Zones.
M	Scenario	Urban administration wishes to control access to all or part of its Urban Zone, or manage movements within that zone.
M	Scope	specifications for common communications and data exchange aspects of the application service vehicle access monitoring that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Load recipient Load owner Vehicle operator Vehicle operator
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	*ISO 15638-8 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 8: Vehicle access management (VAM)* *ISO 15638-14 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 14: Vehicle access control* *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV – Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	3. Data definitions 4. Transaction profiles

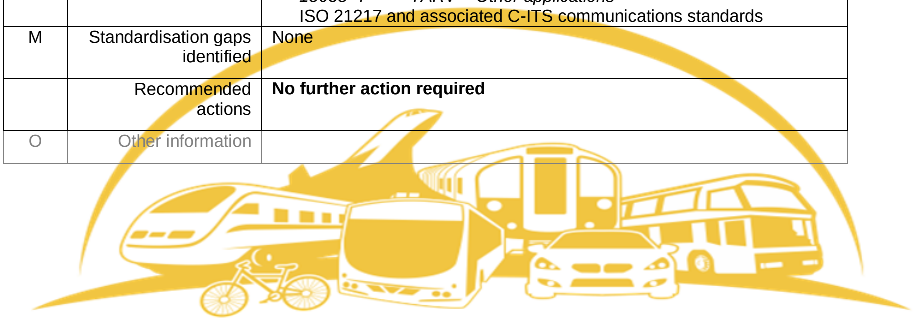


.	Recommended actions	UL 0201 Access control and management of commercial vehicles Data definitions in data repositories. Data transaction profiles (in standard or in data repository). There is no international consensus on these issues. If EU requires load specific data or data beyond general vehicle information (beyond registration number, vehicle classification etc.) it will need to develop specifications and register in standards or in a data repository. This has not yet been identified as a need, so at the moment is considered a low priority, However this priority is likely to increase in the near future. **Recommendation: Project team to identify urban administration needs and specify a European profile and relevant data concepts.**
O	Other information	

·		CEN TC278 PT1701 USE CASE TEMPLATE
M	**Use Case Name**	**Remote digital tachograph monitoring**
M	**Use Case reference /id**	**UL-0202 v1 20151101**
M	Description	Remote monitoring of vehicle tachographs within Urban Zones (to comply to European Regulation: Article 9 of Regulation (EU) No 165/2014).
M	Scenario	Enforcement agent of the Urban administration reads RTM data using 5.8 GHz DSRC.
M	Scope	Specifications for common communications and data exchange aspects of the application service remote digital tachograph monitoring that a jurisdiction regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner
M	Stakeholders	Urban administration Vehicle operator Load owner
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-9 (Currently TS, IS in ballot process) Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 9: Remote digital tachograph monitoring *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV – Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None. Annex b) of the draft in ballot for an IS is designed to exactly meet the European regulation
	Recommended actions	**Member States should support the DIS/FDIS ballots relevant for this work item**
O	Other information	



		CEN TC278 PT1701 USE CASE TEMPLATE
M	**Use Case Name**	**Emergency messaging system/eCall**
M	**Use Case reference /id**	**UL-0203 v1 20151101**
M	Description	Providing emergency data to an application service provider concerning the location, identification, and load of a vehicle in an emergency situation (accident, breakdown or other alarm generated).
M	Scenario	A vehicle involved in an emergency situation sends data to an Application Service Provider who determines the assistance provision to be provided, and whether to alert police and or 'Public Service Assistance Points' (PSAP). The data includes location of the incident, identification of the vehicle, and identification of the cargo, (or a hyper-link to this data).
M	Scope	Specifications or common communications and data exchange aspects of the application service 'Emergency Messaging System/eCall'.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	CEN TS 16405 Intelligent transport systems — eSafety — eCall Additional optional dataset for commercial vehicles ISO 15638-10 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 10: Emergency messaging system/eCall *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None
	Recommended actions	**No further action required**
O	Other information	

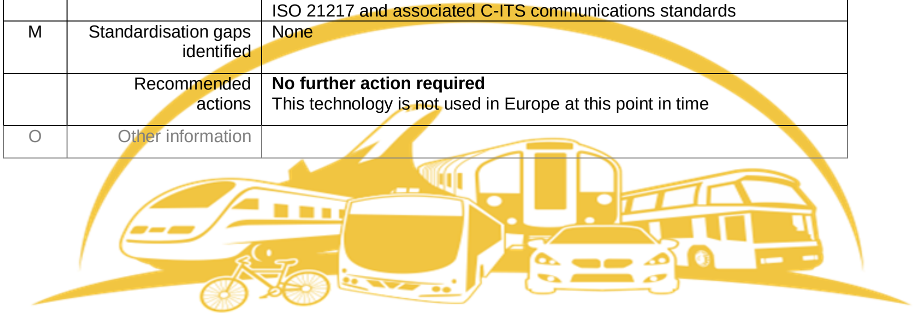


CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Accord européen relatif au transport international des marchandises Dangereuses par Route, cargo management**
M	**Use Case reference /id**	**UL-0204 v1 20151101**
M	Description	Providing emergency data to an application service provider. Specifications for common communications and data exchange aspects of the application service ADR (dangerous goods) that a regulator may elect to require or support as an option.
M	Scenario	The provision of information to an application service provider concerning ADR goods being carried by a vehicle, and their condition.
M	Scope	specifications for common communications and data exchange aspects of the application service ADR (dangerous goods) that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	CEN TS 16405 Intelligent transport systems — eSafety — eCall Additional optional dataset for commercial vehicles ISO 15638-18 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 18: ADR (Dangerous goods) *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None
	Recommended actions	**Member States to support DIS ballot** **Agreement with and if necessary revision to accommodate UNECE JWG ADR**
O	Other information	

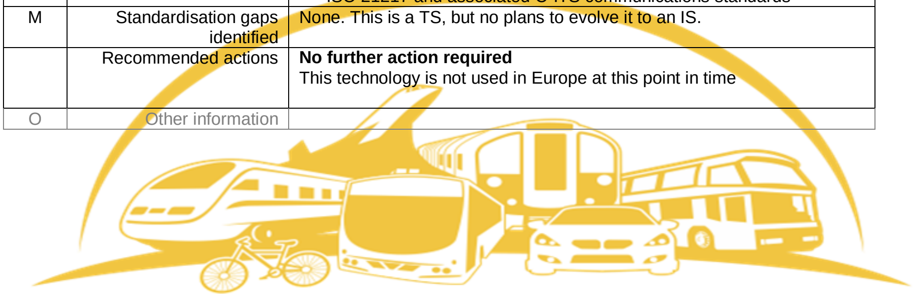
CEN TC278 PT1701 USE CASE TEMPLATE

M	**Use Case Name**	**Driver Work Records**
M	**Use Case reference /id**	**UL-0205 v1 20151101**
M	Description	Remotely providing data to an agent of the administration (via an application service provider) concerning the drivers electronic work diary.
M	Scenario	Where drivers are required to maintain an electronic work record/diary which is connected to the IVS of the vehicle, and can be remotely accessed by wireless means to provide data to an agent of the administration (via an application service provider) concerning the drivers electronic work diary (hours worked and location records).
M	Scope	Specifications for common communications and data exchange aspects of the application service driver work records that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration/regulator Agent of urban administration Vehicle driver Vehicle operator
M	Stakeholders	Urban administration Vehicle operator Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-11 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 11: Driver work records*15638 -1* *TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None
	Recommended actions	**No further action required. Such data is likely to be controlled at a national level so will be nationally specified.** NOTE within Europe driver hours are controlled using remote tachograph monitoring, not electronic work diaries.
O	Other information	

	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Vehicle Mass Measurement**
M	**Use Case reference /id**	**UL-0206 v1 20151101**
M	Description	A vehicle remotely provides "mass data" (dynamic measured impact on road pavement) to the administration/regulator (via the Application Service Provider) for control and enforcement purposes general purposes such as monitoring and access control.
M	Scenario	Collection, collation, and transfer of vehicle mass data from an in-vehicle system to an application service provider to enable data provision to jurisdictions for the control and management of equipped vehicles based on the mass of the regulated vehicle, or for gathering road impact statistics. Vehicles whose impact on the road pavements is lower than the indicated gross weight capacity may be allowed onto roads normally prohibited to that category of vehicles if it is only partially loaded.
M	Scope	Specifications for common communications and data exchange aspects of the application service "Vehicle 'Mass' Monitoring" that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban administration Vehicle driver Vehicle operator Load owner
M	Stakeholders	Urban administration Vehicle operator Load owner Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-12 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 12: Vehicle 'mass' monitoring *15638 -1TARV – Framework and architecture* *15638 -2TARV – Common platform parameters using CALM* *15638 -3TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4TARV – System security requirements* *15638 -5TARV – Generic vehicle information* *15638 -6TARV – Regulated applications* *15638 -7TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None
	Recommended actions	**No further action required** This technology is not used in Europe at this point in time
O	Other information	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Mass information for control and enforcement**
M	**Use Case reference /id**	**UL-0207 v1 20151101**
M	Description	A vehicle remotely provides "mass data" (dynamic measured impact on road pavement) to the administration/regulator (via the application service provider) for control and enforcement purposes.
M	Scenario	Collection, collation, and transfer of vehicle mass data from an in-vehicle system to an application service provider to enable data provision to jurisdictions for the control and management of equipped vehicles based on the mass of the regulated vehicle, or use of such data to enable compliance with the provisions of regulations. Vehicles whose mass indicates they will damage the road may be put into a different tax or class or fined or banned from accessing particular routes.
M	Scope	Specifications for common communications and data exchange aspects of the application service "Vehicle 'Mass' Monitoring" for control and enforcement that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-13 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 13: Mass information for jurisdictional control and enforcement (MICE) *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	None. This is a TS, but no plans to evolve it to an IS.
	Recommended actions	**No further action required** This technology is not used in Europe at this point in time
O	Other information	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle Speed Monitoring**
M	**Use Case reference /id**	**UL-0208 v1 20151101**
M	Description	Remotely monitor vehicle speed
M	Scenario	Remote collection of current or historical speed data
M	Scope	Specifications for common communications and data exchange aspects of the application service Vehicle speed monitoring that a regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator
M	Stakeholders	Urban administration Vehicle operator Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638- 16 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 16: Vehicle speed monitoring *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	Data definitions for different vehicle speed data concepts
	Recommended actions	**Add to meta data concept registry and/or define in a standards deliverable.** **Low priority**
O	Other information	

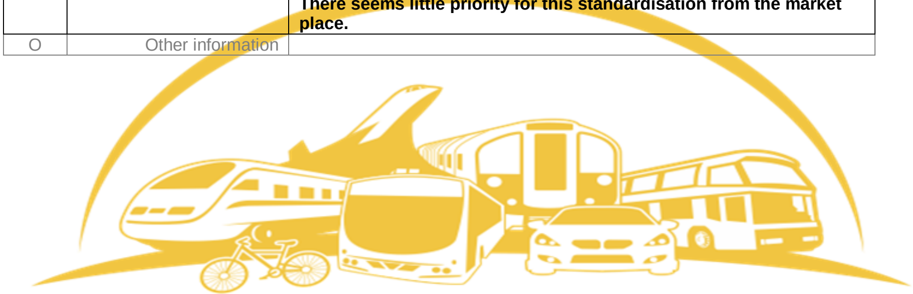
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Consignment and Location Monitoring**
M	**Use Case reference /id**	**UL-0209 v1 20151101**
M	Description	Remote collection of vehicle consignment and location data.
M	Scenario	The TARV vehicle consignment and location monitoring system centres on the IVS and information provided to it from on-board, advising and updating on the consignment status. Typically, it is appropriate where both the location of the regulated vehicle and the status of the consignment is required. The IVS generates vehicle consignment data, at loading and unloading stops or periodically whilst the regulated vehicle is turned-on and moving, and monitors the location of the regulated vehicle during its journey, periodically, as determined by the system. Vehicle location is generated independently by the IVS's GNSS receiver. The content of data concerning the vehicle consignment is generated in accordance with ISO 26683 Part 1 in conformance with one of the 'Profiles' defined in ISO 26683-2.
M	Scope	Specifications for common communications and data exchange aspects of the application service Consignment and location monitoring that a *regulator* may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available

M	Identified standards (not exhaustive list)	ISO 15638-17 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 17: Consignment and location monitoring *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards ISO 26683-1 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 1: Context, architecture and referenced standards ISO 26683-2 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 2: Application interface profiles
M	Standardisation gaps identified	None
	Recommended actions	**None**
O	Other information	

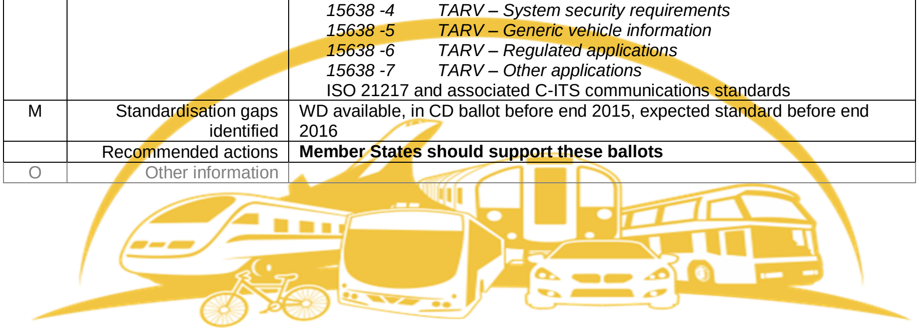
CEN TC278 PT1701 USE CASE TEMPLATE

M	**Use Case Name**	**Vehicle parking facilities**
M	**Use Case reference /id**	**UL-0210 v2 20160416**
M	Description	Provide data exchanges for a secure parking reservation system
M	Scenario	From the view of a jurisdiction, and its police, the general objectives for the vehicle parking facility application service include: ➢ Solve the safety problems due to regulated vehicles, being parked in dangerous locations (such as shoulders), posing high risk for both passing traffic and parked vehicle. ➢ Reduce policing costs to prevent crime (for example, goods of a value of Euro €7 billion are stolen in Europe from trucks each year [source EC Directorate General for Energy and Transport, Faber Maunsell, AECOM, Project SETPOS]). ➢ Achieve political objectives for environmental sustainability. ➢ From the view of a vehicle parking facility manager, the general objectives for the vehicle parking facility (VPF) application service. ➢ Provide a pre-booked service for vehicle parking to quality of service requirements defined by its operational policy or imposed by the jurisdiction within which it is situated, or to commercial requirements. NOTE: en-route on-demand bookings are short notice pre-bookings within this context ➢ At the discretion of the parking facility to provide an at-gate booking service. ➢ Identify the arrival of the regulated vehicle at the parking zone and activate any access mechanism to allow the regulated vehicle to park. ➢ Provide and manage the vehicle parking facility to quality of service requirements defined by its operational policy or imposed by the jurisdiction within which it is situated or to commercial requirements. ➢ Identify and enable the legitimate departure of the regulated vehicle from the parking zone and activate any access mechanism to allow the regulated vehicle to depart. From the view of a vehicle parking reservation system, the general objectives for the vehicle parking facility application service include: ➢ Provide a pre-booked reservation system (probably but not necessarily an internet based reservations service) for vehicle parking to quality of service requirements defined by its operational policy or imposed by the jurisdiction within which it is situated, or to commercial requirements. ➢ At the discretion of the parking facility to provide an at-gate booking service. ➢ Manage fee collection and other payments. ➢ Obtain pre-trip load and security information and provide to vehicle parking facility manager. From the view of a vehicle operator, the general objectives for the vehicle parking facility application service include: ➢ Improve safety. ➢ Reduce insurance costs. ➢ Improved fleet management and logistics management. ➢ Meet employers requirements for working conditions. ➢ Ability to make requests for "Parking Slots", specifying the time of day required, the duration required, the type of vehicle and goods, either reserved pre-trip, or on-demand during the trip. From the view of a TARV vehicle driver, the general objectives for the vehicle parking facility application service include:

		➢ Support to the truck drivers in respecting traffic and driving regulations. ➢ Relief from responsibility for finding a secure and safe location to park the regulated vehicle during overnight and rest periods. ➢ Assist the driver to find socially acceptable resting facilities. ➢ Ability to make requests for "Parking Slots", specifying the time of day required, the duration required, the type of vehicle and goods, on-demand during the trip. See also UL-0227
M	Scope	Specifications for common communications and data exchange aspects of the application service for common communications and data exchange aspects of the application service 'Vehicle Parking Facility' that a regulator may elect to require or support as an option
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638-19 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 19: Vehicle parking facility *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	The present document is a TS awaiting input from European Projects in this area, before it is developed as an EN/IS.
	Recommended actions	**Obtain cooperation and contribution from European safe parking projects. Potentially a project team if significant redevelopment is required.** **There seems little priority for this standardisation from the market place.**
O	Other information	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Weigh in motion**
M	**Use Case reference /id**	**UL-0211 v1 20151101**
M	Description	Weigh in motion either using equipment on-board the vehicle, or using equipment laid-in-road with the result transferred either to a centre or transmitted to and stored in memory on the vehicle.
M	Scenario	The provision of 'weigh-in-motion monitoring' and specifies the form and content of the transmission of such data required to support such systems, and access methods to that data. The data may be transferred by a variety of means (as ITS-station <> ITS-station data transfers in a C-ITS environment using 5.9 GHz, 3G, 4G, LTE or similar), transfers using interrogations from short range dedicated communication systems (such as 5.8 GHz), etc. Includes a profile for remote WIM using 5.8 GHz to comply to upcoming European Regulation.
M	Scope	Specifications for common communications and data exchange aspects of the application service weigh-in-motion monitoring (WIM-On-board and WIM-Roadside) that a jurisdiction regulator may elect to require or support as an option.
M	Actors Involved	Urban administration Agent of urban ministration Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available
M	Identified standards (not exhaustive list)	ISO 15638- 20 Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 20: weigh-in-motion monitoring *15638 -1 TARV – Framework and architecture* *15638 -2 TARV – Common platform parameters using CALM* *15638 -3 TARV –Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services* *15638 -4 TARV – System security requirements* *15638 -5 TARV – Generic vehicle information* *15638 -6 TARV – Regulated applications* *15638 -7 TARV – Other applications* ISO 21217 and associated C-ITS communications standards
M	Standardisation gaps identified	WD available, in CD ballot before end 2015, expected standard before end 2016
	Recommended actions	**Member States should support these ballots**
O	Other information	



		CEN TC278 PT1701 USE CASE TEMPLATE
M	**Use Case Name**	**Vehicle enforcement using roadside sensors**
M	**Use Case reference /id**	**UL-0212 v1 20151124**
M	Description	Objective and textual description
M	Scope	specification is to reinforce enforcement by using a combination of information from both in-vehicle systems (AVI and TARV generic data) and roadside/in-road sensors.
M	Scenario	In many countries road side sensors are already widely used for jurisdiction enforcement purposes. These road side sensors (e.g. for emissions management, or roadside weigh stations) can be used in combination with AVI and/or TARV data for enhancing enforcement by eliminating/reducing problems of incorrect setting/tampering etc. and/or complementing/ corroborating data obtained from on-board systems. By collecting data from various roadside sensors, obtaining AVI and/or TARV data from targeted vehicles; then collating these vehicle and roadside sensor generated data concepts, they can then be transferred from the roadside sensor to the agent of the jurisdiction. This can be achieved by the normal TARV means, via the ASP, or by secure short range communications (for example at 5.8 GHz) directly back to the roadside, where the collated information can be sent by landline or cellular connection directly to the agent of the jurisdiction. In some cases, new means of monitoring, management and enforcement may be enabled.
M	Actors Involved	Urban administration and its agents, Truck operators Drivers
M	Stakeholders	Urban administration and its agents, Truck operators Drivers Cargo owners
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	ISO 15638-21 “Vehicle Enforcement using roadside sensors” is currently under development within ISO TC204 WG7 (work item Led by Japan).
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Urban Consolidation Centres (UCC)**
M	**Use Case reference /id**	**UI-0213 v1 20151101**
M	Description	interurban movements of product are channelled to a UCC, consolidated, and driven 'the last mile' in a low emission vehicle, properly loaded to maximise delivery efficiency, and the same vehicles could effect collection rounds, delivering the collected items to the UCC from where they can make a modal shift to other transport means for the next stage of their journey.
M	Scenario	European Urban administrations are committed (by European and National Regulation) to cut pollution in cities. Emissions in cities have become a major cause of ill-health and death, now perhaps surpassing deaths caused by cigarette smoking in many countries (albeit part of this comparator is caused by the reduction of the number of persons smoking). The greatest contributor to urban pollution are emissions from diesel engines. The most significant contributors to diesel engine emissions in most cities are commercial vehicles. It is postulated that most commercial vehicles in cities are making deliveries or collections. It is contended that most of these vehicles spend a significant part of their time only partially loaded. Reducing the number of commercial vehicle deliveries and collections made by diesel powered vehicles would therefore contribute significantly to the reduction of pollution in cities. Every delivery/collection requires the vehicle to be parked while the collection/delivery is made. Delivery vehicles frequently find parking difficult, especially to /from smaller enterprises. On road parking causes congestion, and congested vehicles emit pollution from all vehicles, that are delayed by the congestion. Given that most delivery/collection vehicles spend much of their time only partially loaded, more efficient delivery/collection would both reduce pollution and reduce congestion delays for other road users. If low emission vehicles, such as electric vehicles, could be used for last mile delivery/collection, pollution could be further and significantly reduced, or at least moved to a generating power station, and therefore away from the city.
M	Scope	Specifications for common communications and data exchange aspects of the application service Urban Consolidation Centre.
M	Actors Involved	Urban administration Agent of urban ministration Freight centre manager Vehicle driver Vehicle operator Load owner Load recipient
M	Stakeholders	Urban administration Freight centre manager Vehicle operator Load owner Load recipient Driver
M	MIS / TM / UL	UL
M	Assumptions	That vehicle has one or more of C-ITS, 2G, 3G, 4G/LTE communications available

M	Identified standards (not exhaustive list)	*ISO 26683-1 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 1: Context, architecture and referenced standards* *ISO 26683-2 Intelligent transport systems — Freight land conveyance content identification and communication (FLC-CIC) — Part 2: Application interface profiles* **Universal Post Corporation Standards** a) Barcode symbology for postal items b) Barcode symbology for postal receptacles c) Communication of postal information using two-dimensional symbols d) Data presentation in ASN.1 **IPC Identification/codification standards** a) Air carriers. identification/codification of b) Airports. identification/codification of c) Countries. identification/codification of d) Data constructs for the communication of information on postal items, batches and receptacles e) FACT-Based licence plates for parcels f) FACT-Based representation of postal information and identifiers g) Framework for communication of information about postal items. batches and receptacles h) Communication of postal information using two-dimensional symbols ID-Tagging of letter mail items i) Placement area definitions; UPU EDI Message Development Guide j) RFID and RDC - Air interfaces: Communications and interfaces Part A: Parameters k) RFID- Reference architecture and terminology l) RFID - System requirements and test procedures q) Item tracking events, identification/codification of n) Office of exchange, identification/codification of o) Postal consignments, identification/codification of p) Postal despatches, identification/codification of q) Postal items, identification/codification of r) Postal receptacles. identification/codification of IPC EDI Messages standards a) Format of message exchanges b) Standard messages for consignments c) Standard messages for despatches d) Standard messages for items e) Standard messages for transport
	Standardisation gaps identified	IPC has designed interoperable codification and message standards for every likely operational scenario that a UCC is likely to face. Although designed for national postal sorting and delivery organisations, by substituting the word 'collection/delivery', in place of 'postal', they meet all the requirements that a UCC is likely to face in its operations in respect of identification and messaging. They have been proven in use by the international postal community over a quarter of a century, in some cases since the end of WW2. ISO 26683 provides methodology for the UCC consolidation and final round process. It may therefore be concluded that: There are already adequate standards available to enable a fully interoperable UCC operation (and one that could co-exist interoperably with the international postal sector).

•	Recommended actions	**Guidelines on the operation of such UCCs (probably in the form of a Technical Specification, could be beneficial in finding and interpreting such available standards.** **No active demand.** **Low priority.**
O	Other information	

·		CEN TC278 PT1701 USE CASE TEMPLATE
M	**Use Case Name**	**Oversize management**
M	**Use Case reference /id**	**UL-0214 v1 20151124**
M	Description	Routing and Management of Oversized vehicles
M	Scope	To provide better data to HGVs and large freight vehicles to enable improved route guidance avoiding road restrictions and to provide better warnings to oversized vehicles to reduce the likelihood on bridge strikes or stuck vehicles causing delays.
M	Scenario	Over-height vehicles are a major issue, and are getting even higher recognition now than they used to. Mainly because if an over-height vehicle strikes a rail or metro bridge, it impacts on both modes of transport (road and rail). Over-width vehicles cause significant congestion. Over-length vehicles often have problems negotiating turns in narrow city streets. Existing measures of managing oversize vehicles (static signing, physical warnings (beams) or dynamic signs) are not proving to be fully effective in in mitigating HGVs using roads which are not suitable for them, which may be a function of more relied use on SatNavs. Possible solutions which may require standards include: (a) Standards for height, weight and width data within HGV SatNav systems (and ability for truck drivers to enter manually or automatically the associated data for their vehicle); (b) Use of V2I standards to provide better in-cab warnings about obstacles, based on automatic measurement of the vehicle – ensuring more targeted information.; (c) Automated warnings to urban administrators in the event of an actual structure strike that could cause road or rail delay (e.g. Bridge Strike) to enable a rapid response.
M	Actors Involved	Urban administrations Truck drivers Truck operators Truck owners Traffic control centre Asset owners (bridge owners etc.)
M	Stakeholders	Urban administrations Truck drivers Truck operators Truck owners Cargo owners Asset owners
M	MIS / TM / UL	UL
M	Assumptions	Truck drivers are able to assess the relevant data for their vehicles. This may be easy for all loads, although abnormal loads normally require detailed planning anyway.
M	Available Standards	None known
M	Standardisation gaps identified*	Oversize Management UL 0214 1) Asset restriction data in SatNavs systems. Format for Urban Administrators to provide data to SatNav providers 2) V2I messaging for in cab warnings
O	"UseCase" level	

O	Requirements Reference	
O	Data Requirements	Asset data, geocoded with location, height, width and weight restrictions vehicle data, height, width and weight.
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

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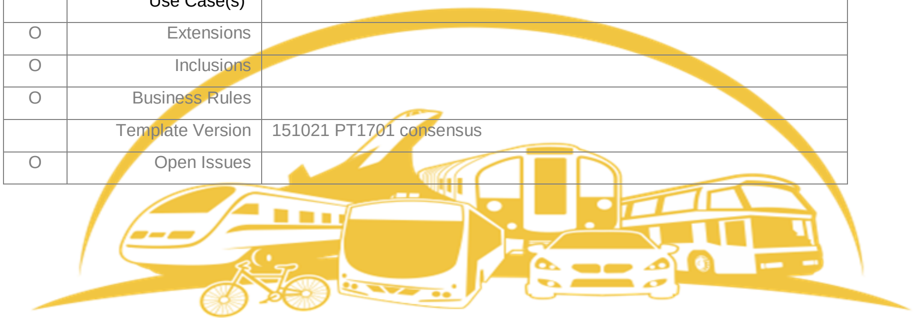
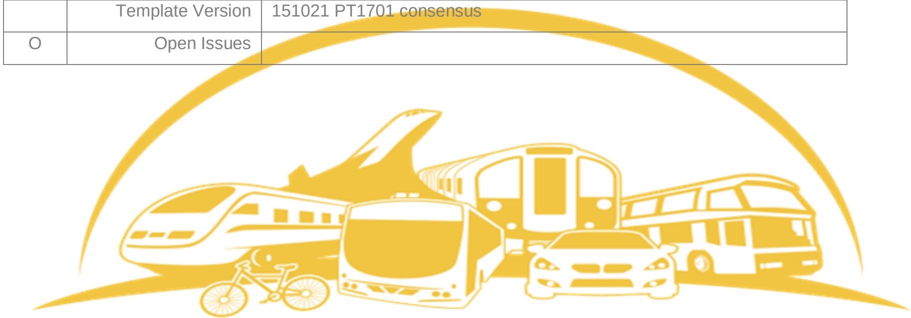
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Freight Scheduling infrastructure**
M	**Use Case reference /id**	**UL-0215 v1 20151124**
M	Description	Scheduling infrastructure (restrictions – day- time of day- length of stay- other limitations)
M	Scope	Provide Euro-wide standardisation of c) the format of schedule management information available to truck operators and drivers d) the availability of schedule management information to truck operators and drivers
M	Scenario	Control to and restrictions within the urban zone varies from urban zone to urban zone. Currently the regulations and restrictions are made available in different ways and in different forms. The objectives of this Use Case are to standardise the format of data available, and to standardise the way and minimum requirements to make this data available.
M	Actors Involved	Receiver/despatcher Truck driver Truck operator Consolidator Scheduler Cargo owner Urban administration
M	Stakeholders	Receiving/despatching organisation Truck operator Cargo owner Urban administration
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	See UL110 and UL113
O	Data Requirements	UL110 and U113
O	Relationships to other "Use Case(s)"	This Use Case is closely related to UL110 and UL113
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Description of freight offer**
M	**Use Case reference /id**	**UL-0216 v1 20151124**
M	Description	Requires information from Opticities and textual description
M	Scope	This is the description of the freight offer: — Covered areas — Freight lines — Limitations — ADR rules (for dangerous goods)
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	None identified. Further information needed to complete Use Case
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



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CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Monitor Compliance**
M	**Use Case reference /id**	**UL-0217 v1 20151124**
M	Description	It is unclear from information available from Opticities whose compliance is being monitored- is the subject the freight operator, or the Urban Administration. More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	Possibly closely linked to UL 0201 and UL 0212
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**ICT framework handling RT heterogeneous mobility resources**
M	**Use Case reference /id**	**UL-0218 v1 20151124**
M	Description	Unclear why this is listed by Opticities as a freight issue and not an MIS issue. More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Network management**
M	**Use Case reference /id**	**UL-0219 v1 20151124**
M	Description	Unclear which actor's network and unclear which network. More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Freight Fares**
M	**Use Case reference /id**	**UL-0220 v1 20151124**
M	Description	Unclear of the objective of this Use Case More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Delivery schedule timetables**
M	**Use Case reference /id**	**UL-0221 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	Sharing delivery vehicle the data around location of the delivery can also prevent incomplete deliveries, additionally many telematics providers can now record data on the emissions produced by the vehicle and the driving habits of the driver this data can then be collected and analysed to demonstrate the potential environmental benefits of shared last mile. It can also contribute to streamlining activity to increase the environmental benefits of UCCs. Data about the delivery and servicing local infrastructure (location of loading bays, locations of vehicles class restrictions etc.) can be massively aid the routing of delivery and servicing vehicles. This is can streamline the process of delivery, which would increase the capacity of the UCC and overall efficiency of the process. Additionally, data about high emissions area, ULEZ and other environmental data can be shared which can improve the overall environmental strategy of UCCs.
M	Actors Involved	Consolidation centres (UCC, post, courier, in-house) Truck operators Truck drivers Receivers/despatchers
M	Stakeholders	Consolidation centres (UCC, post, courier, in-house) Truck operators Receivers/despatchers Cargo owner
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	See UL 0102, UL0108,and 0213
	Recommended Actions	Covered by other UL Use Cases. No specific further action recommended
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Closely related to UL 0213, UL 0215, UL 0216
O	Triggers	(or identify continuous operation)
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Optimise Resources**
M	**Use Case reference /id**	**UL-0222 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

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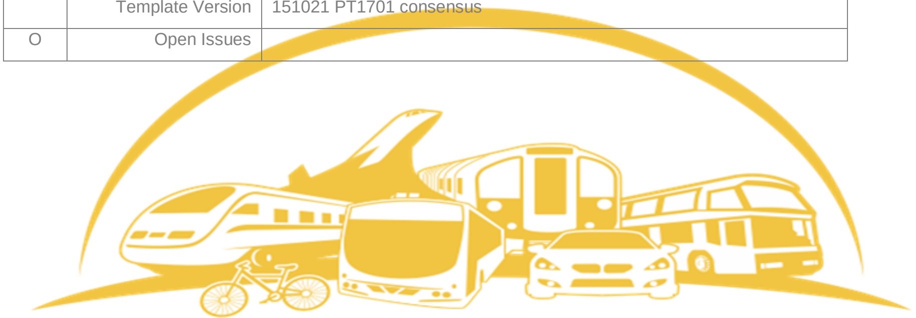
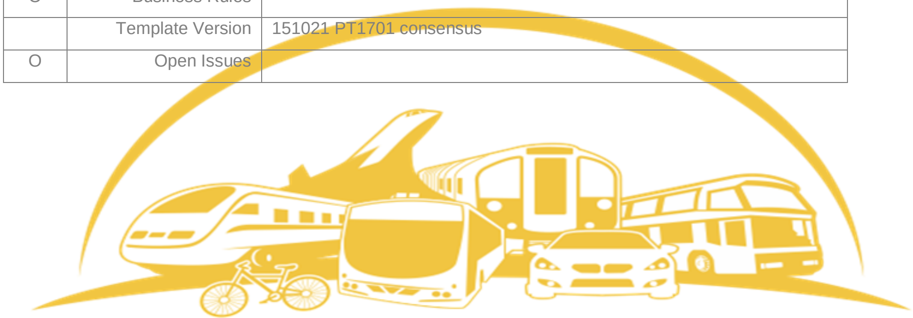
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Improve E2E Freight efficiency**
M	**Use Case reference /id**	**UL-0223 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Vehicle Technology**
M	**Use Case reference /id**	**UL-0224 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	



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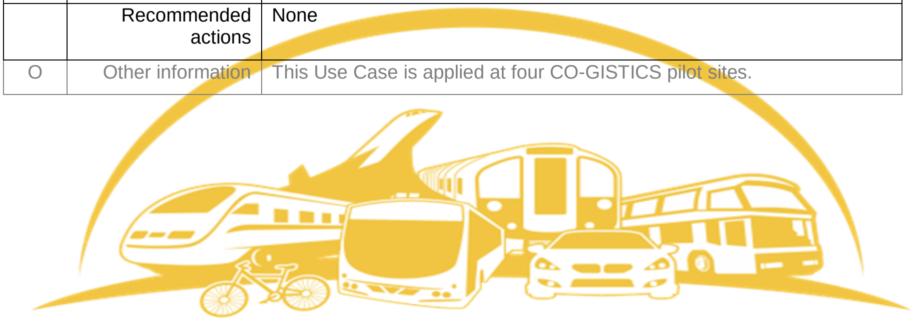
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Innovative load units**
M	**Use Case reference /id**	**UL-0225 v1 20151124**
M	Description	Further clarification of objective required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

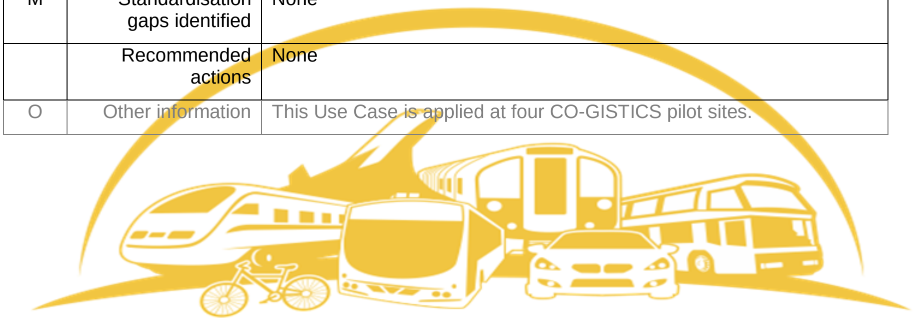
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Restriction Zones Information Harmonisation**
M	**Use Case reference /id**	**UL-0226 v1 20151124**
M	Description	Standardisation of information formats for provision of restriction zones information.
M	Scope	Development of standard formats for access restriction zone information.
M	Scenario	There is no harmonisation of access restriction zones conditions. It is probably impractical to standardise these, but the data about them could be made available in standard formats.
M	Actors Involved	Urban administrations
M	Stakeholders	Urban administrations Recipients/despatchers Truck operators Truck drivers
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	See UL 0215
	Recommended Actions	No additional action recommended
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Almost identical with and should be merged with UL 0215
O	Extensions	
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

·	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Intelligent Truck Parking and Delivery Areas Management (ITP/DAM)**
M	**Use Case reference /id**	**UL-0227 v1 20160415**
M	Description	Management of Urban parking for loading/unloading, highway parking places for resting and parking at hubs, and dry-port electronic payment for parking.
M	Scenario	This service contains information about parking availability for trucks or vans aiming at the efficient allocation of available parking space as well as at the efficiently management of peak hours of in-bound in truck traffic volume around mayor hub infrastructure, e.g. airports or urban areas. The aim of the ITP/DAM service is to: • optimise the truck stops along their route (generally inter-urban areas), • optimise delivery of goods in urban areas (urban) and • optimise interfacing of road transport with other modes (intermodal hubs) See also UL-0210
M	Scope	Information about parking availability for trucks or vans
M	Actors Involved	Urban administration Fleet operations manager Vehicle driver or operator Intermodal terminal operators
M	Stakeholders	Urban administration Fleet operations manager Vehicle driver or operator Intermodal terminal operators
M	MIS / TM / UL	UL
M	Assumptions	The trucks are equipped with C-ITS, 2G, 3G, 4G/LTE communication devices to receive the information related to parking.
M	Identified standards (not exhaustive list)	IEEE802.11p/ETSI ITS-G5, Cellular
M	Standardisation gaps identified	None
	Recommended actions	None
O	Other information	This Use Case is applied at four CO-GISTICS pilot sites.

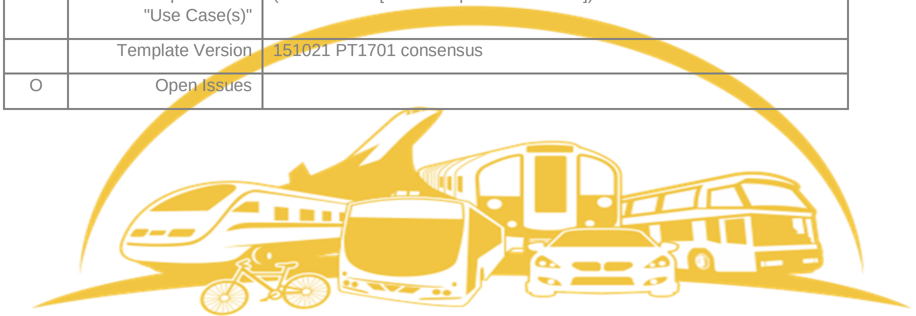


·	**CEN TC278 PT1701 USE CASE TEMPLATE**	
M	**Use Case Name**	**Priority and Speed Advice Service**
M	**Use Case reference /id**	**UL-0228.1 v1 20160415**
M	Description	Service to reduce the number of stop-and-go events and therefore the accelerations resulting in the reduction of the fuel consumption and emissions of the freight trucks circulating along signalized intersections.
M	Scenario	Three scenarios for Priority and Speed Advice are supported: 4. A general speed advice approach to the freight transport. This info allows the driver to choose a fuel-efficient and comfortable speed profile when approaching a traffic light through the provision of a speed advice or the remaining green/red time (as a countdown). 5. Priority for selected transport vehicles. The priority service will be implemented in selected intersections where the terminal systems will notify the system of increased traffic arriving at the intersection and requiring priority. The request will be accepted, depending on the existing conditions at the intersection at the time of the vehicle arrival, and the signal will remain green long enough for the trucks to cross the intersection. 6. In the case of the Vigo pilot site, the priority is not provided per intersection. It is provided in a defined route according were the timing of traffic lights is modified increasing green light time when the truck enters the route and back to normal regulation once the truck has crossed the route.
M	Scope	Reduction of fuel consumption and emissions, better management of and smoother traffic flow, reduction of delays.
M	Actors Involved	Vehicle driver or operator Traffic managers
M	Stakeholders	Fleet operations manager Vehicle driver or operat.r Urban administrations Traffic managers
M	MIS / TM / UL	UL
M	Assumptions	The traffic lights are able to provide in real time estimation of the remaining green/red time and/or priority to special vehicles. The traffic controller is equipped with a G5-enabled unit or connected to the traffic management center. The vehicles are equipped with a G5-enabled unit or have LTE connection respectively.
M	Identified standards (not exhaustive list)	ETSI TS 102 894-1 (Facility layer) ETSI EN 302 636-4-1 (Geonetworking layer) ETSI TS 102 724 (G5) ETSI EN 302 637-3 (DENM) ETSI EN 302 637-2 (CAM) SAE J2735 (SPAT and MAP)
M	Standardisation gaps identified	None
	Recommended actions	None
O	Other information	This Use Case is applied at four CO-GISTICS pilot sites.

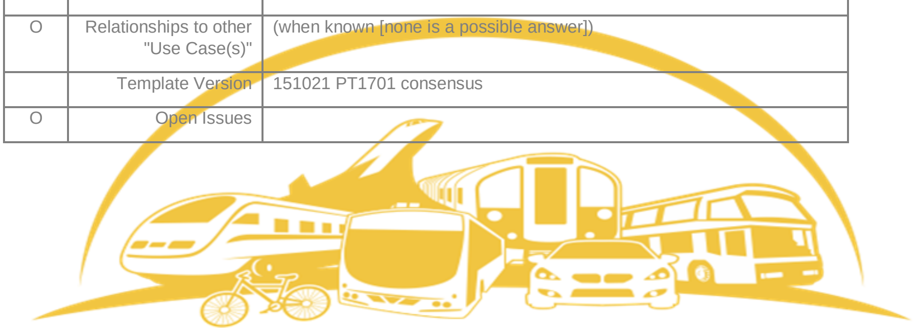
·		**CEN TC278 PT1701 USE CASE TEMPLATE**
M	**Use Case Name**	**Priority and Speed Advice Service (Macro Approach)**
M	**Use Case reference /id**	**UL-0228.2 v1 20160415**
M	Description	The service supports the driver to choose a fuel-efficient and comfortable speed profile during its driving tasks. In a strictly competitive sector, a fleet and transport operator tries to generate competitive advantage partly through cost reduction. The main saving can be achieved by reducing fuel consumption. Cooperative services could support fleet operators and drivers to satisfy this requirement, making available data (e.g. weather conditions, traffic data) useful to suggest a fuel-efficient speed profile, prior and during the trip.
M	Scenario	One macro scenario for Priority and Speed Advice is supported: A general speed advice approach to the freight transport. This info allows the driver to choose a fuel-efficient and comfortable speed profile during the whole route (denoted in the following by macro level).
M	Scope	Reduction of fuel consumption and emissions, better management of and smoother traffic flow, reduction of delays.
M	Actors Involved	Vehicle driver or operator Traffic managers Motorway Managers
M	Stakeholders	Fleet operations manager Vehicle driver or operator Motorway Managers
M	MIS / TM / UL	MIS
M	Assumptions	5. The truck driving is performing a route; 6. The vehicles are able to send/receive information through long-range 3G/4G system; 7. The information received concerns also weather and traffic conditions data; 8. The information concerning the boarding time should be available in order to compute the speed estimation.
M	Identified standards (not exhaustive list)	Long-range (3G/4G)
M	Standardisation gaps identified	None
	Recommended actions	None
O	Other information	This Use Case is applied at four CO-GISTICS pilot sites.



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Emissions monitoring –General**
M	**Use Case reference /id**	**UL-0301 v1 20151124**
M	Description	Monitoring of local pollution levels to manage air quality proactively.
M	Scope	Getting data from local pollution monitoring stations and feeding into traffic management system.
M	Scenario	Roads in cities are not just to get vehicles from A to B, they can be defined as social spaces (squares, highstreets), living spaces (residential, schools) and moving spaces (expressways, arterial roads). A single model of pollution management for a whole city cannot take this into account. Some cities want to manage traffic to make social and living spaces better places (at the cost to the arterial routes) and pollution monitoring can be a feed into this model. i.e. if a living space pollution is high, gate the traffic to either ensure that it keeps moving through that space (not queuing) or reduce the volume in that area.
M	Actors Involved	Traffic manager Road user Resident
M	Stakeholders	Traffic manager
M	MIS / TM / UL	TM/UL
M	Assumptions	None
M	Available Standards	Regional – UTMC Air Quality MIB
M	Standardisation gaps identified*	1) EU wide interface between air quality *outstations* and traffic management systems to allow vendor interoperability
	Recommended Action	UL 0301 Emissions monitoring -general Develop Standard for air quality *outstations* and traffic management systems A project team may be required to overcome vendor lock in aspects
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	



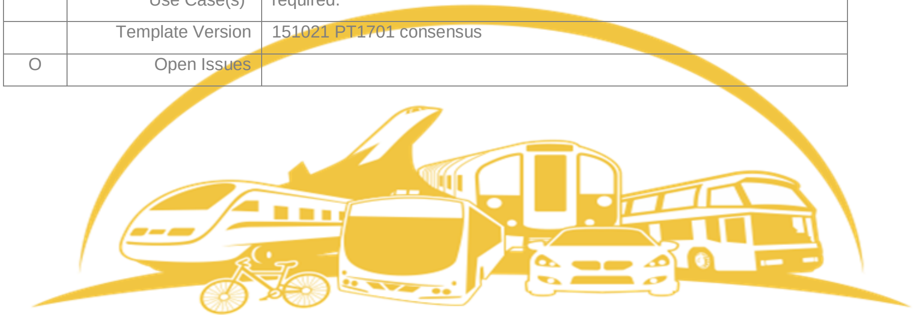
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Urban Low Emission Zone Management**
M	**Use Case reference /id**	**UL-0302 v1 20151124**
M	Description	Managing polluting vehicles in urban areas using charging and enforcement.
M	Scope	Providing detection/identification of polluting vehicles, charging regime and enforcement regime.
M	Scenario	To improve air quality in urban areas it may be necessary to encourage road users to move to less polluting vehicles. This can be achieved by levying a charge on polluting vehicles as they enter the urban area and enforcing that charge.
M	Actors Involved	Traffic enforcement Central government Drivers
M	Stakeholders	Freight carriers
M	MIS / TM / UL	UL
M	Assumptions	Use of ANPR enforcement system. Central government allow access to vehicle owners database.
M	Available Standards	Regional UTMC ANPR Schema.
M	Standardisation gaps identified*	1) Legal basis for being able to charge polluting vehicles (when vehicles are actually legal on the road). 2) EU standard for ANPR to *Instation* data exchange format. 3) Cross boundary enforcement outside of member state. 4) Standards for urban administrators to access central government databases for vehicle look up. 5) Standards for evidential integrity (encryption, image quality, size, timestamping etc).
	Recommended Actions	UL-0302 Urban Low Emission Zone Management. European data format for ANPR data exchange and evidential integrity (possibly as part of a general UL data formats PT). The other issues are political /regulatory decisions.
O	"UseCase" level	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Monitor Emissions Compliance in Urban Zone**
M	**Use Case reference /id**	**UL-0303 v1 20151124**
M	Description	It is unclear from information available from Opticities whose compliance is being monitored- is the subject the freight operator, or the Urban Administration. More information required from Opticities Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	"UseCase" level	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Probably closely related to UL-0301 ,
O	Triggers	(or identify continuous operation)
O	Inclusions	
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Cross border Enforcement** (Opticities, TFL)
M	**Use Case reference /id**	**UL-0304 v1 20151130**
M	Description	Cross border enforcement
M	Scope	City Administrations/Member states access to driver databases for de-criminalised offences and connect into VERA (3 is it now) to get an update on the cross boundary position for de-criminalised enforcement with a view to (where possible) harmonising member states position on this regarding information exchanges and processes.
M	Scenario	'Cross Border Enforcement' refers to the pursuit of traffic offences committed by drivers of a car which is registered in an EU Member State different than the one where they were detected. The goal of the Directive is to offer an automated tool for enforcement authorities in the Member State where the offence was committed to pursue and fine the drivers of cars registered in other EU Member States when they commit traffic offences. Current co-operation agreements exist in the form of bi-lateral and multi-lateral agreements and many EU Member States already have systems in place to follow up traffic fines. However, they are often not able to deal with the increasingly complex cross-border problems posed by traffic offenders. The Directive presents an EU wide automated approach. This new Directive will also mean that EU Member States will not have to negotiate new bilateral agreements with other countries. in May 2014, the European Court of Justice ruled that the legal basis of the Directive on Cross-Border Exchange of Information related to road safety 2011/82, which came into force in November 2013, was incorrect. The European Court of Justice found that the measures proposed in the Directive do not concern 'prevention of crime' as defined under the police co-operation rules, but rather road safety, which is a transport issue. However, given the importance of the law for road safety, the ECJ said the current rules will stay in place while a new proposal is agreed. The Court has granted a one-year transition period, meaning the rules will remain in effect until May 2015. Following the ruling a new Directive 2015/413 was adopted in March 2015 with a legal basis under the EU transport policy. EU Member States must transpose the new legislation into their national law by May 2015 or risk facing EU infringement procedures. In the meantime, the 2011/82 Directive remains in place at national law level until this is replaced by the newly transposed legislation. Three countries, UK, Ireland and Denmark have a later transposition deadline of May 2017 According to the European Commission, non-resident drivers account for approximately 5% of road traffic in the EU. However, 15% of the number of detected speed offences are committed by non-resident drivers. Moreover, according to the Commission document, a foreign-registered car is three times more likely to commit traffic offences than a domestically-registered one. The Commission also gives the example of France, where speeding offences committed by foreign registered cars reach approximately 25% of the total, with the figure going up to 40-50% of the total during periods of high transit and tourism. Consequently, the Commission expects the highest positive benefits to be observed in countries with high levels of transit and tourism traffic, such as Austria, Belgium, France, Germany, Hungary, Italy, Luxembourg, Poland or Spain.

		Eight major road safety related offences are included in the text of the EU Directive: — Speeding; — Not using a seatbelt; — Not stopping at a red traffic light or other mandatory stop signal; — Drink driving; — Driving under the influence of drugs; — Not wearing a safety helmet (for motorcyclists); — Using a forbidden lane (such as the forbidden use of an emergency lane, a lane reserved for public transport, or a lane closed down for road works); — Illegally using a mobile phone, or any other communications device, while driving. The Directive will be most effective in following up offences which can be detected automatically, such as speeding and running red lights.
M	Actors Involved	Member states, City administrations
M	Stakeholders	Member states, City administrations EDPS
M	MIS / TM / UL	UL
M	Available Standards	None
M	Standardisation gaps identified*	If the Directive is to work there needs to be not only standard agreement of access to driver licence databases (political agreement, not standards) but also standardised transactions, standardised data formats, and standardised transaction formats.
	Recommended Actions	UL-0304- Cross border enforcement A project team to determine the transaction and data format standardisation required in order to enable the /directive to be applied and function efficiently.
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Probably closely related to UL-0217 , but further information on UL0217 required.
	Template Version	151021 PT1701 consensus
O	Open Issues	



	CEN TC278 PT1701 USE CASE TEMPLATE	
M	**Use Case Name**	**Green balancing and controls**
M	**Use Case reference /id**	**UL-0305 v1 20151124**
M	Description	Need input from Opticities to pursue this. Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	"UseCase" level	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

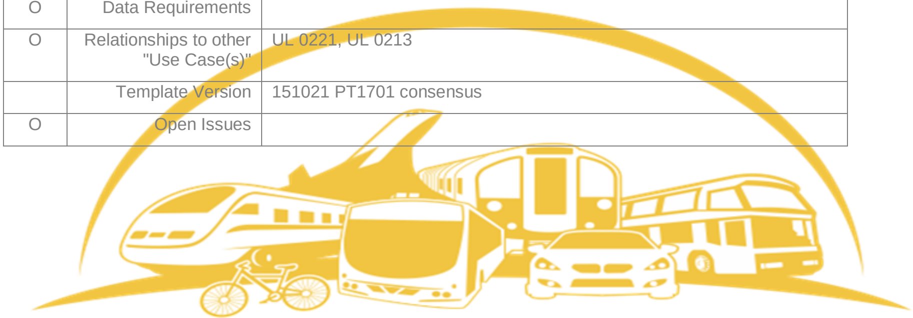
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Eco-drive Support Service**
M	**Use Case reference /id**	**UL-0306 v1 20160415**
M	Description	Support truck drivers and fleet operators in adopting an energy efficient driving style in order to reduce and to validate fuel consumption and CO_2 emissions
M	Scenario	• Truck Driver: Eco-drive support services provide drivers with on trip, pre- and post-trip advice. The main advantage of such services base on the additional information with regards to the total fuel consumption and driving behaviour during a trip with respect to the defined European standard driving cycles UDC and EUDC. Usually, knowledge about fuel consumption is vague so that the system takes into account events that occurred while driving, but that are no longer evident after the trip. Specifically, the information about the total fuel consumption from origin to destination does not reflect the specific conditions causing the increase or decrease of fuel consumption. • Fleet operator: the advantage of the fleet operations are implementing environmental programme (reduction of CO2 and other emissions, energy saving); saving costs (fuel, accidents, sick leaves, risk management); taking care of the personnel (wellbeing).
M	Scope	Validation of book values and reduction of fuel consumption and CO_2 emissions
M	Actors Involved	Fleet operations manager Vehicle driver or operator
M	Stakeholders	Fleet operations manager Infratructure authorities (airports, ports, etc.) Vehicle driver or operator
M	MIS / TM / UL	UL
M	Assumptions	Pre-trip fuel consumption planning is done using significantly different criteria in comparison to post-trip fuel consumption evaluation.

M	Identified standards (not exhaustive list)	3GPP LTE IEEE802.11p/ETSI ITS-G5, Hybrid DIN ISO 26000 (Sustainability guidelines), e.g. http://www.ecodrive.eu/en/service ISO 14001:2004 (Plan-Do-Check-Act, PDCA) Environment Management Norm CEN/TC 278/WG2 – I.T.S. standardization working group Freight, Logistics and Commercial Vehicle Operation FprEN ISO 24534-3 Electronic Registration Information for vehicle trade E/ECE/324/Rev.2/Add.100/Rev.3 or E/ECE/TRANS/505/Rev.2/Add.100/Rev.3 (12 April 2013), "Agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions", Addendum 100: Regulation No. 101, *Uniform provisions concerning the approval of passenger cars powered by an internal combustion engine only, or powered by a hybrid electric power train with regard to the measurement of the emission of carbon dioxide and fuel consumption and/or the measurement of electric energy consumption and electric range, and of categories M1 and N1 vehicles powered by an electric power train only with regard to the measurement of electric energy consumption and electric range.*
M	Standardisation gaps identified	6. Voluntary guidelines for Best Practice 7. Voluntary guidelines for environmental quality management 8. Data format definition, no focus on eco-drive 9. Includes emission characteristics, but not eco-drive 10. Test engine operation, but not with real-time data exchange driving behaviour
	Recommended actions	Development of standards: additional annex linked to C-ITS. standardisation initiatives
O	Other information	This Use Case is applied at four CO-GISTICS pilot sites.

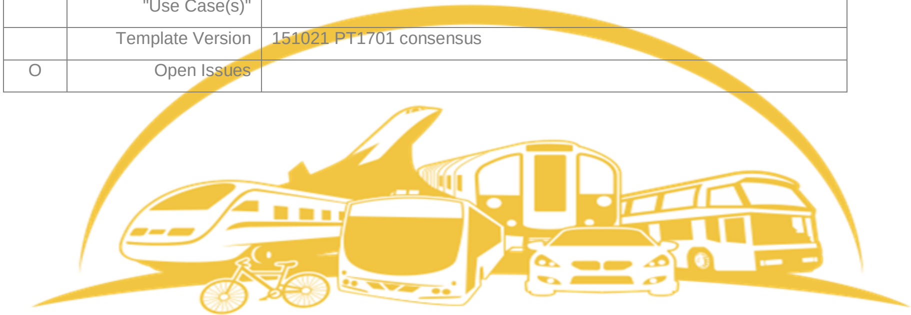
·	**CEN TC278 PT1701 USE CASE TEMPLATE**	
M	**Use Case Name**	**CO2 Footprint Monitoring and Estimation**
M	**Use Case reference /id**	**UL-0307 v1 20160415**
M	Description	Carbon footprint monitoring and estimation was selected to reflect the importance of innovation and standardized approaches in this new field of research activities.
M	Scenario	The challenge of reliable carbon foot print monitoring is closely related to the difficulty of understanding the reasons of increased fuel consumption. In normal logistics operation the most important influence factor comes with the load, which has to be added to the empty weight of the truck. Nevertheless, engine and driving behaviour additionally influence the total CO2 emissions. As transportation impact the global climate change in a severe manner, a better understanding of the existing monitoring methodologies will play an important role for future policy and tax instruments, already suggested by many experts to reduce greenhouse emissions. Up to now many companies, report their yearly CO2 emissions and also have yearly targets to achieve savings, yet on a voluntary basis.
M	Scope	Estimation and measurement of CO_2 emissions from transport activity based on real-time information, this service has no interaction with the driver.
M	Actors Involved	Fleet operations manager Vehicle driver or operator
M	Stakeholders	EU and National governments Urban administrations Public transport authorities Cargo service customer
M	MIS / TM / UL	UL
M	Assumptions	UL-0xx3 v1 (Eco-drive Support Service) is applied. Fleet configuration data is available, freight statistics and average fuel consumption per vehicle and time of engine operation is available, CAN-Bus data and/or satellite positioning of location and speed profiles per second is available

M	Identified standards (not exhaustive list)	3GPP LTE DIN ISO 26000 (Sustainability guidelines), e.g. http://www.ecodrive.eu/en/service ISO 14001:2004 (Plan-Do-Check-Act, PDCA) Environment Management Norm CEN/TC 278/WG2 – I.T.S. standardization working group Freight, Logistics and Commercial Vehicle Operation EN16258: Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers) For the pilot site in Bordeaux the following French regulation (décrets) apply: The information on CO2 for transport services ia disposition from the French "Grenelle de l’environnement" debate. The obligation was introduced by an article of the law known as "Grenelle II", specified in article L1431-3 of the "Code des transports". There are three regulatory texts: - décret n° 2011-1336 of October 24, 2011 relative to the information of the quantity of CO2 emission for a transport service - l’arrêté of April 10 2012 on the application of artcles 5, 6 and 8 of décret n° 2011-1336 - l’arrêté of April 10 2012 on the application of artcles 14 of décret n° 2011-1336
M	Standardisation gaps identified	5. Voluntary action plans 6. Voluntary action plans 7. No C-I.T.S. classification 8. In-Vehicle data formats
	Recommended actions	Development of new standards to close gaps.
O	Other information	This Use Case is applied at seven CO-GISTICS pilot sites.

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Loading bays information and reservation services for logistical efficiency**
M	**Use Case reference /id**	**UL-0401 v1 20151124**
M	Description	Standardised booking system for referencing and booking loading bays Unsure if there is some additional requirement hidden in "for logistical efficiency"- need input from Opticities
M	Scope	Booking system for loading bays. Standardised identification system for loading bays.
M	Scenario	Last mile delivery/collection Booking system for loading bays. Standardised identification system for loading bays (Note loading bay reservation is not covered in UL 0213, and is related to UL 0221)
M	Actors Involved	Receivers/despatchers Urban administrations and their agents in-house or commercial consolidation centre/sorting offices loading bay owners truck operators Drivers
M	Stakeholders	Cargo owners Urban administrations and their agents in-house or commercial consolidation centre/sorting offices loading bay owners truck operators
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
	Recommended Actions	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	UL 0221, UL 0213
	Template Version	151021 PT1701 consensus
O	Open Issues	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Loading bays information and reservation services for specific freight vehicles -Measurement place**
M	**Use Case reference /id**	**UL-0501 v1 20151124**
M	Description	More information required from Opticities as to why this is a separate Use Case Measurement place: weight no of axles etc./ covered area/freight lines/limitations- time of day-day-size/ADR rules
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	Receivers/despatchers Urban administrations and their agents in-house or commercial consolidation centre/sorting offices loading bay owners truck operators Drivers UNECE JWG RID (re ADR)
M	Stakeholders	Cargo owners Urban administrations and their agents in-house or commercial consolidation centre/sorting offices loading bay owners truck operators
M	MIS / TM / UL	UL
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Recommended Actions	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	Closely related to UL 0401, UL o213, UL0221
	Template Version	151021 PT1701 consensus
O	Open Issues	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Cargo identification (inside urban zone)**
M	**Use Case reference /id**	**UL-0601 v1 20151124**
M	Description	Further information required as to the reason this idenitification is required and who by and if and why it is different to UL0102,UL 0108, UL 0209, Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Recommended Actions	
O	Requirements Reference	
O	Data Requirements	
O	Relationships to other "Use Case(s)"	UL0102,UL 0108, UL 0209,
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Cargo Identification – Dynamic**
M	**Use Case reference /id**	**UL-0602 v1 20151124**
M	Description	Further information required as to the reason this identification is different from UC 0601
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Business Rules	
	Template Version	151021 PT1701 consensus
O	Open Issues	

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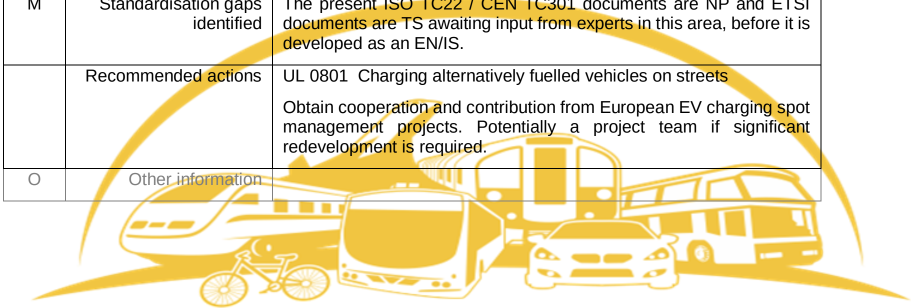
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Use of alternatively fuelled vehicles for urban logistics**
M	**Use Case reference /id**	**UL-0701 v1 20151124**
M	Description	Use of alternatively fuelled vehicles for urban logistics
M	Scope	This identified subject is a commercial and/or political decision it is not a subject for standardisation.
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	No standardisation action required
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
	Template Version	151021 PT1701 consensus
O	Open Issues	

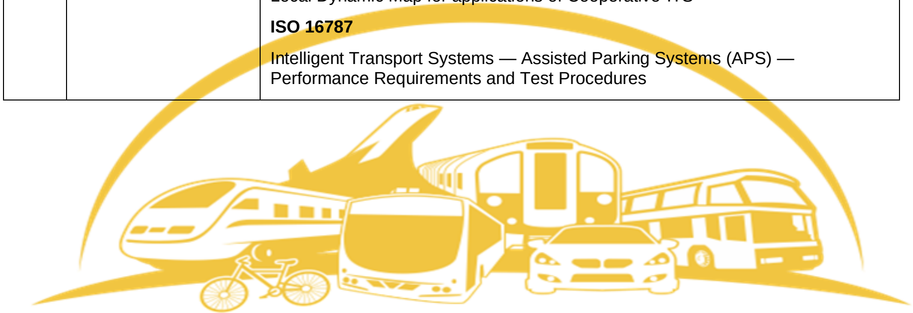
CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Charging alternatively fuelled vehicles on streets**
M	**Use Case reference /id**	**UL-0801 v1**
M	Description	Provision of information related to location, availability and pricing of alternatively fuelling stations (electric vehicles) placed along the streets and managed by specific operators or urban administrations.
M	Scenario	‘Charging Spot’(s) in the vicinity and/or surrounding areas on the travel of an electrical vehicle have a limited number of parking lots. Certain lots can be occupied and their availability in time has to be known in real time by each electric vehicle to be considered in their energy control strategies to optimize their route. Reservation and/or payment of a charging spot, are to be assumed also in such scenario.
M	Scope	Specifications for common communications and data exchange aspects for application service ‘Charging Spot access on street’.
M	Actors Involved	Urban administration Urban administrations Charging spot operator Vehicle driver or operator Traffic managers Trip planning service providers
M	Stakeholders	Urban administration Urban administrations Charging spot operator Vehicle driver
M	MIS / TM / UL	UL / TM
M	Assumptions	Such vehicle has one or more of C-ITS communications available: 2G, 3G, 4G/LTE, ITS-G5.
M	Identified standards (not exhaustive list)	ISO/NP 15118-xx Road vehicles -- Vehicle to grid communication interface. DATEX II ETSI TS 101 556-1 V1.1.1 (2012-07) -- Electric Vehicle Charging Spot Notification Specification ETSI TS 101 556-3 V1.1.1 (2014-10) -- Communications system for the planning and reservation of EV energy supply using wireless network
M	Standardisation gaps identified	The present ISO TC22 / CEN TC301 documents are NP and ETSI documents are TS awaiting input from experts in this area, before it is developed as an EN/IS.
	Recommended actions	UL 0801 Charging alternatively fuelled vehicles on streets Obtain cooperation and contribution from European EV charging spot management projects. Potentially a project team if significant redevelopment is required.
O	Other information	



CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Charging (e.g. during loading/unloading at the specific bays)**
M	**Use Case reference /id**	**UL-0901 v1 20151124**
M	Description	Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
O	Scenario #Scenario.	Series of numbered steps, starting at one, preferably in order needed to be carried out (high level)
O	Expected Outcomes	
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for light vehicles:** **Parking Availability in multimodal areas**
M	**Use Case reference /id**	**UL-1001 v1**
M	Description	Provision to drivers and travellers of information concerning the location of parking places and availability of parking spaces in the context of a multimodal trip planner.
M	Scope	Users may request this information before their trip or during their trip. In both cases existing parking places around a certain location either -indicated by the user (which may be driver/navigation system), or -according to the position of the driver. Requests to the urban logistics domain are addressed to get the actual availability of free parking spaces. This Use Case may be part of “Actual Trip Plan Delivery”. This information may be displayed on maps.
M	Actors Involved	Driver / traveller Traveller information providers Car park operators
M	Stakeholders	
M	MIS / TM / UL	UL / MIS
M	Assumptions	Such vehicle has one or more C-ITS communications available: 3G, 4G/LTE, ITS-G5.
M	Available Standards	Transmodel/NeTEx: for parking place retrieval ISO/TS 18234-7:2013 Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI) ISO/DTS 21219-14 Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI) CEN/TS 16157-6) DATEX II 2.3(Dec. 2014) evolutions for parking space availability for parking space availability
M	Standardisation gaps identified*	1) Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas car park operators deliver information about parking space availability using DATEX II. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged.
O	Other information	

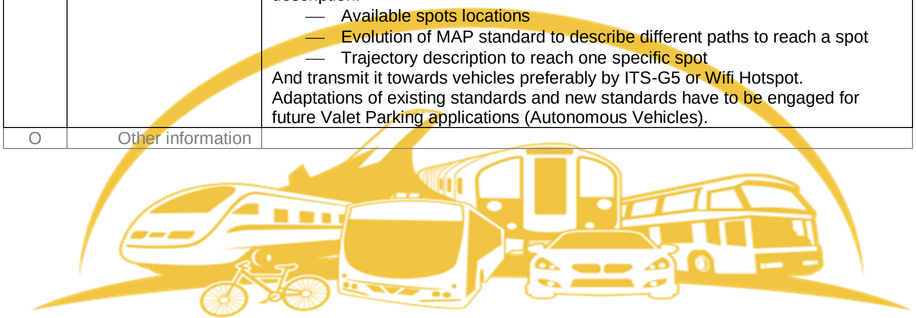
		CEN TC278 PT1701 USE CASE TEMPLATE
M	**Use Case Name**	**Intelligent parking for light vehicles:** **Off-street Parking Access and Availability**
M	**Use Case reference /id**	**UL-1002 v1**
M	Description	Provision to drivers of information concerning the location of parking places their availability, their cost by duration and the access to reach them.
M	Scope	Drivers request this information in real time around a destination point -indicated by the user (which may be driver or navigation system), -according to the position of the vehicle (map of free places) This information can be displayed on embedded maps.
M	Actors Involved	driver traveller information providers car park operators urban administration Urban administrations
M	Stakeholders	
M	MIS / TM / UL	UL / TM
M	Assumptions	Such vehicle has one or more C-ITS communications available: 3G, 4G/LTE, ITS-G5.
M	Available Standards	**ISO/TS 18234-7:2013** Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI) **ISO/DTS 21219-14** Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI) **CEN/TS 16157-6)** DATEX II 2.3(Dec. 2014) evolutions for parking space availability **ISO/TS 17931:2013** Intelligent transport systems -- Extension of map database specifications for Local Dynamic Map for applications of Cooperative-ITS **ISO 16787** Intelligent Transport Systems — Assisted Parking Systems (APS) — Performance Requirements and Test Procedures



M	Standardisation gaps identified*	Car park operators deliver information about parking space availability using DATEX II. 1/ An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. 2/ Development of standards based on ITS-G5 broadcasted services, to describe equivalent Local Dynamic Map elements related to : - Available places - Cost of parking lot €/hr - … And transmit it towards vehicles
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for light vehicles: On-street Parking Availability**
M	**Use Case reference /id**	**UL-1003 v1**
M	Description	Provision to drivers of information concerning the location of parking spots, their availability, their duration possibility and cost along the streets.
M	Scope	Drivers request this information in real time around a destination point -indicated by the user (which may be driver or navigation system), -according to the position of the vehicle (map of free places) This information can be displayed on embedded maps.
M	Actors Involved	Driver Traveller information providers Urban administration Urban administrations
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	Such vehicle has one or more C-ITS communications available: 3G, 4G/LTE, ITS-G5.
M	Available Standards	**ISO/TS 18234-7:2013** Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI) **ISO/DTS 21219-14** Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI) **CEN/TS 16157-6)** DATEX II 2.3(Dec. 2014) evolutions for parking space availability **ISO/TS 17931:2013** Intelligent transport systems -- Extension of map database specifications for Local Dynamic Map for applications of Cooperative-ITS **ISO 16787** Intelligent Transport Systems — Assisted Parking Systems (APS) —Performance Requirements and Test Procedures
M	Standardisation gaps identified*	1/ An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. 2/ Development of standards based on ITS-station broadcasted services, to describe equivalent local dynamic map elements related to : - Available spots - Locations of spots - Cost of parking spots (€/hr) - … And transmit it towards vehicles.
O	Other information	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for light vehicles: Parking spot internal access management**
M	**Use Case reference /id**	**UL-1004 v1**
M	Description	Provision to drivers of information concerning the location and the access trajectory of an available parking spot in a car park.
M	Scope	Vehicle receives from the car park infrastructure some information related to the best trajectory to reach an available spot: -chosen by the user or the car park and tacking in account some personal parameters (disabled person, luggage, ..) to facilitate access to pedestrian exit These trajectory indications can be displayed on embedded maps.
M	Actors Involved	Driver Car park operator Urban administrations
M	Stakeholders	
M	MIS / TM / UL	UL
M	Assumptions	Such vehicle has one or more C-ITS communications available: Wifi 11n, ITS-G5 and specific localization systems (no GNSS coverture).
M	Available Standards	**ISO/TS 18234-7:2013** Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI) **ISO/DTS 21219-14** Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI) **CEN/TS 16157-6)** DATEX II 2.3(Dec. 2014) evolutions for parking space availability **ISO/TS 17931:2013** Intelligent transport systems -- Extension of map database specifications for Local Dynamic Map for applications of Cooperative-ITS **ISO 16787** Intelligent Transport Systems — Assisted Parking Systems (APS) —Performance Requirements and Test Procedures
M	Standardisation gaps identified*	No standards for indoor positioning and navigation systems New elements to include in Local Dynamic Map related to a Car Park internal description: — Available spots locations — Evolution of MAP standard to describe different paths to reach a spot — Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. Adaptations of existing standards and new standards have to be engaged for future Valet Parking applications (Autonomous Vehicles).
O	Other information	



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CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**intelligent parking for light commercial vehicles**
M	**Use Case reference /id**	**UL-1101 v1 20151124**
M	Description	Objective and textual description
M	Scope	Limit and content of Use Case
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
O	Triggers	(or identify continuous operation)
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Intelligent parking for heavy goods vehicles**
M	**Use Case reference /id**	**UL-1201 v2 20160416**
M	Description	Intelligent parking for heavy goods vehicles
M	Scope	See UL0210 and UL 0227
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

CEN TC278 PT1701 USE CASE TEMPLATE		
M	**Use Case Name**	**Automated/autonomous vehicles in the Urban-ITS environment**
M	**Use Case reference /id**	**UL-1301 v1 20160416**
M	Description	Specific features and requirements to support automates/autonomous vehicles use in the urban-ITS paradigm
M	Scope	Urban-ITS specific protocols to support, maintain and enable automated/autonomous vehicle operation in an urban-ITS environment, or use automated/autonomous vehicle protocols to enhance provision of urban-ITS
M	Scenario	
M	Actors Involved	
M	Stakeholders	
M	MIS / TM / UL	Indicate areas involved
M	Assumptions	
M	Available Standards	
M	Standardisation gaps identified*	1) 2) etc
O	Data Requirements	
O	Relationships to other "Use Case(s)"	(when known [none is a possible answer])
	Template Version	151021 PT1701 consensus
O	Open Issues	

Technical Report: Intelligent Transport Systems

Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

Annex N References

N.1 Standards

European Committee for Standardization

EN 12896	Road transport and traffic telematics. Public transport. Reference data model (Transmodel)(2006)

Parts 1 to 3 have been issued under the number prEN12896-1:2015, prEN12896-2:2015, prEN12896-3:2015.

EN 15531	Public transport. Service interface for real-time information relating to public transport operations.(SIRI)
EN 15531-1:	Public transport. Service interface for real-time information relating to public transport operations - Business case
EN 15531-2:	Public transport. Service interface for real-time information relating to public transport operations – Communication
EN 15531-3 :	Public transport. Service interface for real-time information relating to public transport operations – Services
EN 15531-4:	Public transport. Service interface for real-time information relating to public transport operations - Facility monitoring service
CEN TS 15531-5:	Public transport. Service interface for real-time information relating to public transport operations- Situation exchange service

CEN/TS16157 DATEX/DATEX II

CEN/TS 16157-1:2011,	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 1: Context and framework
CEN/TS 16157-2:2011,	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing
CEN/TS 16157-3:2011,	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 3: Situation publication
CEN/TS 16157-4:2014,	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 4: Variable message sign publication
CEN/TS 16157-5:2014,	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part5: Measured and elaborated data publication
CEN/TS 16157-6:2015,	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 6: Parking publication

CEN TS16614-1 to 3:	Network and Timetable Exchange (NeTEx): data exchange format based on Transmodel relating to public transport planned data for network, timetable and fares.
CEN TS 16614-1:	Public transport. Network and Timetable Exchange (NeTEx). Part 1 - Public transport network topology exchange format
CEN TS 16614-2:	Public transport. Network and Timetable Exchange (NeTEx). Part 2 - Public transport scheduled timetables exchange format
CEN TS 16614-3:	Public transport. Network and Timetable Exchange (NeTEx). Part 3 - Public transport network fare information exchange forma
CEN/ISO TS 19091,	Intelligent Transport Systems - Cooperative-ITS - Using V2I and I2V Communications for Applications Related to Signalized Intersections (SPaT, MAP, SRM, SSM)
EN 28701: 2009 – I	Identification of Fixed Objects for Public transport (IFOPT): a complementary data model to Transmodel;
EN15531-1 to 4 and CEN TS15531-5:	Service Interface for Real-time Information (SIRI): data exchange format based on Transmodel relating to public transport operation

International Standards Organisation

ISO 6709	Standard representation of geographic point location by coordinates
ISO 7498	Information processing systems -- Open Systems Interconnection -- Basic Reference Model -- Part 2: Security Architecture
ISO/IEC 8824-1:2015	Information technology -- Abstract Syntax Notation One (ASN.1): Specification of basic notation
ISO/IEC 8824-2:2015	Information technology -- Abstract Syntax Notation One (ASN.1): Information object specification
ISO/IEC 8824-3:2015	Information technology -- Abstract Syntax Notation One (ASN.1): Constraint specification
ISO/IEC 8824-4:2015	Information technology -- Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications
ISO/IEC 8825-1:2015	Information technology -- ASN.1 encoding rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER) and Distinguished Encoding Rules (DER)
ISO/IEC 8825-2:2015	Information technology -- ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)
ISO/IEC 8825-3:2015	Information technology -- ASN.1 encoding rules: Specification of Encoding Control Notation (ECN)
ISO/IEC 8825-4:2015	Information technology -- ASN.1 encoding rules: XML Encoding Rules (XER)
ISO/IEC 8825-5:2015	Information technology -- ASN.1 encoding rules: Mapping W3C XML schema definitions into ASN.1

ISO/IEC 8825-6:2015	Information technology -- ASN.1 encoding rules: Registration and application of PER encoding instructions
ISO/IEC 8825-7:2015	Information technology -- ASN.1 encoding rules -- Part 7: Specification of Octet Encoding Rules (OER)
ISO 9735	Electronic data interchange for administration, commerce and transport (EDIFACT) -- Application level syntax rules
ISO 11067	Intelligent transport systems -- Curve speed warning systems (CSWS) -- Performance requirements and test procedures
ISO 11270	Intelligent transport systems -- Lane keeping assistance systems (LKAS) -- Performance requirements and test procedures
ISO/FDIS 14296:2015	Extension of map database specifications for applications of Cooperative-ITS
ISO IS14813-1:	Intelligent transport systems – Reference model architecture(s) for the ITS sector – Part 1: ITS service domains, service groups and services.
ISO IS14813-5	Intelligent transport systems – Reference model architecture(s) for the ITS sector – Part 5: Requirements for architecture descriptions in ITS standards
ISO 14813-6	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 6: Data presentation in ASN.1
ISO 14817-1	Intelligent transport systems – ITS central data dictionaries – Part 1: Requirements for ITS data definitions
ISO 14817-2	Intelligent transport systems – ITS central data dictionaries – Part 2: Governance of the Central ITS Data Concept Registry
ISO 14819-1:2013	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 1: Coding protocol for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C
ISO 14819-2:2013	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 2: Event and information codes for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C
ISO 14819-3:2013	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 3: Location referencing for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C
EN/ISO14825:2011	Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0
ISO 14827-1	Data interfaces between centres for transport information and control systems
ISO/IEC 15418	Information technology -- Automatic identification and data capture techniques -- GS1 Application Identifiers and ASC MH10 Data Identifiers and maintenance
ISO/IEC 15420	Information technology -- Automatic identification and data capture techniques -- EAN/UPC bar code symbology specification.
ISO/IEC 15394	Packaging -- Bar code and two-dimensional symbols for shipping, transport and receiving labels

ISO/IEC 15424	Information technology -- Automatic identification and data capture techniques -- Data Carrier Identifiers (including Symbology Identifiers)
ISO/IEC 15438	Information technology -- Automatic identification and data capture techniques -- PDF417 bar code symbology specification
ISO/IEC15459-1	Information technology -- Unique identifiers -- Part 1: Unique identifiers for transport units
ISO/IEC 15459-4	Information technology -- Unique identifiers -- Part 4: Individual items
ISO/IEC 15459-5	Information technology -- Unique identifiers -- Part 5: Unique identifier for returnable transport items (RTIs)
ISO 15622	Intelligent transport systems -- Adaptive Cruise Control systems -- Performance requirements and test procedures
ISO 15623	Intelligent transport systems -- Forward vehicle collision warning systems -- Performance requirements and test procedures
ISO 15784	Data exchange involving roadside modules ISO communication
ISO 15961	Information technology -- Radio frequency identification (RFID) for item management -- Data protocol: application interface
ISO 15962	Information technology -- Radio frequency identification (RFID) for item management -- Data protocol: data encoding rules and logical memory functions
ISO/IEC 16022	Information technology -- Automatic identification and data capture techniques -- Data Matrix bar code symbology specification
ISO/IEC 16023	Information technology -- International symbology specification -- MaxiCode
ISO/IEC 16388	Information technolog -- Automatic identification and data capture techniques -- Code 39 bar code symbology specification
ISO 16787 (DIS)	Intelligent Transport Systems -- Assisted Parking System (APS) - Performance requirements and test procedures
ISO 17185	is composed of the following parts: Part 1: Standards framework for public information systems; Part 2: Data and interface standards catalogue and cross reference; and Part 3: Use Cases for journey planning systems and their inter-operation.
ISO 17185-3	Intelligent transport systems -- Public transport user information -- Part 3: Use Cases for journey planning systems and their interoperation
ISO 17267:2009	Intelligent transport systems -- Navigation systems -- Application programming interface (API)
ISO 17363	Supply chain applications of RFID -- Freight containers
ISO 17364	Supply chain applications of RFID -- Returnable transport items (RTIs)
ISO 17365	Supply chain applications of RFID -- Transport units
ISO 17366	Supply chain applications of RFID -- Product packaging
ISO 17367	Supply chain applications of RFID -- Product tagging
ISO 17419	Intelligent transport systems -- Cooperative systems -- Classification and management of ITS applications in a global context

ISO 17423	Intelligent transport systems -- Cooperative systems -- ITS application requirements and objectives for selection of communication profilesISO TS 17427-1 Part 1: Intelligent Transport Systems – Cooperative-ITS- roles and responsibilities in C-ITS.
ISO TS 17426	Intelligent transport systems -- Cooperative systems -- Contextual speeds
ISO TS 17427	
ISO 17427-1 (in progress)	Intelligent transport systems -- Cooperative systems -- Roles and responsibilities in the context of Cooperative-ITS based on architecture(s) for cooperative systems
ISO TR 17427—2	Part 2: Intelligent Transport Systems – Cooperative-ITS- -Framework overview
ISO TR 17427—3	Part 3: : Intelligent Transport Systems – Cooperative-ITS- -Concept of operations (ConOps) for ‘Core’ systems [Technical Report]
ISO TR 17427—4	Part 4: : Intelligent Transport Systems – Cooperative-ITS- -Minimum system requirements and behaviour for core systems
ISO CD TR 17427-5	Intelligent transport systems -- Cooperative ITS -- Part 5: Common approaches to security
ISO TR 17427—6	Part 6: : Intelligent Transport Systems – Cooperative-ITS- -Core systems risk assessment methodology
ISO TR 17427—7	Part 7: : Intelligent Transport Systems – Cooperative-ITS- - Privacy aspects
ISO TR 17427—8	Part 8: Intelligent Transport Systems – Cooperative-ITS- - Liability aspects
ISO TR 17427—9	Part 9: Intelligent Transport Systems – Cooperative-ITS- -Compliance and enforcement aspects
ISO TR 17427—10	Part 10: Intelligent Transport Systems – Cooperative-ITS- Driver distraction and information display
ISO 17429	Intelligent transport systems -- Cooperative-ITS -- ITS station facilities for the transfer of information between ITS stations (in progress)
ISO 17438-1	Intelligent transport systems -- Indoor navigation for personal and vehicle ITS station -- Part 1: General information and Use Case definition
ISO 17438-2 AWI	Intelligent transport systems -- Indoor navigation for personal and vehicle ITS station -- Part 2: Indoor navigation for personal and vehicle ITS-stations
ISO 17452	Intelligent transport systems -- Using UML for defining and documenting ITS/TICS interfaces
ISO 17572-1	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 1: General requirements and conceptual model
ISO 17572-2	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 2: Pre-coded location references (pre-coded profile)
ISO 17572-3	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 3: Dynamic location references (dynamic profile)
ISO 17687	Transport Information and Control Systems (TICS) -- General fleet management and commercial freight operations -- Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous goods transportation

ISO/TS 17931:2013	Intelligent transport systems -- Extension of map database specifications for Local Dynamic Map for applications of Cooperative-ITS
ISO/IEC 18004	Information technology -- Automatic identification and data capture techniques -- QR Code 2005 bar code symbology specification
ISO/TS 18234-1.	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 1: Introduction, numbering and versions (TPEG1-INV)
ISO/TS 18234-2.	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 2: Syntax, semantics and framing structure (TPEG1-SSF)
ISO TS 18234 -4	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 4: Road Traffic Message (RTM) application
ISO TS 18234 -5	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 5: Public Transport Information (PTI) application
ISO/TS 18234-7	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI)
ISO 19091 AWI	Intelligent transport systems -- Cooperative ITS -- Using V2I and I2V communications for applications related to signalized intersections
ISO 19101	Geographic information -- Reference model (various parts)
ISO 19116	Geographic information -- Positioning services
ISO 19136	Geographic information -- Geography Markup Language (GML)
ISO 19147	Geographic information -- Transfer Nodes
ISO CD 19237	Intelligent transport systems -- Pedestrian collision mitigation systems -- Operation, performance, and verification requirements
ISO 19297 AWI	Shareable geospatial database for ITS applications
ISO 19404	Architecture of signal control systems using V2I information
ISO 19501	Information technology -- Open Distributed Processing -- Unified Modeling Language (UML)
ISO 19638	Intelligent transport systems -- Road Boundary Departure Prevention Systems (RBDPS) -- Performance requirements and test procedures
ISO 20035 AWI	Intelligent transport systems -- Cooperative adaptive cruise control (CACC) -- Operation, performance and verification requirements
ISO/TS 20452:2007	Requirements and Logical Data Model for a Physical Storage Format (PSF) and an Application Program Interface (API) and Logical Data Organization for PSF used in Intelligent Transport Systems (ITS) Database Technology
ISO 21196	Intelligent transport systems- Cooperative-ITS - Secure sessions (in progress)

ISO 21210	Intelligent transport systems -- Communications access for land mobiles (CALM) -- IPv6 Networking
ISO 21217	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Architecture
ISO/DTS 21219-14	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI)
ISO/TS 21219 Parts 21,22,23	Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) - part 21,22, 23
ISO/TR 21707	Intelligent transport systems -- Integrated transport information, management and control -- Data quality in ITSs
ISO/IEC/IEEE 21450	Information technology -- Smart transducer interface for sensors and actuators -- Common functions, communication protocols, and Transducer Electronic Data Sheet (TEDS) formats
ISO/IEC 21451-2	Information technology -- Smart transducer interface for sensors and actuators -- Part 2: Transducer to microprocessor communication protocols and Transducer Electronic Data Sheet (TEDS) formats
ISO/IEC 21451-4	Information technology -- Smart transducer interface for sensors and actuators -- Part 4: Mixed-mode communication protocols and Transducer Electronic Data Sheet (TEDS) formats
ISO 22179	Intelligent transport systems -- Full speed range adaptive cruise control (FSRA) systems -- Performance requirements and test procedure
ISO 22742	Packaging -- Linear bar code and two-dimensional symbols for product packaging
ISO 24102.6	Intelligent transport systems – Cooperative-ITS - Flow and Path Management (in progress)
ISO TR24529	Intelligent transport systems – Systems architecture – Use of 'Unified Modelling Language' in ITS International Standards and deliverables
ISO TR 24531	Intelligent transport systems -- System architecture, taxonomy and terminology -- Using XML in ITS standards, data registries and data dictionaries
ISO TR 24532	Intelligent transport systems -- Systems architecture, taxonomy and terminology -- Using CORBA (Common Object Request Broker Architecture) in ITS standards, data registries and data dictionaries
ISO 24533	Intelligent Transport Systems — Data dictionary and message set to facilitate the movement of freight and its intermodal transfer — Road transport information exchanges
ISO TR 25100	Intelligent transport systems -- Systems architecture -- Harmonization of ITS data concepts [Technical Report]
ISO TR 25102	Intelligent transport systems -- System architecture -- 'Use Case' pro-forma template [Technical Report]
ISO 26262-1	Road vehicles -- Functional safety -- Part 1: Vocabulary
ISO 26262-2	Road vehicles -- Functional safety -- Part 2: Management of functional safety

ISO 26262-3	Road vehicles -- Functional safety -- Part 3: Concept phase
ISO 26262-4	Road vehicles -- Functional safety -- Part 4: Product development at the system level
ISO 26262-5	Road vehicles -- Functional safety -- Part 5: Product development at the hardware level
ISO 26262-6	Road vehicles -- Functional safety -- Part 6: Product development at the software level
ISO 26262-7	Road vehicles -- Functional safety -- Part 7: Production and operation
ISO 26262-8	Road vehicles -- Functional safety -- Part 8: Supporting processes
ISO 26262-9	Road vehicles -- Functional safety -- Part 9: Automotive Safety Integrity Level (ASIL)-oriented and safety-oriented analyses
ISO 26262-10	Road vehicles -- Functional safety -- Part 10: Guideline on ISO 26262
ISO CD 26262-11	Road vehicles -- Functional safety -- Part 11: Application of concepts for semiconductors
ISO CD 26262-12	Road vehicles -- Functional safety -- Part 12: Adaptation for motorcycles
ISO 26684	Intelligent transport systems (ITS) -- Cooperative intersection signal information and violation warning systems (CIWS) -- Performance requirements and test procedures
ISO TR26999	Intelligent transport systems – Systems architecture – Use of Process Orientated Methodology in ITS International Standards and deliverables
ISO 28219	Packaging -- Labelling and direct product marking with linear bar code and two-dimensional symbols

ISO/IEC/IEEE 42010:2011 Systems and software engineering — Architecture description

International Electrotechnical Commission

IEC 61375	Electric railway equipment – Train bus –Part 1: Train communication network
IEC 62580	Electronic railway equipment – On-board multimedia and telematic subsystems for railways –Part 1: General architecture

European Telecommunications Standards Institute

ETSI TS 101 539-1	Intelligent Transport Systems (ITS); V2X Applications; Part 1: Road Hazard Signalling (RHS) application requirements specification
ETSI TS 101 539-2	Intelligent Transport System (ITS); V2X Applications; Intersection Collision Risk Warning (ICRW) application requirements specification
ETSI TS 101 539-3	Intelligent Transport Systems (ITS); V2X Applications; Part 3: Longitudinal Collision Risk Warning (LCRW) application requirements specification

ETSI TS 101 556-1	Intelligent Transport Systems (ITS); Infrastructure to Vehicle Communication; Electric Vehicle Charging Spot Notification Specification –
ETSI TS 101 556-3	Intelligent Transport Systems (ITS); Infrastructure to Vehicle Communications; Part 3: Communications system for the planning and reservation of EV energy supply using wireless networks
ETSI TR 103 298	Intelligent Transport Systems (ITS); Platooning; Pre-standardization study
ETSI TR 103 299	Intelligent Transport System (ITS); Cooperative Adaptive Cruise Control (C-ACC); Pre-standardization study
ETSI TR 103 300	Intelligent Transport System (ITS); Cooperative Vulnerable Road Users (VRU); Study of Use Cases and standardization perspectives
ETSI EN 302 665	Intelligent Transport Systems (ITS); Communications Architecture
ETSI EN 302 637-1	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 1: Functional Requirements (Cooperative Awareness Message (CAM))
ETSI EN 301 637 -2	Intelligent Transport Systems (ITS); Decentralised Environmental Notification Message (DENV)
ETSI EN 301 637 -3	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service
ETSI EN 302 895	Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM)

Institute of Electrical and Electronics Engineers

IEEE P1609.3	Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services
IEEE 802.11	Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications
IEEE P1609 var parts	IEEE Guide for Wireless Access in Vehicular Environments (WAVE)

Society of Automotive Engineers

SAE J2735	Dedicated Short Range Communications (DSRC) Message Set Dictionary
SAE2945	Dedicated Short Range Communication (DSRC) Minimum Performance Requirements

Internet Engineering Task Force

RFC 2460	Internet Protocol, Version 6 (IPv6) Specification

RFC 3470	Guidelines for the Use of Extensible Markup Language (XML) within IETF Protocols
RFC 3587	IPv6 Global Unicast Address Format
RFC 3917	Requirements for IP Flow Information Export (IPFIX)
RFC 3963	Network Mobility (NEMO) Basic Support Protocol
RFC 4291	IP Version 6 Addressing Architecture
RFC 4294	IPv6 Node Requirements
RFC 4493	The AES-CMAC Algorithm
RFC 4861	Neighbor Discovery for IP Version 6 (IPv6)
RFC 4862	IPv6 Stateless Address Autoconfiguration
RFC 5648	Multiple Care-of Addresses Registration
RFC 7303	XML Media Types

Regional / Local standards

Regional: OCIT-*Instation*s/OTS system model (architecture)

Regional: OCIT-*Instation*s VD - OCIT-I_VD-DM-LSA

Regional: OCIT-C, intersection_config_data

Regional: OCIT-*Outstation*s

UK: Urban Traffic Management Control UTMC programme

N.2 Legislation and Regulations

COMMISSION IMPLEMENTING DECISION "on a standardisation request to the European standardisation organisations as regards Intelligent Transport Systems (ITS) In urban areas in support of Directive 2010/40/EU of the European Parliament and of the Council of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport"

Article 291 of the Treaty on the Functioning of the European Union allows the Commission to adopt implementing measures for a legal act when uniform conditions of implementation are necessary. The basic legal act must explicitly confer on the Commission the power to adopt implementing acts.

Regulation (EU) No 182/2011 of the European Parliament and of the Council of 16 February 2011 laying down the rules and general principles concerning mechanisms for control by Member States of the Commission's exercise of implementing powers. (Commission Implementing Decisions)

DIRECTIVE 2010/40/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 7 July 2010 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport

Standardisation request M/453 Standardisation Mandate addressed to CEN and ETSI in the field of information and communication technologies to support the interoperability of co-operative systems for intelligent transport in the European Community

Deployment of Intelligent Transport Systems {ITS) in Europe (Dec 2008) [1]

Directive 2010/40/EU: Framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport (Aug 2010) [2];

INSPIRE Metadata Regulation 03.12.2008
Commission Decision regarding INSPIRE monitoring and reporting 05.06.2009

Commission Regulation (EC) No 976/2009 of 19 October 2009 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards the Network Services 19.10.2009
Corrigendum to INSPIRE Metadata Regulation 15.12.2009

Regulation on INSPIRE Data and Service Sharing 29.03.2010

COMMISSION REGULATION (EU) No 1089/2010 of 23 November 2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services 08.12.2010
Commission Regulation (EU) No 1089/2010 as regards interoperability of spatial data sets and services 08.12.2010
Commission Regulation amending Regulation (EC) No 976/2009 as regards download services and transformation service 08.12.2010

COMMISSION REGULATION (EU) No 102/2011 of 4 February 2011 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data sets and services 05.02.2011

COMMISSION REGULATION (EU) No 1253/2013 of 21 October 2013 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC as regards interoperability of spatial data sets and services 10.12.2013

Commission Regulation (EU) No 1311/2014 of 10 December 2014 amending Regulation (EC) No 976/2009 as regards the definition of an INSPIRE metadata element 11.12.2014

Commission Regulation (EU) No 1311/2014 of 10 December 2014 amending Regulation (EC) No 976/2009 as regards the definition of an INSPIRE metadata element 11.12.2014

Commission Regulation (EU) No 1312/2014 of 10 December 2014 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data services 11.12.2014

Commission Regulation (EU) No 1312/2014 of 10 December 2014 amending Regulation (EU) No 1089/2010 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards interoperability of spatial data services 11.12.2014

Horizon 2020: Financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative for Research and Innovation, aimed at securing Europe's global competitiveness.

Technical Report: Intelligent Transport Systems
Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

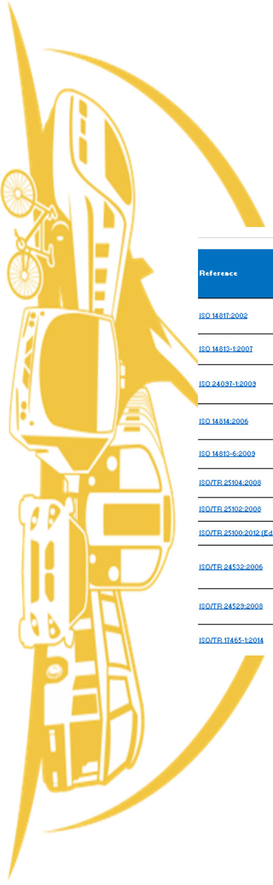
Annex O Principal existing ITS Standards

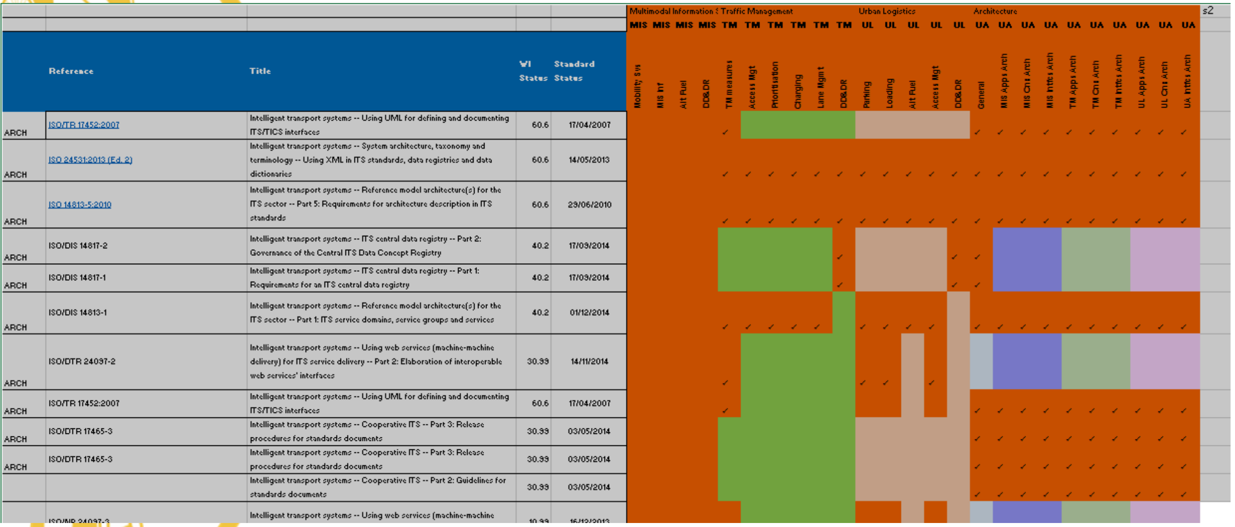
PT1701 acknowledge ERTICO and ETSI as the source of much of the material in this Annex and thank them for making the material available to the pre-study.

The following pages list known principal existing standards, and identify which of the CID parameters they may assist.

s1

Reference	Title	WI Status	Standard Status	Multimodal Informa				Traffic Management						Urban Logistics					Architecture									
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
				Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cnt Arch	MIS Intfcs Arch	TM Apps Arch	TM Cnt Arch	TM Intfcs Arch	UL Apps Arch	UL Cnt Arch	UA Intfcs Arch
ISO 14817:2002	Transport information and control systems -- Requirements for an ITS/TICS central Data Registry and ITS/TICS Data Dictionaries	**90.9**	**16/12/2013**	✓	✓		✓						✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 14813-1:2007	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 1: ITS service domains, service groups and services	90.92	08/09/2010	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO 24097-1:2009	Intelligent transport systems -- Using web services (machine-machine delivery) for ITS service delivery -- Part 1: Realization of interoperable web services	90.2	15/07/2014		✓		✓	✓					✓	✓	✓			✓	✓	✓		✓	✓		✓	✓		✓
ISO 14814:2006	Road transport and traffic telematics -- Automatic vehicle and equipment identification -- Reference architecture and terminology	90.2	15/07/2014																✓									
ISO 14813-6:2009	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 6: Data presentation in ASN.1	90.2	15/07/2014	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO/TR 25104:2008	Intelligent transport systems -- System architecture, taxonomy, terminology and data modelling -- Training requirements for ITS architecture	60.6	28/01/2008																✓									
ISO/TR 25102:2008	Intelligent transport systems -- System architecture -- 'Use Case' pro-forma template	60.6	07/02/2008	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓			✓			✓			✓		
ISO/TR 25100:2012 (Ed. 2)	Intelligent transport systems -- Systems architecture -- Harmonization of ITS data concepts	60.6	13/09/2012	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO/TR 24532:2006	Intelligent transport systems -- Systems architecture, taxonomy and terminology -- Using CORBA (Common Object Request Broker Architecture) in ITS standards, data registries and data dictionaries	60.6	09/06/2006				✓						✓					✓										
ISO/TR 24529:2008	Intelligent transport systems -- Systems architecture -- Use of unified modelling language (UML) in ITS International Standards and deliverables	60.6	08/04/2008																✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ISO/TR 17465-1:2014	Intelligent transport systems -- Cooperative ITS -- Part 1: Terms and definitions	60.6	16/10/2014					✓		✓		✓							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓





					Multimodal Information S				Traffic Management						Urban Logistics					Architecture										s2
					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
ARCH	ISO/TR 17452:2007	Intelligent transport systems -- Using UML for defining and documenting ITS/TICS interfaces	60.6	17/04/2007					✓											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ARCH	ISO 24531:2013 (Ed. 2)	Intelligent transport systems -- System architecture, taxonomy and terminology -- Using XML in ITS standards, data registries and data dictionaries	60.6	14/05/2013					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ARCH	ISO 14813-5:2010	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 5: Requirements for architecture description in ITS standards	60.6	29/06/2010					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ARCH	ISO/DIS 14817-2	Intelligent transport systems -- ITS central data registry -- Part 2: Governance of the Central ITS Data Concept Registry	40.2	17/09/2014										✓					✓	✓										
ARCH	ISO/DIS 14817-1	Intelligent transport systems -- ITS central data registry -- Part 1: Requirements for an ITS central data registry	40.2	17/09/2014										✓					✓	✓										
ARCH	ISO/DIS 14813-1	Intelligent transport systems -- Reference model architecture(s) for the ITS sector -- Part 1: ITS service domains, service groups and services	40.2	01/12/2014					✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ARCH	ISO/DTR 24097-2	Intelligent transport systems -- Using web services (machine-machine delivery) for ITS service delivery -- Part 2: Elaboration of interoperable web services' interfaces	30.99	14/11/2014					✓						✓	✓		✓												
ARCH	ISO/TR 17452:2007	Intelligent transport systems -- Using UML for defining and documenting ITS/TICS interfaces	60.6	17/04/2007					✓											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ARCH	ISO/DTR 17465-3	Intelligent transport systems -- Cooperative ITS -- Part 3: Release procedures for standards documents	30.99	03/05/2014																✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ARCH	ISO/DTR 17465-3	Intelligent transport systems -- Cooperative ITS -- Part 3: Release procedures for standards documents	30.99	03/05/2014																✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
		Intelligent transport systems -- Cooperative ITS -- Part 2: Guidelines for standards documents	30.99	03/05/2014																✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	ISO/NP 24097-3	Intelligent transport systems -- Using web services (machine-machine	10.99	16/12/2013																										

					Multimodal Information §				Traffic Management						Urban Logistics					Architecture										s3
					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttfcs Arch	TM Apps Arch	TM Cns Arch	TM Inttfcs Arch	UL Apps Arch	UL Cns Arch	UA Inttfcs Arch	
ARCH	ISO/NP 14813-4	Transport information and control systems -- Reference model architecture(s) for the TICS sector -- Part 4: Reference model tutorial	10.99	18/02/2014																										
ARCH	ISO/NP 14813-3	Transport information and control systems -- Reference model architecture(s) for the TICS sector -- Part 3: Example elaboration	10.99	18/02/2014																										
ARCH	ISO/NP 14813-2	Transport information and control systems -- Reference model architecture(s) for the TICS sector -- Part 2: Core TICS reference architecture	10.99	17/02/2014																										
ARCH	ISO/NP 14817-3	Intelligent transport systems -- ITS central data registry and data dictionaries -- Part 3: Object identifier assignments for ITS data concepts	10.6	27/10/2014				✓						✓					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ARCH	ISO/NP 13189	Business Case Template for ITS Projects	10	31/08/2010	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
AVI	EN ISO 14814:2006	Road transport and traffic telematics - Automatic vehicle and equipment identification - Reference architecture and terminology (ISO 14814:2006)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 14815:2005	Road transport and traffic telematics - Automatic vehicle and equipment identification - System specifications (ISO 14815:2005)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 14815:2005	Road transport and traffic telematics - Automatic vehicle and equipment identification - System specifications (ISO 14815:2005)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 14816:2005	Road transport and traffic telematics - Automatic vehicle and equipment identification - Numbering and data structure (ISO 14816:2005)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 14816:2005/prA1 (WI=00278384)	Road transport and traffic telematics - Automatic vehicle and equipment identification - Numbering and data structure - Amendment 1	Under Drafting	Not Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 17261:2012	Intelligent transport systems - Automatic vehicle and equipment identification - Intermodal goods transport architecture and terminology (ISO 17261:2012)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													

					Multimodal Information				Traffic Management						Urban Logistics					Architecture										s4
					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inftcs Arch	TM Apps Arch	TM Cns Arch	TM Inftcs Arch	UL Apps Arch	UL Cns Arch	UA Inftcs Arch	
AVI	*EN ISO 17262:2012*	*Intelligent transport systems - Automatic vehicle and equipment identification - Numbering and data structures (ISO 17262:2012)*	*Active*	*Published*	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 17262:2012/AC: 2013	Intelligent transport systems - Automatic vehicle and equipment identification - Numbering and data structures - Technical Corrigendum 1 (ISO 17262:2012/Cor 1:2013)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 17262:2012/prA1 (WI=00278385)	Intelligent transport systems - Automatic vehicle and equipment identification - Numbering and data structures - Amendment 1	Under Drafting	Not Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 17263:2012	Intelligent transport systems - Automatic vehicle and equipment identification - System parameters (ISO 17263:2012)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 17263:2012/AC: 2013	Intelligent transport systems - Automatic vehicle and equipment identification - System parameters - Technical Corrigendum 1 (ISO 17263:2012/Cor 1:2013)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 17264:2009	Intelligent transport systems - Automatic vehicle and equipment identification - Interfaces (ISO 17264:2009)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 17264:2009/prA1 (WI=00278386)	Intelligent transport systems - Automatic vehicle and equipment identification - Interfaces - Amendment 1	Under Drafting	Not Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 24534-1:2010	Automatic vehicle and equipment identification - Electronic Registration Identification (ERI) for vehicles - Part 1: Architecture (ISO 24534-1:2010)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 24534-2:2010	Automatic vehicle and equipment identification - Electronic Registration Identification (ERI) for vehicles - Part 2: Operational requirements (ISO 24534-2:2010)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 24534-3:2010	Automatic vehicle and equipment identification - Electronic Registration Identification (ERI) for vehicles - Part 3: Vehicle data (ISO 24534-3:2010)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
AVI	EN ISO 24534-4:2010	Automatic vehicle and equipment identification - Electronic Registration Identification (ERI) for vehicles - Part 4: Secure communications using asymmetrical techniques (ISO 24534-4:2010)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													

					Mult	0	0	0	Traf	0	0	0	0	0	Urb:	0	0	0	0	Arch	0	0	0	0	0	0	0	0	0	s5
					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttcs Arch	TM Apps Arch	TM Cns Arch	TM Inttcs Arch	UL Apps Arch	UL Cns Arch	UA Inttcs Arch	
AVI	prEN ISO 19061 (WI=00278354)	Intelligent transport systems - Automatic Vehicle and Equipment Registration (AVI/AEI) - Interoperable application profile for AVI/AEI and Electronic Register Identification using dedicated short range communication	Under Drafting	Not Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓													
COM	EN 12253:2004	Road transport and traffic telematics - Dedicated short-range communication - Physical layer using microwave at 5,8 GHz	Active	Published						✓		✓			✓			✓												
COM	EN 12795:2003	Road transport and traffic telematics - Dedicated Short Range Communication (DSRC) - DSRC data link layer: medium access and logical link control	Active	Published						✓		✓			✓			✓												
COM	EN 12834:2003	Road transport and traffic telematics - Dedicated Short Range Communication (DSRC) - DSRC application layer	Active	Published						✓		✓			✓			✓												
COM	EN 13372:2004	Road Transport and Traffic Telematics (RTTT) - Dedicated short-range communication - Profiles for RTTT applications	Active	Published						✓		✓			✓			✓												
COM	ISO 24103:2009	**Intelligent transport systems -- Communications access for land mobiles (CALM) -- Media adapted interface layer (MAIL)**	**90.9**	**14/11/2014**																										
COM	ISO/TS 25114:2010	Intelligent transport systems -- Probe data reporting management (PDRM)	90.92	26/04/2011	✓	✓			✓																					
COM	ISO 24102:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Management	90.92	13/02/2012	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 22837:2009	Vehicle probe data for wide area communications	90.92	26/04/2011	✓	✓			✓																					
COM	ISO 21214:2006	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Infra-red systems	90.92	11/04/2008	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 24101-1:2008	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Application management -- Part 1: General requirements	90.6	17/06/2011	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												

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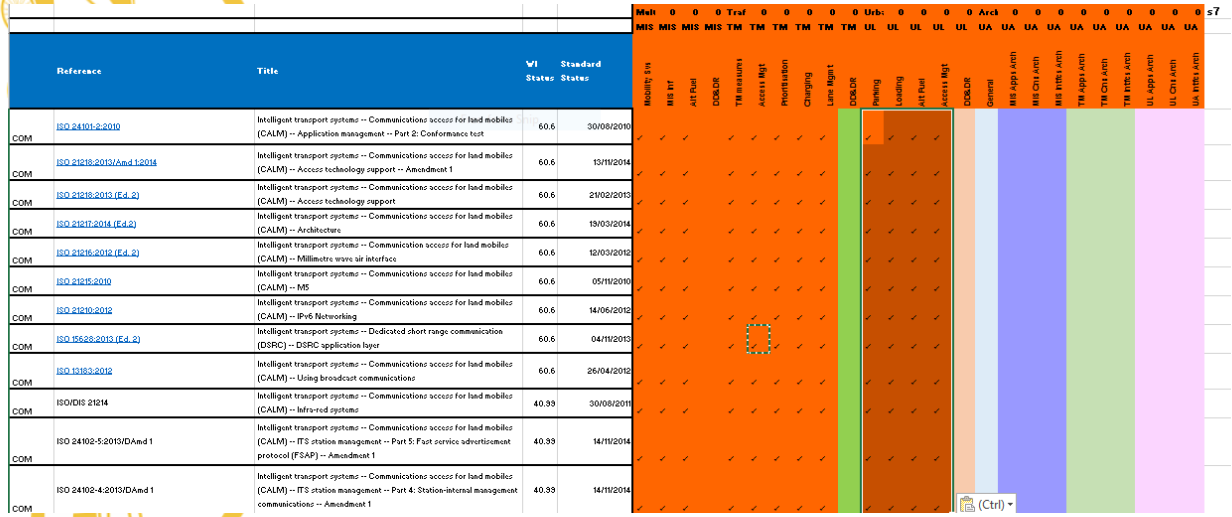
					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cm Arch	MIS Inttfcs Arch	TM Apps Arch	TM Cm Arch	TM Inttfcs Arch	UL Apps Arch	UL Cm Arch	UA Inttfcs Arch	
COM	ISO 21212:2008	Intelligent transport systems -- Communications access for land mobiles (CALM) -- 2G Cellular systems	90.6	17/03/2012	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 15662:2006	Intelligent transport systems -- Wide area communication -- Protocol management information	90.6	17/09/2014																										
COM	ISO 25111:2009	Intelligent transport systems -- Communications access for land mobiles (CALM) -- General requirements for using public networks	90.20	15/10/2014	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 24978:2009	Intelligent transport systems -- ITS Safety and emergency messages using any available wireless media -- Data registry procedures	90.2	15/07/2014																✓										
COM	ISO/TS 29284:2012	Intelligent transport systems -- Event-based probe vehicle data	60.6	13/12/2012	✓	✓			✓																					
COM	ISO 25113:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Mobile wireless broadband using HC-SDMA	60.6	25/02/2010	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 25112:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Mobile wireless broadband using IEEE 802.16	60.6	25/02/2010	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 24102-5:2013	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 5: Fast service advertisement protocol (FSAP)	60.6	24/06/2013	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 24102-4:2013	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 4: Station-internal management communications	60.6	24/06/2013	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 24102-3:2013	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 3: Service access points	60.6	24/06/2013	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 24102-1:2013	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 1: Local management	60.6	24/06/2013	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												



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					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
COM	ISO 24101-2:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Application management -- Part 2: Conformance test	60.6	30/08/2010	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 21218:2013/Amd 1:2014	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Access technology support -- Amendment 1	60.6	13/11/2014	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 21218:2013 (Ed. 2)	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Access technology support	60.6	21/02/2013	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 21217:2014 (Ed.2)	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Architecture	60.6	19/03/2014	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 21216:2012 (Ed. 2)	Intelligent transport systems -- Communication access for land mobiles (CALM) -- Millimetre wave air interface	60.6	12/03/2012	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 21215:2010	Intelligent transport systems -- Communications access for land mobiles (CALM) -- M5	60.6	05/11/2010	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 21210:2012	Intelligent transport systems -- Communications access for land mobiles (CALM) -- IPv6 Networking	60.6	14/06/2012	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 15628:2013 (Ed. 2)	Intelligent transport systems -- Dedicated short range communication (DSRC) -- DSRC application layer	60.6	04/11/2013	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 13183:2012	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Using broadcast communications	60.6	26/04/2012	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO/DIS 21214	Intelligent transport systems -- Communications access for land mobiles (CALM) -- Infra-red systems	40.99	30/08/2011	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 24102-5:2013/DAmd 1	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 5: Fast service advertisement protocol (FSAP) -- Amendment 1	40.99	14/11/2014	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
COM	ISO 24102-4:2013/DAmd 1	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 4: Station-internal management communications -- Amendment 1	40.99	14/11/2014	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												

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					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cnt Arch	MIS Infrs Arch	TM Apps Arch	TM Cnt Arch	TM Infrs Arch	UL Apps Arch	UL Cnt Arch	UA Infrs Arch	
COM	ISO 24102-3:2013/DAmd 1	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 3: Service access points -- Amendment 1	40.99	14/11/2014	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓													
COM	ISO 24102-1:2013/DAmd 1	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 1: Local management -- Amendment 1	40.99	14/11/2014	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓													
COM	ISO 21210:2012/DAmd 1	Intelligent transport systems -- Communications access for land mobiles (CALM) -- IPv6 Networking -- Amendment 1	40.99	10/07/2014	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓													
COM	ISO/DIS 24102-2	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 2: Remote management of ITS-SCUs	40.20	13/11/2014	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓													
COM	ISO/DIS 17515-1	Intelligent transport systems -- Communications access for land mobiles (CALM) - Evolved Universal Terrestrial Radio Access Network (E-UTRAN) -- Part 1: General usage	40.20	08/10/2014	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓													
COM	ISO/CD 19080	Intelligent Transport Systems -- Communications access for land mobiles (CALM) - CoAP facility	30.99	24/03/2014	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓													
COM	ISO/CD 19079	Intelligent Transport Systems -- Communications access for land mobiles (CALM) -- 6LoWPAN networking	30.99	24/03/2014	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓													
COM	ISO/AWI 18317	Intelligent transport systems -- Pre-emption of ITS communication networks for disaster relief and emergency communications	20	28/07/2014																										
COM	ISO/NP 24102-6	Intelligent transport systems -- Communications access for land mobiles (CALM) -- ITS station management -- Part 6: Path and flow management	10.99	07/06/2012	✓	✓	✓		✓	✓	✓	✓			✓	✓	✓													
COM	ISO/NP TS 25114	Intelligent transport systems -- Probe data reporting management (PDRM)	10	26/04/2011	✓				✓																					
COM	ISO/NP 22837	Vehicle probe data for wide area communications	10	26/04/2011																										

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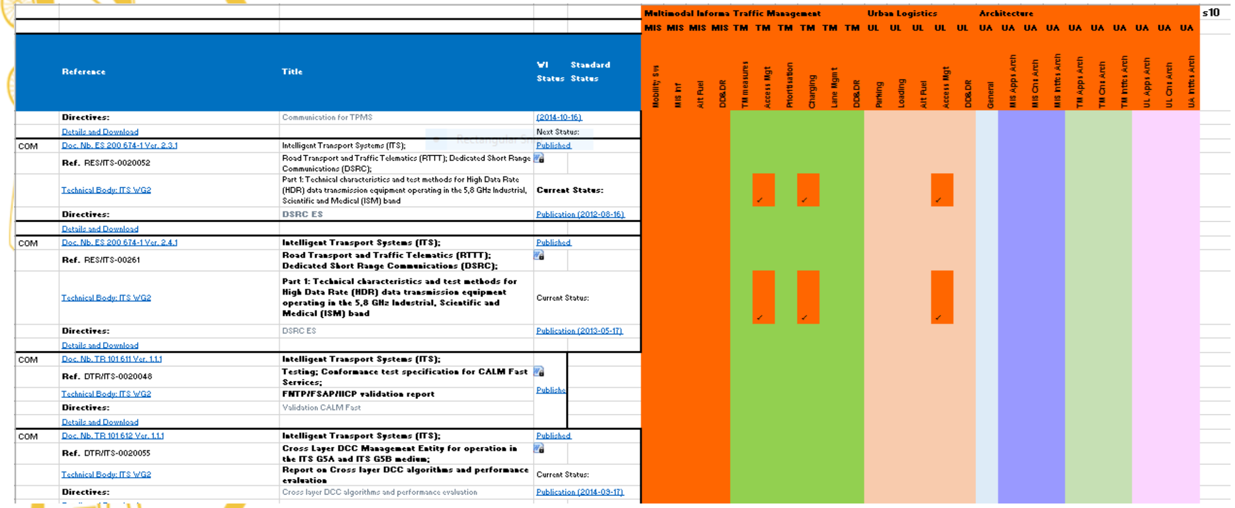
	Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
COM	ISO/NP 18380	Intelligent Transport Systems -- Communications access for land mobiles (CALM) - IPv4-IPv6 interoperability	10	07/06/2012																										
COM	ISO/NP 18378	Intelligent Transport Systems -- Communications access for land mobiles (CALM) - Multicast	10	07/06/2012																										
COM	ISO/NP 18376	Intelligent Transport Systems -- Criteria for Privacy and Integrity protection in Probe Vehicle Information Systems	10	07/06/2012	✓				✓																					
COM	IEEE 1609.2-2013 Standard for Wireless Access in Vehicular Environments - Security Services for Applications and Management Messages:																													
COM	IEEE 1609.3-2010 Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services:																													
COM	IEEE 1609.4-2010 Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation:																													
COM	IEEE 1609.12-2012 Standard for Wireless Access in Vehicular Environments (WAVE) - Identifier Allocations:																													
COM	IEEE 802.11-2012 Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification:																													
COM	IEEE 1609.0-2013 Standard for Wireless Access in Vehicular Environments (WAVE) - Architecture:																													
COM	IEEE 1609.11 - 2010 Standard for Wireless Access in Vehicular Environments (WAVE)-- Over-the-Air Electronic Payment Data Exchange Protocol for Intelligent Transportation Systems (ITS):																													
COM	Doc. Nb. TS 101 556-2 Ver. 0.0.6	**Intelligent Transport Systems (ITS);**	Drafting Stage																											
i2V	**Ref.** DTS/ITS-0010030	**Infrastructure to Vehicle Communication;**	Current Status:																											
	Technical Body: ITS WG1	**Part 2: Communication system specification to support application requirements for Tyre Pressure Monitoring System (TPMS)**	Start of pre-processing																											
	Directives:	Communication for TPMS	(2014-10-16)																											



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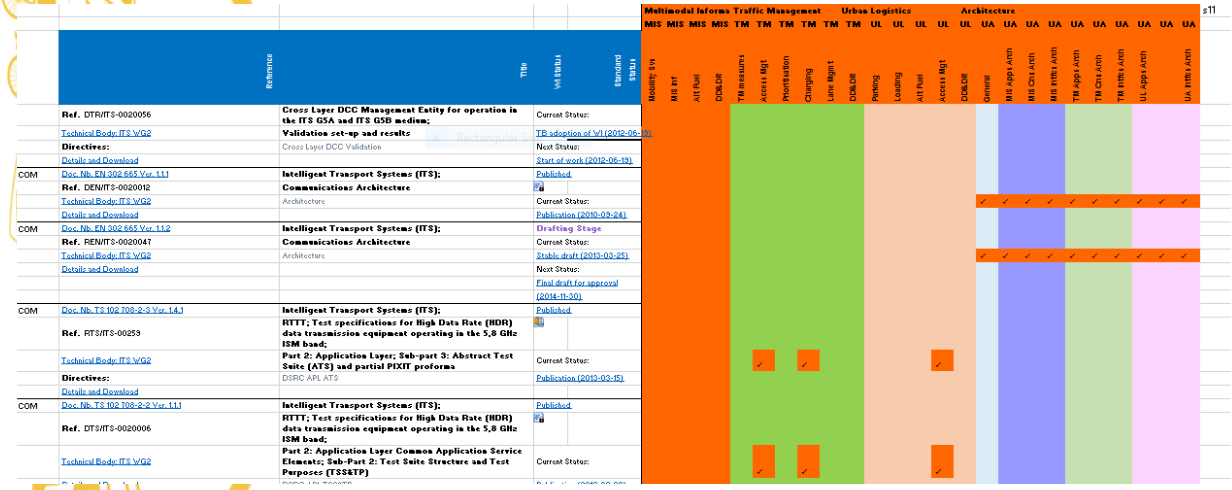
					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
	Directives:	Communication for TPMS	(2014-10-16)																											
	Details and Download		Next Status:																											
COM	Doc. Nb. ES 200 674-1 Ver. 2.3.1	Intelligent Transport Systems (ITS);	Published																											
	Ref. RES/ITS-0020052	Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communications (DSRC);																												
	Technical Body: ITS WG2	Part 1: Technical characteristics and test methods for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band	**Current Status:**							✓		✓						✓												
	Directives:	DSRC ES	Publication (2012-08-16)																											
	Details and Download																													
COM	Doc. Nb. ES 200 674-1 Ver. 2.4.1	**Intelligent Transport Systems (ITS);**	Published																											
	Ref. RES/ITS-00261	**Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communications (DSRC);**																												
	Technical Body: ITS WG2	**Part 1: Technical characteristics and test methods for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band**	Current Status:							✓		✓						✓												
	Directives:	DSRC ES	Publication (2013-05-17)																											
	Details and Download																													
COM	Doc. Nb. TR 101 611 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**																												
	Ref. DTR/ITS-0020048	**Testing; Conformance test specification for CALM Fast Services;**																												
	Technical Body: ITS WG2	**FNTP/FSAP/IICP validation report**	Publishe																											
	Directives:	Validation CALM Fast																												
	Details and Download																													
COM	Doc. Nb. TR 101 612 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
	Ref. DTR/ITS-0020055	**Cross Layer DCC Management Entity for operation in the ITS G5A and ITS G5B medium;**																												
	Technical Body: ITS WG2	**Report on Cross layer DCC algorithms and performance evaluation**	Current Status:																											
	Directives:	Cross layer DCC algorithms and performance evaluation	Publication (2014-09-17)																											



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					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
	Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttfcs Arch	TM Apps Arch	TM Cns Arch	TM Inttfcs Arch	UL Apps Arch		UA Inttfcs Arch
	Ref. DTR/ITS-0020056	**Cross Layer DCC Management Entity for operation in the ITS G5A and ITS G5B medium;**	Current Status:																										
	Technical Body: ITS WG2	**Validation set-up and results**	TB adoption of WI (2012-06-19)																										
	Directives:	Cross Layer DCC Validation	Next Status:																										
	Details and Download		Start of work (2012-06-19)																										
COM	Doc. Nb. EN 302 665 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																										
	Ref. DEN/ITS-0020012	**Communications Architecture**																											
	Technical Body: ITS WG2	Architecture	Current Status:																	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Details and Download		Publication (2010-09-24)																										
COM	Doc. Nb. EN 302 665 Ver. 1.1.2	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																										
	Ref. REN/ITS-0020047	**Communications Architecture**	Current Status:																										
	Technical Body: ITS WG2	Architecture	Stable draft (2013-03-25)																	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Details and Download		Next Status:																										
			Final draft for approval																										
			(2014-11-30)																										
COM	Doc. Nb. TS 102 708-2-3 Ver. 1.4.1	**Intelligent Transport Systems (ITS);**	Published																										
	Ref. RTS/ITS-00259	**RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band;**																											
	Technical Body: ITS WG2	**Part 2: Application Layer; Sub-part 3: Abstract Test Suite (ATS) and partial PIXIT proforma**	Current Status:							✓		✓						✓											
	Directives:	DSRC APL ATS	Publication (2013-03-15)																										
	Details and Download																												
COM	Doc. Nb. TS 102 708-2-2 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																										
	Ref. DTS/ITS-0020006	**RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band;**																											
	Technical Body: ITS WG2	**Part 2: Application Layer Common Application Service Elements; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)**	Current Status:							✓		✓						✓											
	Details and Download	DSRC APL TSS&TP	[illegible]																										

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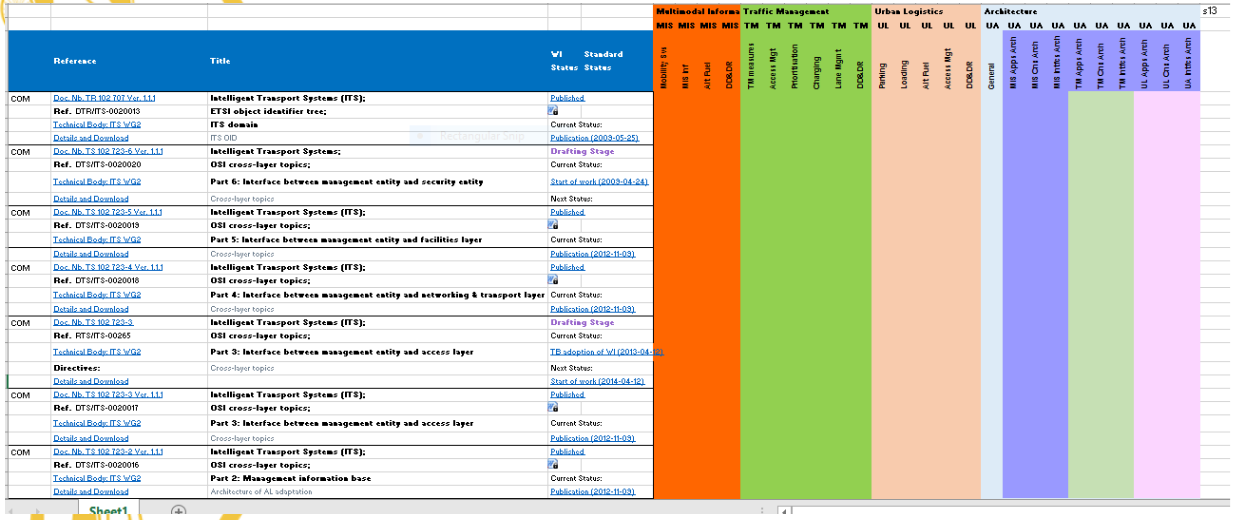
					Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s12
					MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
	Reference	Title	WI Status	Standard Status	Mobility Sys	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
COM	Doc. Nb. TS 102 708-1-3 Ver. 1.1.1 **Ref.** DTS/ITS-0020004 Technical Body: ITS WG2 Details and Download	**Intelligent Transport Systems (ITS);** **RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band;** **Part 1: Data Link Layer; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma** DSRC DLC ATS	Published Current Status: Publication (2010-03-23)							✓		✓						✓												
COM	Doc. Nb. TS 102 708-2-2 Ver. 1.4.1 **Ref.** RTS/ITS-00258 Technical Body: ITS WG2 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band;** **Part 2: Application Layer; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)** DSRC APL TSS&TP	Published Current Status: Publication (2013-03-15)							✓		✓						✓												
COM	Doc. Nb. TS 102 708-2-1 Ver. 1.3.1 **Ref.** RTS/ITS-00257 Technical Body: ITS WG2 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band;** **Part 2: Application Layer; Sub-part 1: Protocol Implementation Conformance Statement (PICS) proforma specification** DSRC APL PICS	Published Current Status: Publication (2013-03-15)							✓		✓						✓												
COM	Doc. Nb. TS 102 708-1-2 Ver. 1.1.1 **Ref.** DTS/ITS-0020003 Technical Body: ITS WG2 Details and Download	**Intelligent Transport Systems (ITS);** **RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band;** **Part 1: Data Link Layer; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)** DSRC DLC TSS&TP	Published Current Status: Publication (2010-03-23)							✓		✓						✓												
COM	Doc. Nb. TS 102 708-1-1 Ver. 1.1.1 **Ref.** DTS/ITS-0020002 Technical Body: ITS WG2 Details and Download	**Intelligent Transport Systems (ITS);** **RTTT; Test specifications for High Data Rate (HDR) data transmission equipment operating in the 5,8 GHz ISM band;** **Part 1: Data Link Layer; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification** DSRC DLC PICS	Published Current Status: Publication (2010-03-23)							✓		✓						✓												



	Reference	Title	WI Status / Standard Status
COM	Doc. Nb. TR 102 707 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published
	Ref. DTR/ITS-0020013	**ETSI object identifier tree;**	
	Technical Body: ITS WG2	**ITS domain**	Current Status:
	Details and Download	ITS OID	Publication (2009-05-25)
COM	Doc. Nb. TS 102 723-6 Ver. 1.1.1	**Intelligent Transport Systems;**	**Drafting Stage**
	Ref. DTS/ITS-0020020	**OSI cross-layer topics;**	Current Status:
	Technical Body: ITS WG2	**Part 6: Interface between management entity and security entity**	Start of work (2009-04-24)
	Details and Download	Cross-layer topics	Next Status:
COM	Doc. Nb. TS 102 723-5 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published
	Ref. DTS/ITS-0020019	**OSI cross-layer topics;**	
	Technical Body: ITS WG2	**Part 5: Interface between management entity and facilities layer**	Current Status:
	Details and Download	Cross-layer topics	Publication (2012-11-09)
COM	Doc. Nb. TS 102 723-4 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published
	Ref. DTS/ITS-0020018	**OSI cross-layer topics;**	
	Technical Body: ITS WG2	**Part 4: Interface between management entity and networking & transport layer**	Current Status:
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COM	Doc. Nb. TS 102 723-3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**
	Ref. RTS/ITS-00265	**OSI cross-layer topics;**	Current Status:
	Technical Body: ITS WG2	**Part 3: Interface between management entity and access layer**	TB adoption of WI (2013-04-12)
	Directives:	Cross-layer topics	Next Status:
	Details and Download		Start of work (2014-04-12)
COM	Doc. Nb. TS 102 723-3 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published
	Ref. DTS/ITS-0020017	**OSI cross-layer topics;**	
	Technical Body: ITS WG2	**Part 3: Interface between management entity and access layer**	Current Status:
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COM	Doc. Nb. TS 102 723-2 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published
	Ref. DTS/ITS-0020016	**OSI cross-layer topics;**	
	Technical Body: ITS WG2	**Part 2: Management information base**	Current Status:
	Details and Download	Architecture of AL adaptation	Publication (2012-11-09)

Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s13
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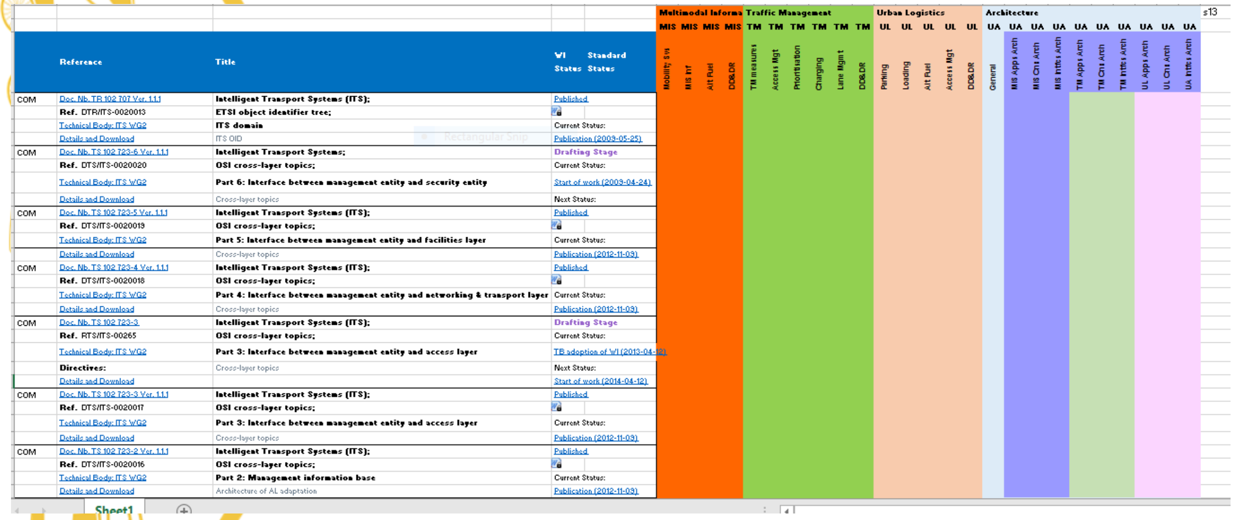
Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cnt Arch	MIS Intfcs Arch	TM Apps Arch	TM Cnt Arch	TM Intfcs Arch	UL Apps Arch	UL Cnt Arch	UA Intfcs Arch	

Sheet1



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COM	Doc. Nb. TS 102 723-6 Ver. 1.1.1	**Intelligent Transport Systems;**	**Drafting Stage**																											
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	Technical Body: ITS WG2	**Part 6: Interface between management entity and security entity**	Start of work (2009-04-24)																											
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COM	Doc. Nb. TS 102 723-5 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
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	Technical Body: ITS WG2	**Part 5: Interface between management entity and facilities layer**	Current Status:																											
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COM	Doc. Nb. TS 102 723-4 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
	Ref. DTS/ITS-0020018	**OSI cross-layer topics;**																												
	Technical Body: ITS WG2	**Part 4: Interface between management entity and networking & transport layer**	Current Status:																											
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COM	Doc. Nb. TS 102 723-3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
	Ref. RTS/ITS-00265	**OSI cross-layer topics;**	Current Status:																											
	Technical Body: ITS WG2	**Part 3: Interface between management entity and access layer**	TB adoption of WI (2013-04-12)																											
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COM	Doc. Nb. TS 102 723-3 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
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COM	Doc. Nb. TS 102 723-2 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
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	Technical Body: ITS WG2	**Part 2: Management information base**	Current Status:																											
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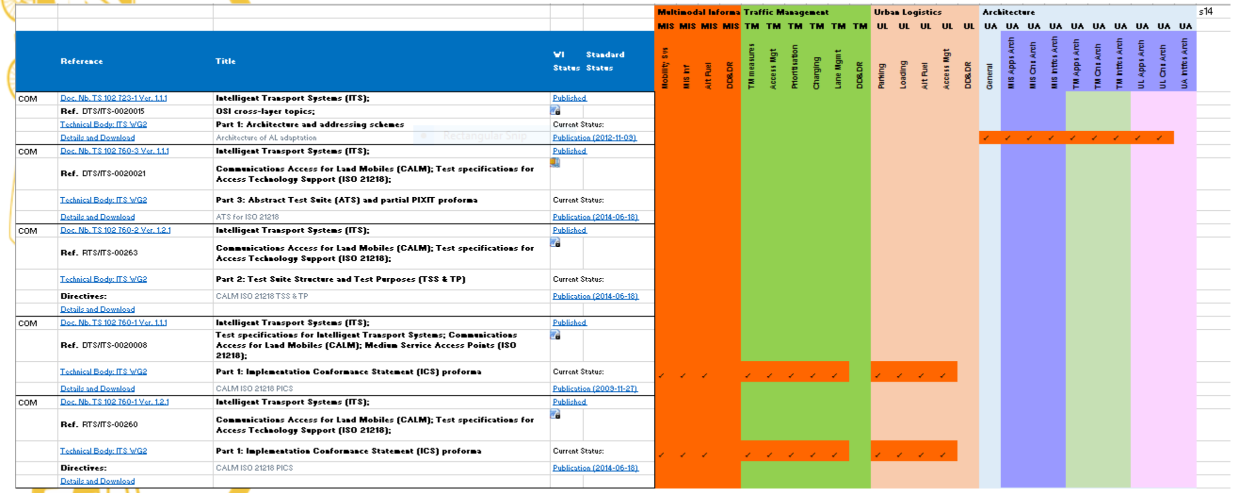

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COM	Doc. Nb. TS 102 723-1 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
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COM	Doc. Nb. TS 102 760-3 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
	Ref. DTS/ITS-0020021	**Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218);**																												
	Technical Body: ITS WG2	**Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma**	Current Status:																											
	Details and Download	ATS for ISO 21218	Publication (2014-06-18)																											
COM	Doc. Nb. TS 102 760-2 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
	Ref. RTS/ITS-00263	**Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218);**																												
	Technical Body: ITS WG2	**Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	Current Status:																											
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COM	Doc. Nb. TS 102 760-1 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
	Ref. DTS/ITS-0020008	**Test specifications for Intelligent Transport Systems; Communications Access for Land Mobiles (CALM); Medium Service Access Points (ISO 21218);**																												
	Technical Body: ITS WG2	**Part 1: Implementation Conformance Statement (ICS) proforma**	Current Status:		✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
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COM	Doc. Nb. TS 102 760-1 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
	Ref. RTS/ITS-00260	**Communications Access for Land Mobiles (CALM); Test specifications for Access Technology Support (ISO 21218);**																												
	Technical Body: ITS WG2	**Part 1: Implementation Conformance Statement (ICS) proforma**	Current Status:		✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
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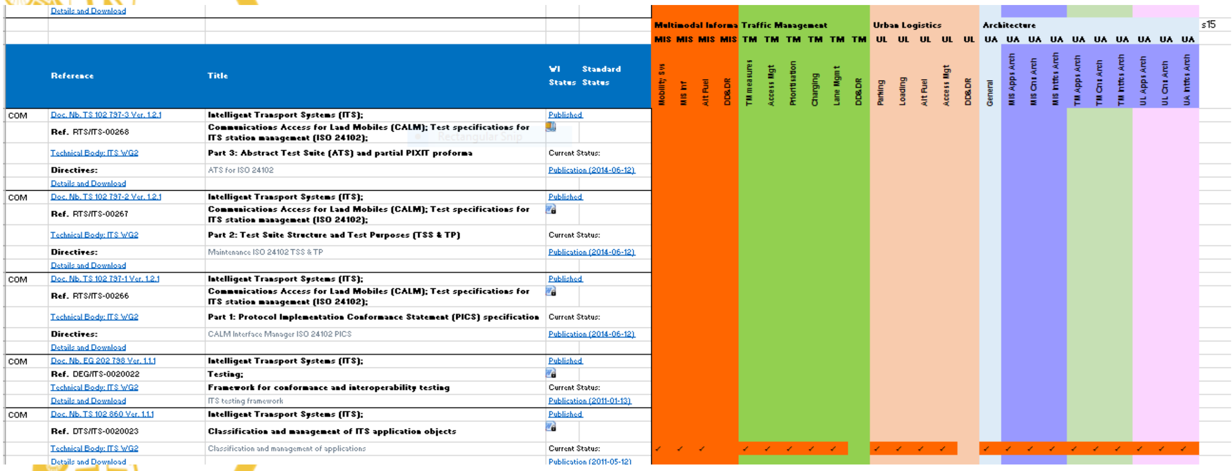

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COM	Doc. Nb. TS 102 797-3 Ver. 1.2.1	Intelligent Transport Systems (ITS);	Published																											
	Ref. RTS/ITS-00268	Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102);																												
	Technical Body: ITS WG2	Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma	Current Status:																											
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COM	Doc. Nb. TS 102 797-2 Ver. 1.2.1	Intelligent Transport Systems (ITS);	Published																											
	Ref. RTS/ITS-00267	Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102);																												
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COM	Doc. Nb. TS 102 797-1 Ver. 1.2.1	Intelligent Transport Systems (ITS);	Published																											
	Ref. RTS/ITS-00266	Communications Access for Land Mobiles (CALM); Test specifications for ITS station management (ISO 24102);																												
	Technical Body: ITS WG2	Part 1: Protocol Implementation Conformance Statement (PICS) specification	Current Status:																											
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COM	Doc. Nb. EG 202 798 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Published																											
	Ref. DEG/ITS-0020022	Testing;																												
	Technical Body: ITS WG2	Framework for conformance and interoperability testing	Current Status:																											
	Details and Download	ITS testing framework	Publication (2011-01-13)																											
COM	Doc. Nb. TS 102 860 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Published																											
	Ref. DTS/ITS-0020023	Classification and management of ITS application objects																												
	Technical Body: ITS WG2	Classification and management of applications	Current Status:		✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
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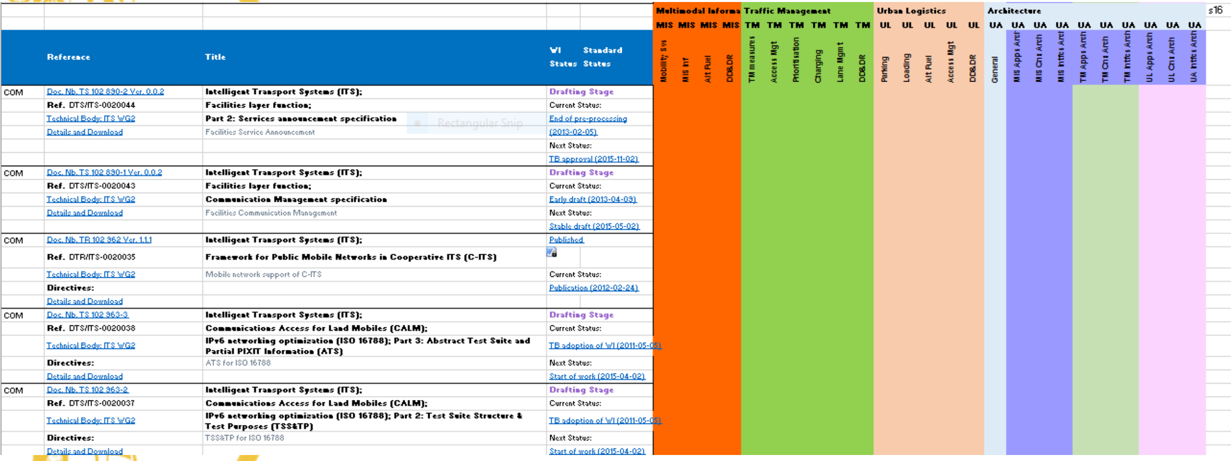

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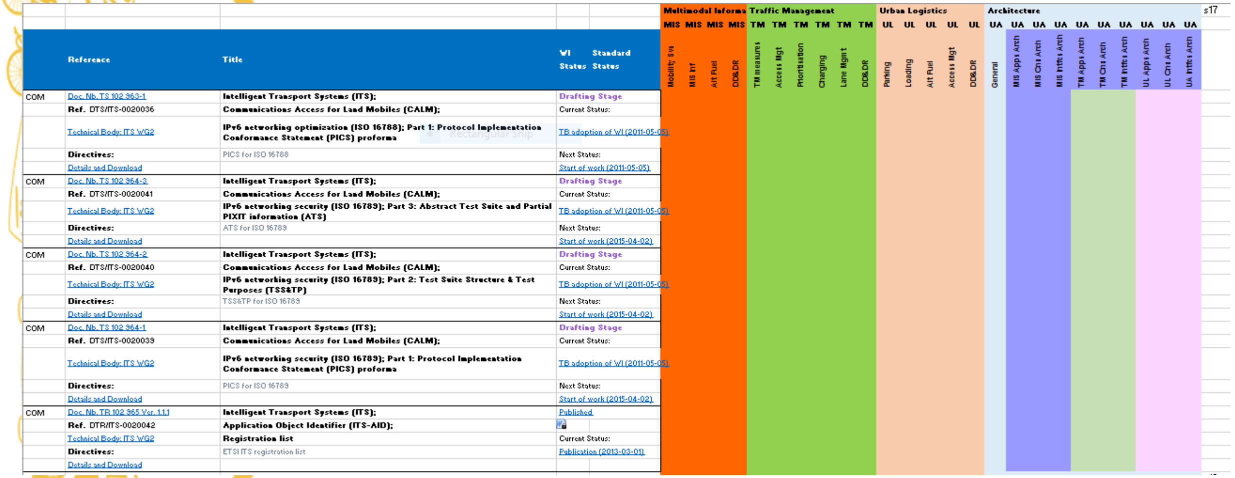
COM	Doc. Nb. TS 102 890-2 Ver. 0.0.2 **Ref.** DTS/ITS-0020044 Technical Body: ITS WG2 Details and Download	**Intelligent Transport Systems (ITS);** **Facilities layer function;** **Part 2: Services announcement specification** Facilities Service Announcement	**Drafting Stage** Current Status: End of pre-processing (2013-02-05) Next Status: TB approval (2015-11-02)																											
COM	Doc. Nb. TS 102 890-1 Ver. 0.0.2 **Ref.** DTS/ITS-0020043 Technical Body: ITS WG2 Details and Download	**Intelligent Transport Systems (ITS);** **Facilities layer function;** **Communication Management specification** Facilities Communication Management	**Drafting Stage** Current Status: Early draft (2013-04-09) Next Status: Stable draft (2015-05-02)																											
COM	Doc. Nb. TR 102 962 Ver. 1.1.1 **Ref.** DTR/ITS-0020035 Technical Body: ITS WG2 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Framework for Public Mobile Networks in Cooperative ITS (C-ITS)** Mobile network support of C-ITS	Published Current Status: Publication (2012-02-24)																											
COM	Doc. Nb. TS 102 963-3 **Ref.** DTS/ITS-0020038 Technical Body: ITS WG2 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Communications Access for Land Mobiles (CALM);** **IPv6 networking optimization (ISO 16788); Part 3: Abstract Test Suite and Partial PIXIT Information (ATS)** ATS for ISO 16788	**Drafting Stage** Current Status: TB adoption of WI (2011-05-05) Next Status: Start of work (2015-04-02)																											
COM	Doc. Nb. TS 102 963-2 **Ref.** DTS/ITS-0020037 Technical Body: ITS WG2 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Communications Access for Land Mobiles (CALM);** **IPv6 networking optimization (ISO 16788); Part 2: Test Suite Structure & Test Purposes (TSS&TP)** TSS&TP for ISO 16788	**Drafting Stage** Current Status: TB adoption of WI (2011-05-05) Next Status: Start of work (2015-04-02)																											



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	Technical Body: ITS WG2	**IPv6 networking optimization (ISO 16788); Part 1: Protocol Implementation Conformance Statement (PICS) proforma**	TB adoption of WI (2011-05-05)																											
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	Technical Body: ITS WG2	**IPv6 networking security (ISO 16789); Part 3: Abstract Test Suite and Partial PIXIT information (ATS)**	TB adoption of WI (2011-05-05)																											
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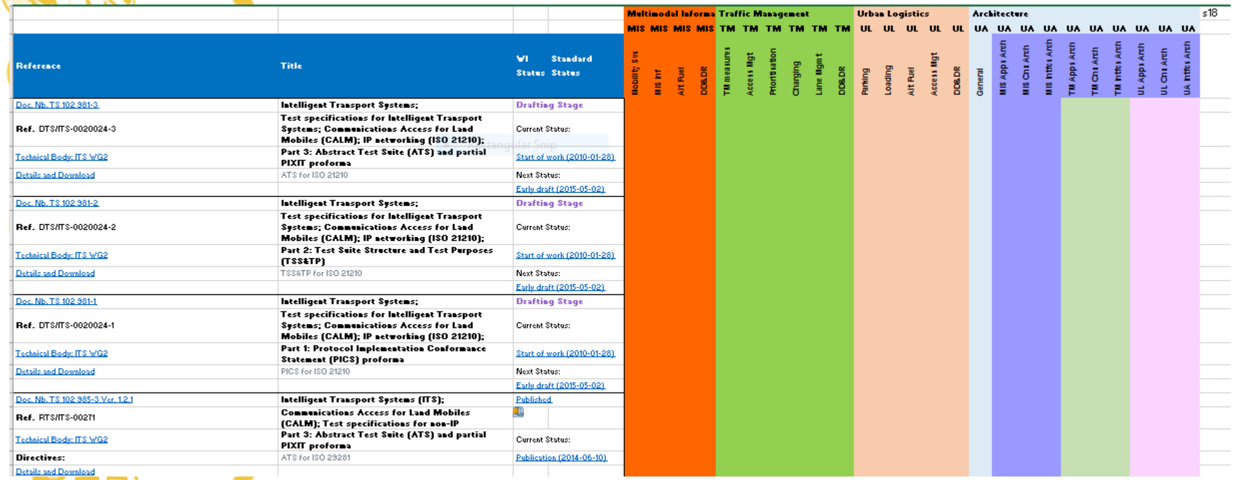

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Technical Body: ITS WG2	**Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma**	Start of work (2010-01-28)																											
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Doc. Nb. TS 102 985-3 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-00271	**Communications Access for Land Mobiles (CALM); Test specifications for non-IP**																												
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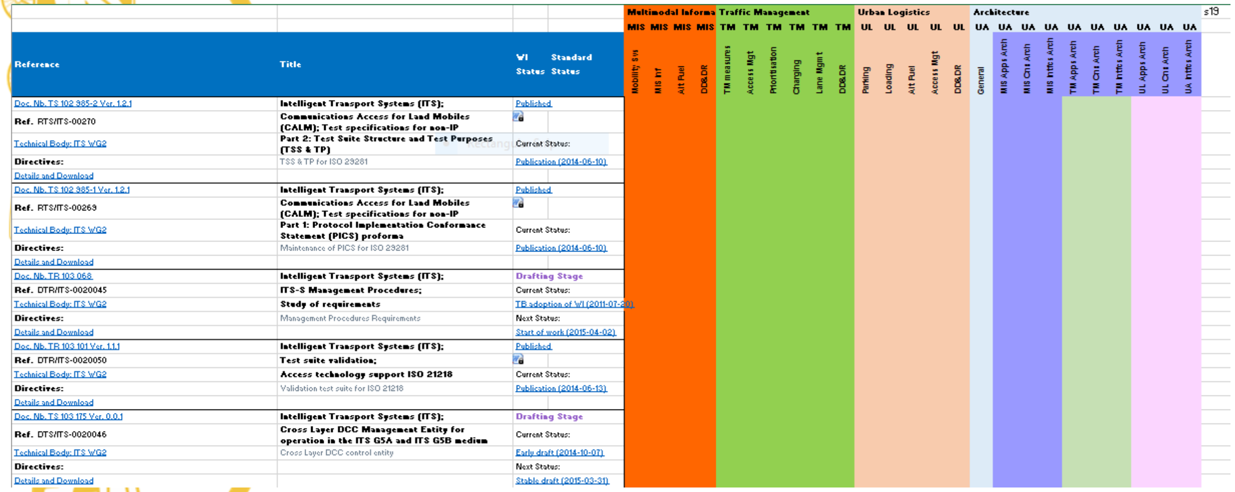

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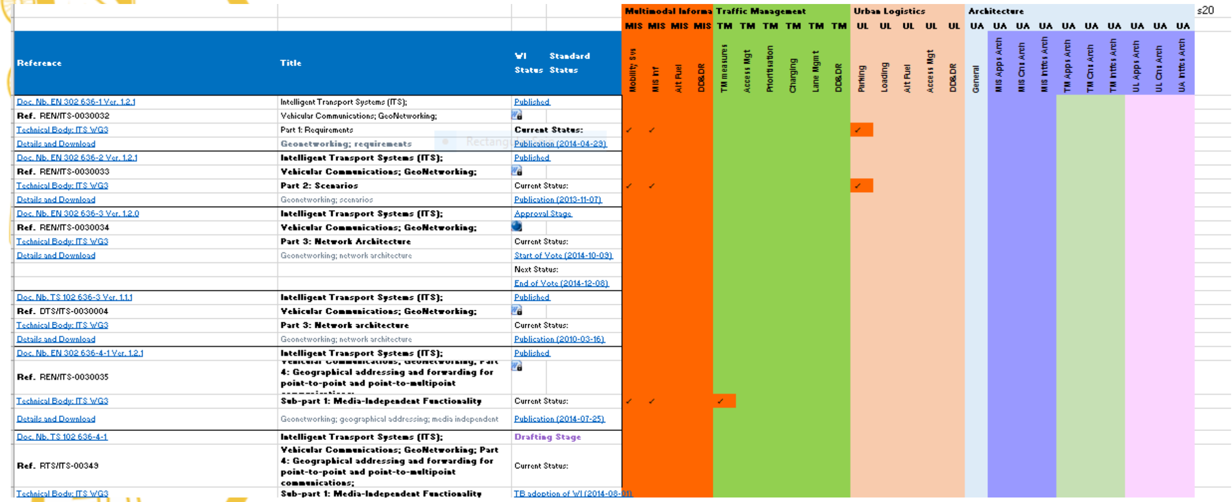
Details and Download																													
Doc. Nb. TS 102 985-1 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-00269	**Communications Access for Land Mobiles (CALM); Test specifications for non-IP**																												
Technical Body: ITS WG2	**Part 1: Protocol Implementation Conformance Statement (PICS) proforma**	Current Status:																											
Directives:	Maintenance of PICS for ISO 29281	Publication (2014-06-10)																											
Details and Download																													
Doc. Nb. TR 103 068	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTR/ITS-0020045	**ITS-S Management Procedures;**	Current Status:																											
Technical Body: ITS WG2	**Study of requirements**	TB adoption of WI (2011-07-20)																											
Directives:	Management Procedures Requirements	Next Status:																											
Details and Download		Start of work (2015-04-02)																											
Doc. Nb. TR 103 101 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTR/ITS-0020050	**Test suite validation;**																												
Technical Body: ITS WG2	**Access technology support ISO 21218**	Current Status:																											
Directives:	Validation test suite for ISO 21218	Publication (2014-06-13)																											
Details and Download																													
Doc. Nb. TS 103 175 Ver. 0.0.1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-0020046	**Cross Layer DCC Management Entity for operation in the ITS G5A and ITS G5B medium**	Current Status:																											
Technical Body: ITS WG2	Cross Layer DCC control entity	Early draft (2014-10-07)																											
Directives:		Next Status:																											
Details and Download		Stable draft (2015-03-31)																											



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Reference	Title	WI Status	Standard Status	Multimodal Informa				Traffic Management						Urban Logistics					Architecture									
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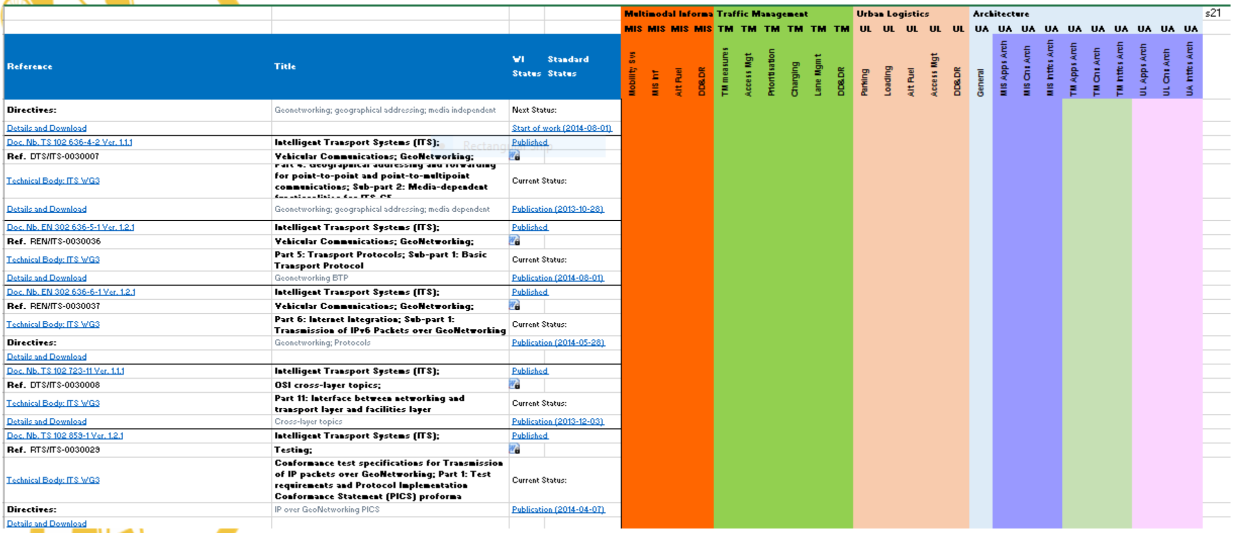
				Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inftrs Arch	TM Apps Arch	TM Cns Arch	TM Inftrs Arch	UL Apps Arch	UL Cns Arch	UA Inftrs Arch
Doc. Nb. EN 302 636-1 Ver. 1.2.1	Intelligent Transport Systems (ITS);	Published																										
Ref. REN/ITS-0030032	Vehicular Communications; GeoNetworking;																											
Technical Body: ITS WG3	Part 1: Requirements	**Current Status:**		✓	✓									✓														
Details and Download	**Geonetworking; requirements**	Publication (2014-04-29)																										
Doc. Nb. EN 302 636-2 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																										
Ref. REN/ITS-0030033	**Vehicular Communications; GeoNetworking;**																											
Technical Body: ITS WG3	**Part 2: Scenarios**	Current Status:		✓	✓									✓														
Details and Download	Geonetworking; scenarios	Publication (2013-11-07)																										
Doc. Nb. EN 302 636-3 Ver. 1.2.0	**Intelligent Transport Systems (ITS);**	Approval Stage																										
Ref. REN/ITS-0030034	**Vehicular Communications; GeoNetworking;**																											
Technical Body: ITS WG3	**Part 3: Network Architecture**	Current Status:																										
Details and Download	Geonetworking; network architecture	Start of Vote (2014-10-09)																										
		Next Status:																										
		End of Vote (2014-12-08)																										
Doc. Nb. TS 102 636-3 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																										
Ref. DTS/ITS-0030004	**Vehicular Communications; GeoNetworking;**																											
Technical Body: ITS WG3	**Part 3: Network architecture**	Current Status:																										
Details and Download	Geonetworking; network architecture	Publication (2010-03-16)																										
Doc. Nb. EN 302 636-4-1 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																										
Ref. REN/ITS-0030035	**Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications;**																											
Technical Body: ITS WG3	**Sub-part 1: Media-Independent Functionality**	Current Status:		✓	✓			✓																				
Details and Download	Geonetworking; geographical addressing; media independent	Publication (2014-07-25)																										
Doc. Nb. TS 102 636-4-1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																										
Ref. RTS/ITS-00349	**Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications;**	Current Status:																										
Technical Body: ITS WG3	**Sub-part 1: Media-Independent Functionality**	TB adoption of WI (2014-08-01)																										



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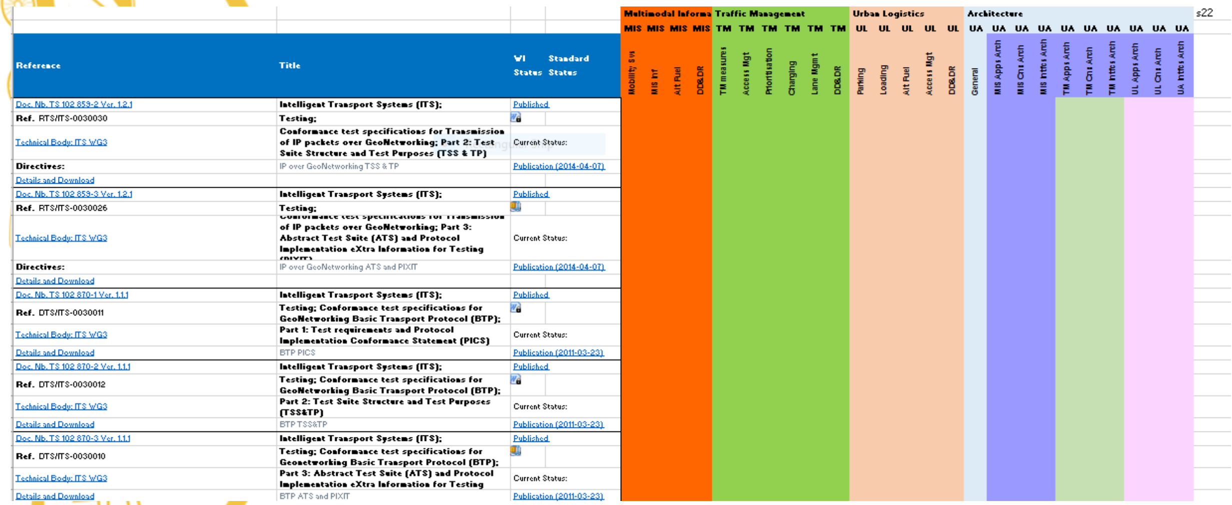
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Sys	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cms Arch	MIS Inftrs Arch	TM Apps Arch	TM Cms Arch	TM Inftrs Arch	UL Apps Arch	UL Cms Arch	UA Inftrs Arch	
Directives:	Geonetworking; geographical addressing; media independent	Next Status:																											
Details and Download		Start of work (2014-08-01)																											
Doc. Nb. TS 102 636-4-2 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0030007	**Vehicular Communications; GeoNetworking;**																												
Technical Body: ITS WG3	**Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 2: Media-dependent**	Current Status:																											
Details and Download	Geonetworking; geographical addressing; media dependent	Publication (2013-10-28)																											
Doc. Nb. EN 302 636-5-1 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. REN/ITS-0030036	**Vehicular Communications; GeoNetworking;**																												
Technical Body: ITS WG3	**Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol**	Current Status:																											
Details and Download	Geonetworking BTP	Publication (2014-08-01)																											
Doc. Nb. EN 302 636-6-1 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. REN/ITS-0030037	**Vehicular Communications; GeoNetworking;**																												
Technical Body: ITS WG3	**Part 6: Internet Integration; Sub-part 1: Transmission of IPv6 Packets over GeoNetworking**	Current Status:																											
Directives:	Geonetworking; Protocols	Publication (2014-05-28)																											
Details and Download																													
Doc. Nb. TS 102 723-11 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0030008	**OSI cross-layer topics;**																												
Technical Body: ITS WG3	**Part 11: Interface between networking and transport layer and facilities layer**	Current Status:																											
Details and Download	Cross-layer topics	Publication (2013-12-03)																											
Doc. Nb. TS 102 859-1 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0030029	**Testing;**																												
Technical Body: ITS WG3	**Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma**	Current Status:																											
Directives:	IP over GeoNetworking PICS	Publication (2014-04-07)																											
Details and Download																													



Reference	Title	WI Status	Standard Status	Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s22
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				Mobility Sys	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inftrs Arch	TM Apps Arch	TM Cns Arch	TM Inftrs Arch	UL Apps Arch	UL Cns Arch	UA Inftrs Arch	
Doc. Nb. TS 102 859-2 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0030030	**Testing;**																												
Technical Body: ITS WG3	**Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	Current Status:																											
Directives:	IP over GeoNetworking TSS & TP	Publication (2014-04-07)																											
Details and Download																													
Doc. Nb. TS 102 859-3 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0030026	**Testing;**																												
Technical Body: ITS WG3	**Conformance test specifications for Transmission of IP packets over GeoNetworking; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)**	Current Status:																											
Directives:	IP over GeoNetworking ATS and PIXIT	Publication (2014-04-07)																											
Details and Download																													
Doc. Nb. TS 102 870-1 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0030011	**Testing; Conformance test specifications for GeoNetworking Basic Transport Protocol (BTP);**																												
Technical Body: ITS WG3	**Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS)**	Current Status:																											
Details and Download	BTP PICS	Publication (2011-03-23)																											
Doc. Nb. TS 102 870-2 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0030012	**Testing; Conformance test specifications for GeoNetworking Basic Transport Protocol (BTP);**																												
Technical Body: ITS WG3	**Part 2: Test Suite Structure and Test Purposes (TSS&TP)**	Current Status:																											
Details and Download	BTP TSS&TP	Publication (2011-03-23)																											
Doc. Nb. TS 102 870-3 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0030010	**Testing; Conformance test specifications for Geonetworking Basic Transport Protocol (BTP);**																												
Technical Body: ITS WG3	**Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing**	Current Status:																											
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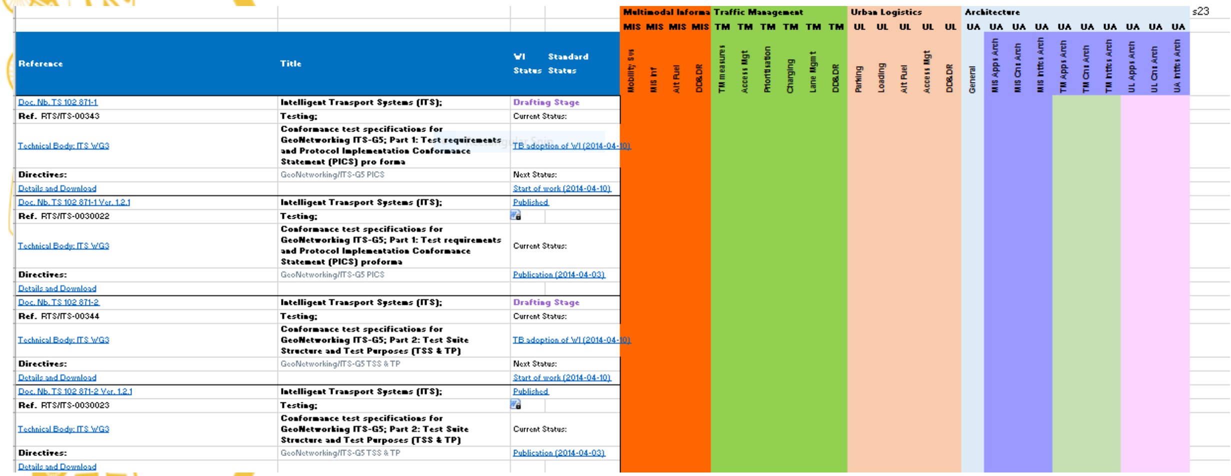

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s23
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Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttcs Arch	TM Apps Arch	TM Cns Arch	TM Inttcs Arch	UL Apps Arch	UL Cns Arch	UA Inttcs Arch	
Doc. Nb. TS 102 871-1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00343	**Testing;**	Current Status:																											
Technical Body: ITS WG3	**Conformance test specifications for GeoNetworking ITS-G5; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) pro forma**	TB adoption of WI (2014-04-10)																											
Directives:	GeoNetworking/ITS-G5 PICS	Next Status:																											
Details and Download		Start of work (2014-04-10)																											
Doc. Nb. TS 102 871-1 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0030022	**Testing;**																												
Technical Body: ITS WG3	**Conformance test specifications for GeoNetworking ITS-G5; Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS) proforma**	Current Status:																											
Directives:	GeoNetworking/ITS-G5 PICS	Publication (2014-04-03)																											
Details and Download																													
Doc. Nb. TS 102 871-2	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00344	**Testing;**	Current Status:																											
Technical Body: ITS WG3	**Conformance test specifications for GeoNetworking ITS-G5; Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	TB adoption of WI (2014-04-10)																											
Directives:	GeoNetworking/ITS-G5 TSS & TP	Next Status:																											
Details and Download		Start of work (2014-04-10)																											
Doc. Nb. TS 102 871-2 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0030023	**Testing;**																												
Technical Body: ITS WG3	**Conformance test specifications for GeoNetworking ITS-G5; Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	Current Status:																											
Directives:	GeoNetworking/ITS-G5 TSS & TP	Publication (2014-04-03)																											
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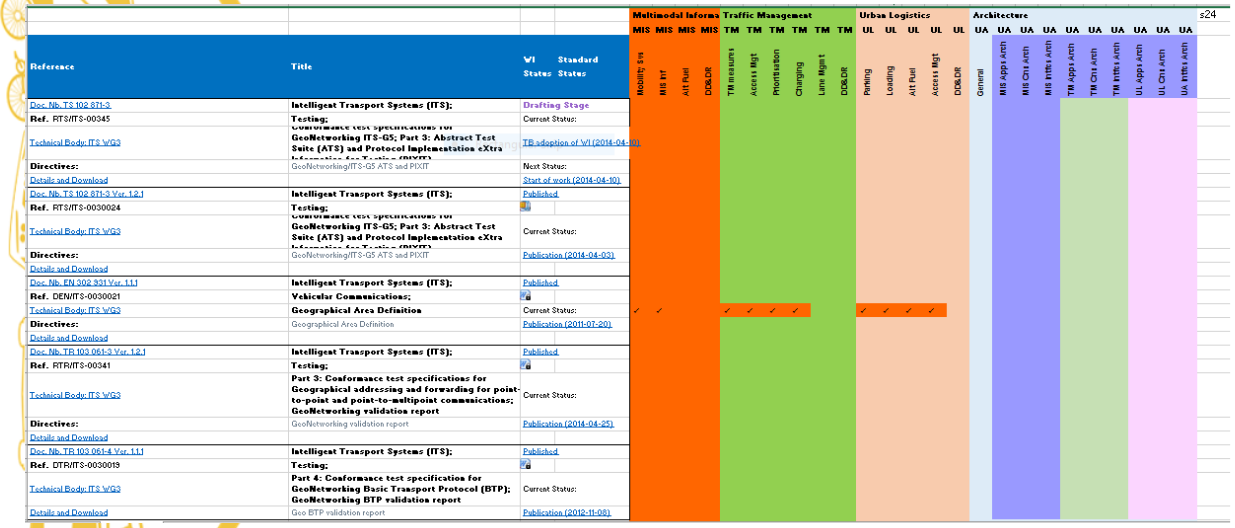

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s24
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Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cms Arch	MIS Inttcs Arch	TM Apps Arch	TM Cms Arch	TM Inttcs Arch	UL Apps Arch	UL Cms Arch	UA Inttcs Arch	
Doc. Nb. TS 102 871-3	Intelligent Transport Systems (ITS);	Drafting Stage																											
Ref. RTS/ITS-00345	Testing;	Current Status:																											
Technical Body: ITS WG3	Conformance test specifications for GeoNetworking ITS-G5; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)	TB adoption of WI (2014-04-10)																											
Directives:	GeoNetworking/ITS-G5 ATS and PIXIT	Next Status:																											
Details and Download		Start of work (2014-04-10)																											
Doc. Nb. TS 102 871-3 Ver. 1.2.1	Intelligent Transport Systems (ITS);	Published																											
Ref. RTS/ITS-0030024	Testing;																												
Technical Body: ITS WG3	Conformance test specifications for GeoNetworking ITS-G5; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)	Current Status:																											
Directives:	GeoNetworking/ITS-G5 ATS and PIXIT	Publication (2014-04-03)																											
Details and Download																													
Doc. Nb. EN 302 931 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Published																											
Ref. DEN/ITS-0030021	Vehicular Communications;																												
Technical Body: ITS WG3	Geographical Area Definition	Current Status:		✓	✓			✓	✓	✓	✓			✓	✓	✓	✓												
Directives:	Geographical Area Definition	Publication (2011-07-20)																											
Details and Download																													
Doc. Nb. TR 103 061-3 Ver. 1.2.1	Intelligent Transport Systems (ITS);	Published																											
Ref. RTR/ITS-00341	Testing;																												
Technical Body: ITS WG3	Part 3: Conformance test specifications for Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; GeoNetworking validation report	Current Status:																											
Directives:	GeoNetworking validation report	Publication (2014-04-25)																											
Details and Download																													
Doc. Nb. TR 103 061-4 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Published																											
Ref. DTR/ITS-0030019	Testing;																												
Technical Body: ITS WG3	Part 4: Conformance test specification for GeoNetworking Basic Transport Protocol (BTP); GeoNetworking BTP validation report	Current Status:																											
Details and Download	Geo BTP validation report	Publication (2012-11-08)																											

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s25
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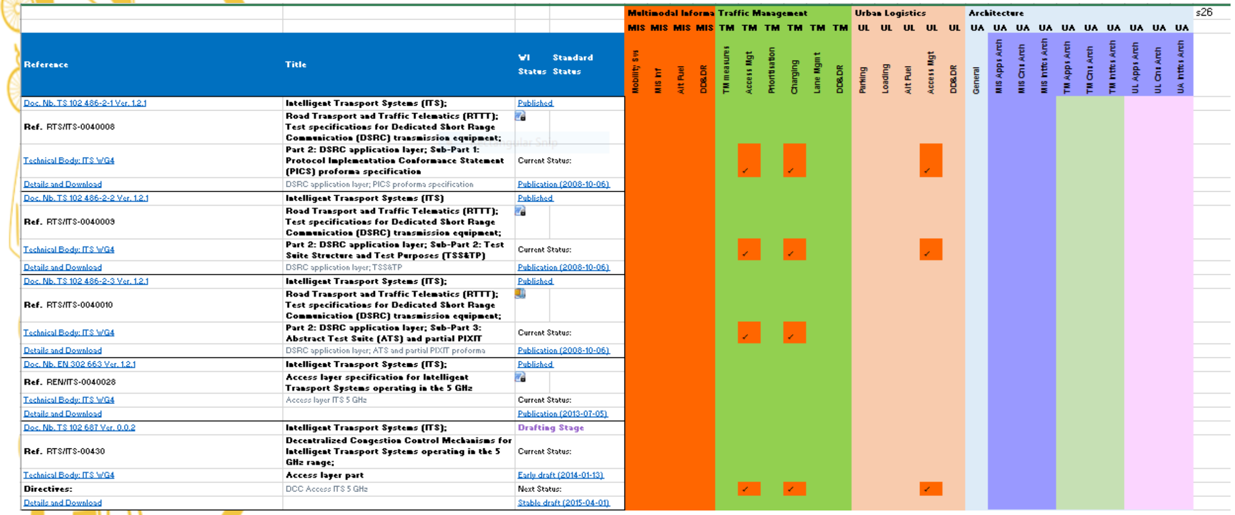
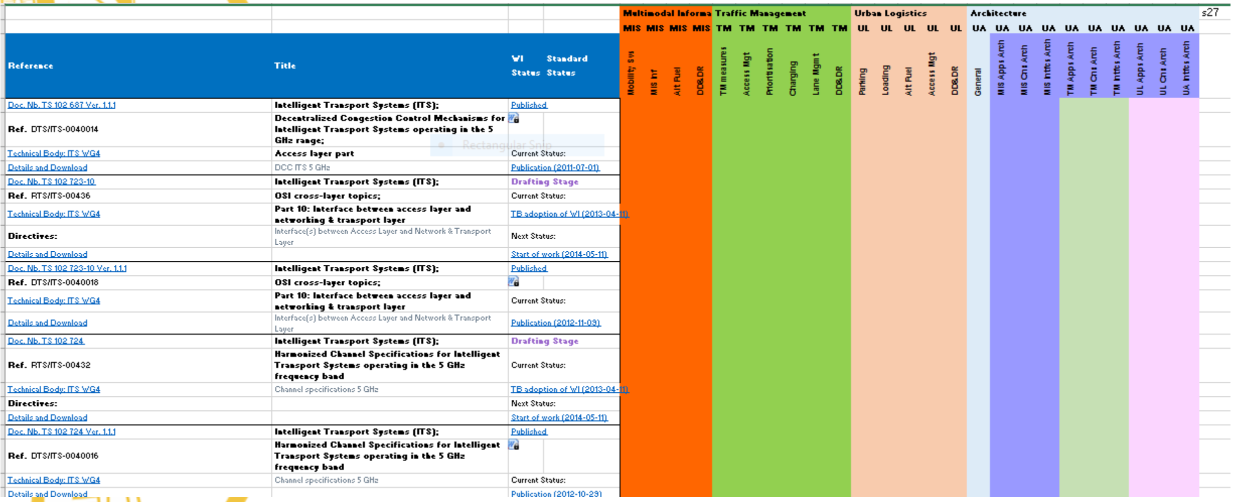
Doc. Nb. TR 103 061-5 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTR/ITS-0030018	**Testing;**																												
Technical Body: ITS WG3	**Part 5: IPv6 over GeoNetworking validation report**	Current Status:																											
Directives:	IPv6 over GeoNetworking validation report	Publication (2012-11-08)																											
Details and Download																													
Doc. Nb. TR 103 099	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTR/ITS-00346	**Architecture of conformance validation framework**	Current Status:																											
Technical Body: ITS WG3		TB adoption of WI (2014-04-10)																											
Directives:	Conformance validation framework	Next Status:																											
Details and Download		Start of work (2014-04-10)																											
Doc. Nb. TR 103 099 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTR/ITS-00340	**Architecture of conformance validation framework**																												
Technical Body: ITS WG3		Current Status:																											
Directives:	Conformance validation framework	Publication (2014-05-19)																											
Details and Download																													
Doc. Nb. TS 102 486-1-2 Ver. 1.2.1	Intelligent Transport Systems (ITS);	Published																											
Ref. RTS/ITS-0040006	Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment;																												
Technical Body: ITS WG4	Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)	**Current Status:**							✓		✓						✓												
Details and Download	**Protocol Testing for DSC MAC and LLC layers**	Publication (2008-10-06)																											
Doc. Nb. TS 102 486-1-3 Ver. 1.2.2	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0040017	**Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment;**																												
Technical Body: ITS WG4	**Part 1: DSRC data link layer: medium access and logical link control; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT proforma**	Current Status:							✓		✓						✓												
Details and Download	DSRC data link layer; ATS and partial PIXIT proforma	Publication (2009-05-27)																											



			Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s26
			MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	**Title**	**WI Status Standard Status**	Mobility Sys	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cms Arch	MIS Inftrs Arch	TM Apps Arch	TM Cms Arch	TM Inftrs Arch	UL Apps Arch	UL Cms Arch	UA Inftrs Arch	
Doc. Nb. TS 102 486-2-1 Ver. 1.2.1 **Ref.** RTS/ITS-0040008 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS);** **Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment;** **Part 2: DSRC application layer; Sub-Part 1: Protocol Implementation Conformance Statement (PICS) proforma specification** DSRC application layer; PICS proforma specification	Published Current Status: Publication (2008-10-06)						✓		✓						✓												
Doc. Nb. TS 102 486-2-2 Ver. 1.2.1 **Ref.** RTS/ITS-0040009 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS)** **Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment;** **Part 2: DSRC application layer; Sub-Part 2: Test Suite Structure and Test Purposes (TSS&TP)** DSRC application layer; TSS&TP	Published Current Status: Publication (2008-10-06)						✓		✓						✓												
Doc. Nb. TS 102 486-2-3 Ver. 1.2.1 **Ref.** RTS/ITS-0040010 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS);** **Road Transport and Traffic Telematics (RTTT); Test specifications for Dedicated Short Range Communication (DSRC) transmission equipment;** **Part 2: DSRC application layer; Sub-Part 3: Abstract Test Suite (ATS) and partial PIXIT** DSRC application layer; ATS and partial PIXIT proforma	Published Current Status: Publication (2008-10-06)						✓		✓																		
Doc. Nb. EN 302 663 Ver. 1.2.1 **Ref.** REN/ITS-0040028 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS);** **Access layer specification for Intelligent Transport Systems operating in the 5 GHz** Access layer ITS 5 GHz	Published Current Status: Publication (2013-07-05)																										
Doc. Nb. TS 102 687 Ver. 0.0.2 **Ref.** RTS/ITS-00430 Technical Body: ITS WG4 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Decentralized Congestion Control Mechanisms for Intelligent Transport Systems operating in the 5 GHz range;** **Access layer part** DCC Access ITS 5 GHz	**Drafting Stage** Current Status: Early draft (2014-01-13) Next Status: Stable draft (2015-04-01)						✓		✓						✓												



				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s27
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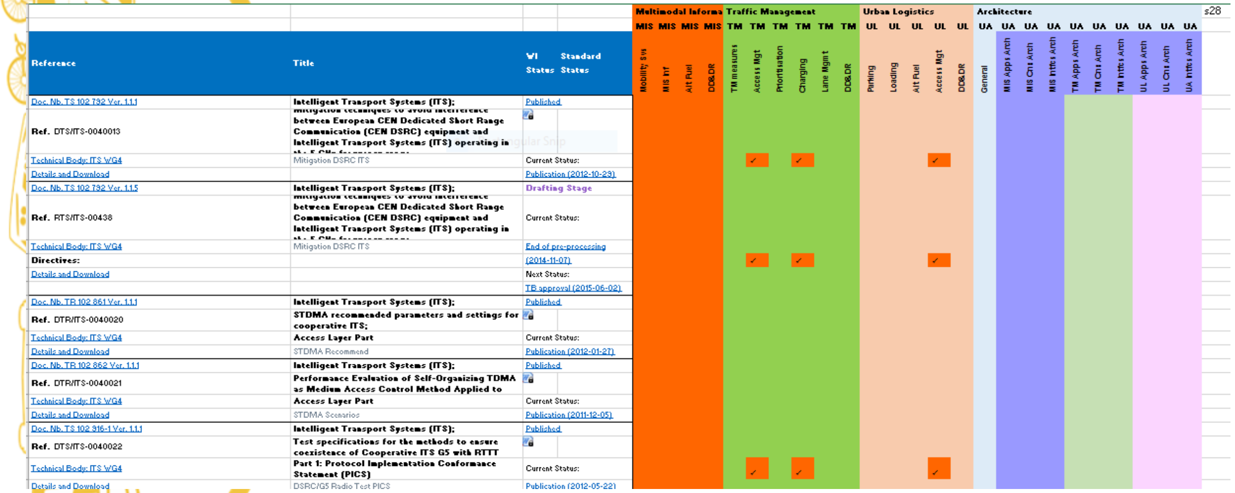
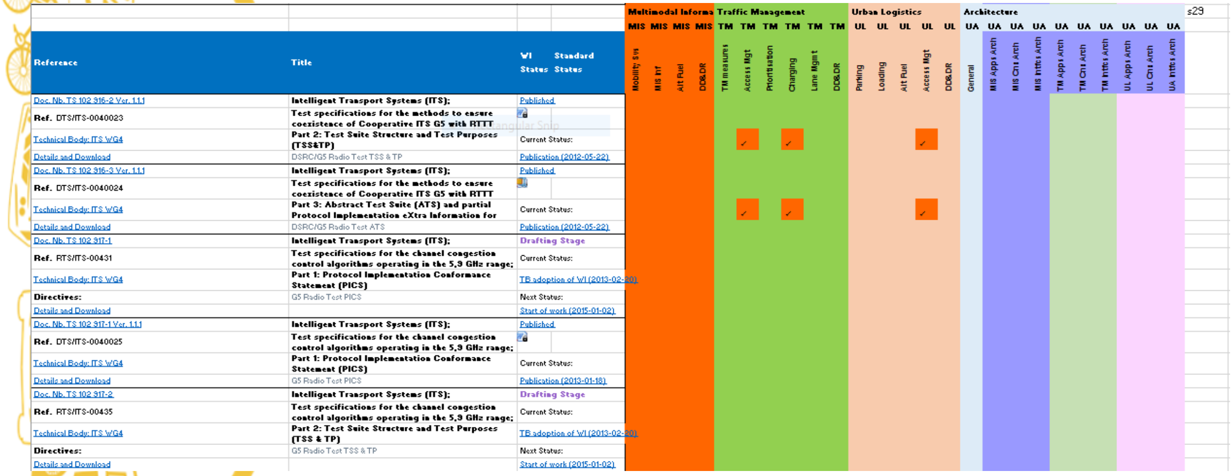
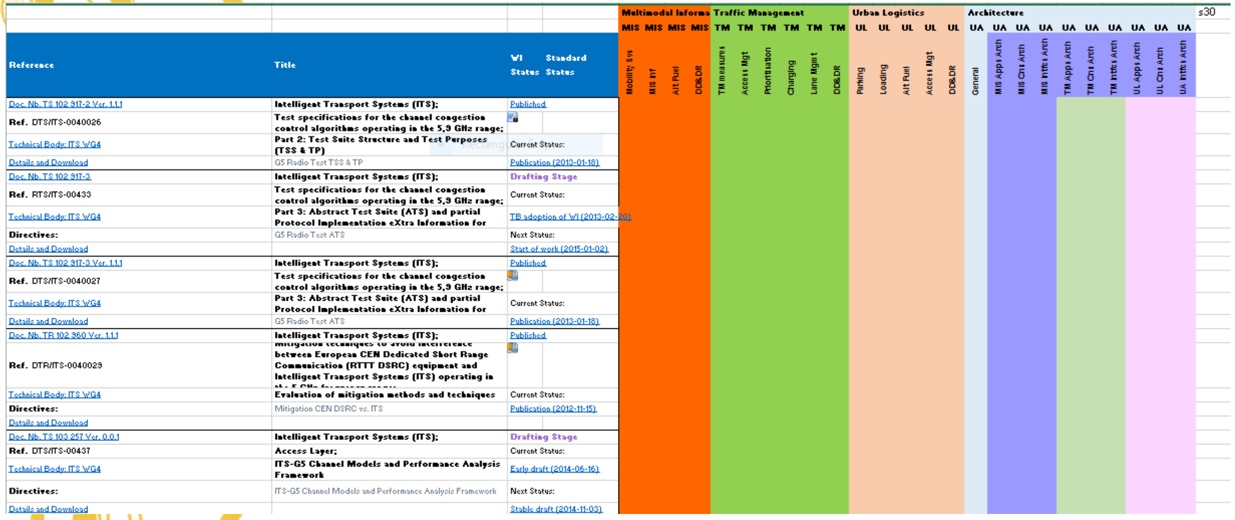
Doc. Nb. TS 102 687 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0040014	**Decentralized Congestion Control Mechanisms for Intelligent Transport Systems operating in the 5 GHz range;**																												
Technical Body: ITS WG4	**Access layer part**	Current Status:																											
Details and Download	DCC ITS 5 GHz	Publication (2011-07-01)																											
Doc. Nb. TS 102 723-10	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00436	**OSI cross-layer topics;**	Current Status:																											
Technical Body: ITS WG4	**Part 10: Interface between access layer and networking & transport layer**	TB adoption of WI (2013-04-11)																											
Directives:	Interface(s) between Access Layer and Network & Transport Layer	Next Status:																											
Details and Download		Start of work (2014-05-11)																											
Doc. Nb. TS 102 723-10 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0040018	**OSI cross-layer topics;**																												
Technical Body: ITS WG4	**Part 10: Interface between access layer and networking & transport layer**	Current Status:																											
Details and Download	Interface(s) between Access Layer and Network & Transport Layer	Publication (2012-11-09)																											
Doc. Nb. TS 102 724	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00432	**Harmonized Channel Specifications for Intelligent Transport Systems operating in the 5 GHz frequency band**	Current Status:																											
Technical Body: ITS WG4	Channel specifications 5 GHz	TB adoption of WI (2013-04-11)																											
Directives:		Next Status:																											
Details and Download		Start of work (2014-05-11)																											
Doc. Nb. TS 102 724 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0040016	**Harmonized Channel Specifications for Intelligent Transport Systems operating in the 5 GHz frequency band**																												
Technical Body: ITS WG4	Channel specifications 5 GHz	Current Status:																											
Details and Download		Publication (2012-10-29)																											



Reference	Title	WI Status	Standard Status	Multimodal Informa MIS Mobility svs	MIS MIS Inf	MIS Alt Fuel	MIS DD&DR	Traffic Management TM TM measures	TM Access Mgt	TM Prioritisation	TM Charging	TM Lane Mgmt	TM DD&DR	Urban Logistics UL Parking	UL Loading	UL Alt Fuel	UL Access Mgt	UL DD&DR	Architecture UA General	UA MIS Apps Arch	UA MIS Cms Arch	UA MIS Inftcs Arch	UA TM Apps Arch	UA TM Cms Arch	UA TM Inftcs Arch	UA UL Apps Arch	UA UL Cms Arch	UA UA Inftcs Arch	s28
Doc. Nb. TS 102 792 Ver. 1.1.1 **Ref.** DTS/ITS-0040013 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS);** **mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (CEN DSRC) equipment and Intelligent Transport Systems (ITS) operating in** Mitigation DSRC ITS	Published Current Status: Publication (2012-10-23)							✓		✓						✓												
Doc. Nb. TS 102 792 Ver. 1.1.5 **Ref.** RTS/ITS-00438 Technical Body: ITS WG4 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (CEN DSRC) equipment and Intelligent Transport Systems (ITS) operating in** Mitigation DSRC ITS	**Drafting Stage** Current Status: End of pre-processing (2014-11-07) Next Status: TB approval (2015-06-02)							✓		✓						✓												
Doc. Nb. TR 102 861 Ver. 1.1.1 **Ref.** DTR/ITS-0040020 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS);** **STDMA recommended parameters and settings for cooperative ITS;** **Access Layer Part** STDMA Recommend	Published Current Status: Publication (2012-01-27)																											
Doc. Nb. TR 102 862 Ver. 1.1.1 **Ref.** DTR/ITS-0040021 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS);** **Performance Evaluation of Self-Organizing TDMA as Medium Access Control Method Applied to** **Access Layer Part** STDMA Scenarios	Published Current Status: Publication (2011-12-05)																											
Doc. Nb. TS 102 916-1 Ver. 1.1.1 **Ref.** DTS/ITS-0040022 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS);** **Test specifications for the methods to ensure coexistence of Cooperative ITS G5 with RTTT** **Part 1: Protocol Implementation Conformance Statement (PICS)** DSRC/G5 Radio Test PICS	Published Current Status: Publication (2012-05-22)							✓		✓						✓												



				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s29
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
Doc. Nb. TS 102 916-2 Ver. 1.1.1 **Ref.** DTS/ITS-0040023 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS); Test specifications for the methods to ensure coexistence of Cooperative ITS G5 with RTTT Part 2: Test Suite Structure and Test Purposes (TSS&TP)** DSRC/G5 Radio Test TSS & TP	Published Current Status: Publication (2012-05-22)							✓		✓						✓												
Doc. Nb. TS 102 916-3 Ver. 1.1.1 **Ref.** DTS/ITS-0040024 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS); Test specifications for the methods to ensure coexistence of Cooperative ITS G5 with RTTT Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for** DSRC/G5 Radio Test ATS	Published Current Status: Publication (2012-05-22)							✓		✓						✓												
Doc. Nb. TS 102 917-1 **Ref.** RTS/ITS-00431 Technical Body: ITS WG4 **Directives:** Details and Download	**Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 1: Protocol Implementation Conformance Statement (PICS)** G5 Radio Test PICS	**Drafting Stage** Current Status: TB adoption of WI (2013-02-20) Next Status: Start of work (2015-01-02)																											
Doc. Nb. TS 102 917-1 Ver. 1.1.1 **Ref.** DTS/ITS-0040025 Technical Body: ITS WG4 Details and Download	**Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 1: Protocol Implementation Conformance Statement (PICS)** G5 Radio Test PICS	Published Current Status: Publication (2013-01-18)																											
Doc. Nb. TS 102 917-2 **Ref.** RTS/ITS-00435 Technical Body: ITS WG4 **Directives:** Details and Download	**Intelligent Transport Systems (ITS); Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range; Part 2: Test Suite Structure and Test Purposes (TSS & TP)** G5 Radio Test TSS & TP	**Drafting Stage** Current Status: TB adoption of WI (2013-02-20) Next Status: Start of work (2015-01-02)																											



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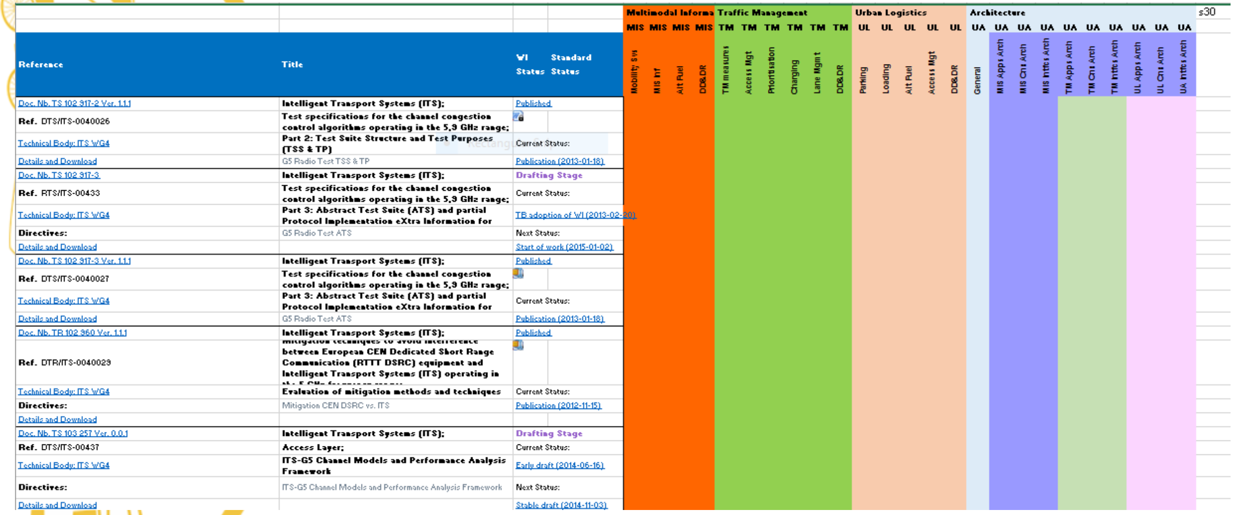
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Sys	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cnt Arch	MIS Inttcs Arch	TM Apps Arch	TM Cnt Arch	TM Inttcs Arch	UL Apps Arch	UL Cnt Arch	UA Inttcs Arch	
Doc. Nb. TS 102 917-2 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0040026	**Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range;**																												
Technical Body: ITS WG4	**Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	Current Status:																											
Details and Download	G5 Radio Test TSS & TP	Publication (2013-01-18)																											
Doc. Nb. TS 102 917-3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00433	**Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range;**	Current Status:																											
Technical Body: ITS WG4	**Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for**	TB adoption of WI (2013-02-20)																											
Directives:	G5 Radio Test ATS	Next Status:																											
Details and Download		Start of work (2015-01-02)																											
Doc. Nb. TS 102 917-3 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0040027	**Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range;**																												
Technical Body: ITS WG4	**Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for**	Current Status:																											
Details and Download	G5 Radio Test ATS	Publication (2013-01-18)																											
Doc. Nb. TR 102 960 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTR/ITS-0040029	**mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (RTTT DSRC) equipment and Intelligent Transport Systems (ITS) operating in**																												
Technical Body: ITS WG4	**Evaluation of mitigation methods and techniques**	Current Status:																											
Directives:	Mitigation CEN DSRC vs. ITS	Publication (2012-11-15)																											
Details and Download																													
Doc. Nb. TS 103 257 Ver. 0.0.1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-00437	**Access Layer;**	Current Status:																											
Technical Body: ITS WG4	**ITS-G5 Channel Models and Performance Analysis Framework**	Early draft (2014-06-16)																											
Directives:	ITS-G5 Channel Models and Performance Analysis Framework	Next Status:																											
Details and Download		Stable draft (2014-11-03)																											



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				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
Doc. Nb. TS 102 917-2 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0040026	**Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range;**																												
Technical Body: ITS WG4	**Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	Current Status:																											
Details and Download	G5 Radio Test TSS & TP	Publication (2013-01-18)																											
Doc. Nb. TS 102 917-3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00433	**Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range;**	Current Status:																											
Technical Body: ITS WG4	**Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for**	TB adoption of WI (2013-02-20)																											
Directives:	G5 Radio Test ATS	Next Status:																											
Details and Download		Start of work (2015-01-02)																											
Doc. Nb. TS 102 917-3 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTS/ITS-0040027	**Test specifications for the channel congestion control algorithms operating in the 5,9 GHz range;**																												
Technical Body: ITS WG4	**Part 3: Abstract Test Suite (ATS) and partial Protocol Implementation eXtra Information for**	Current Status:																											
Details and Download	G5 Radio Test ATS	Publication (2013-01-18)																											
Doc. Nb. TR 102 960 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. DTR/ITS-0040029	**mitigation techniques to avoid interference between European CEN Dedicated Short Range Communication (RTTT DSRC) equipment and Intelligent Transport Systems (ITS) operating in**																												
Technical Body: ITS WG4	**Evaluation of mitigation methods and techniques**	Current Status:																											
Directives:	Mitigation CEN DSRC vs. ITS	Publication (2012-11-15)																											
Details and Download																													
Doc. Nb. TS 103 257 Ver. 0.0.1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-00437	**Access Layer;**	Current Status:																											
Technical Body: ITS WG4	**ITS-G5 Channel Models and Performance Analysis Framework**	Early draft (2014-06-16)																											
Directives:	ITS-G5 Channel Models and Performance Analysis Framework	Next Status:																											
Details and Download		Stable draft (2014-11-03)																											

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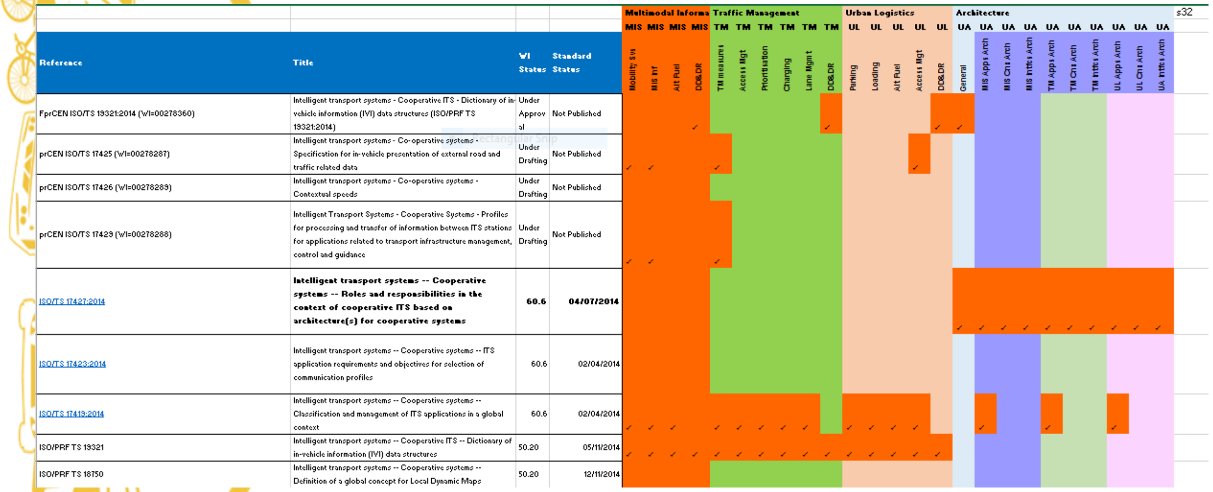
Reference	Title	WI Status	Standard Status	Multimodal Informa				Traffic Management						Urban Logistics					Architecture									
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
				Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttcs Arch	TM Apps Arch	TM Cns Arch	TM Inttcs Arch	UL Apps Arch	UL Cns Arch	UA Inttcs Arch
Doc. Nb. TS 102 637-1 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																										
Ref. DTS/ITS-0010002-1	**Vehicular Communications; Basic Set of Applications;**																											
Technical Body: ITS WG1	**Part 1: Functional Requirements**	Current Status:																										
Details and Download	Basic set of applications; functional requirements	Publication (2010-09-08)																										
Doc. Nb. TR 102 638 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																										
Ref. DTR/ITS-0010001	**Vehicular Communications; Basic Set of Applications;**																											
Technical Body: ITS WG1	**Definitions**	Current Status:																										
Details and Download		Publication (2009-06-29)																										
Doc. Nb. TR 102 698 Ver. 1.1.2	**Intelligent Transport Systems (ITS);**	Published																										
Ref. RTR/ITS-00100011	**Vehicular Communications;**																											
Technical Body: ITS WG1	**C2C-CC Demonstrator 2008; Use Cases and Technical Specifications**	Current Status:																										
Details and Download	Vehicular Communications C2C-CC Demonstrator 2008	Publication (2010-07-05)																										
CEN ISO/TS 17419:2014	Intelligent transport systems - Cooperative systems - Classification and management of ITS applications in a global context (ISO/TS 17419:2014)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
CEN ISO/TS 17423:2014	Intelligent transport systems - Cooperative systems - ITS application requirements and objectives for selection of communication profiles (ISO/TS 17423:2014)	Active	Published	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓											
CEN ISO/TS 17427:2014	Intelligent transport systems - Cooperative systems - Roles and responsibilities in the context of cooperative ITS based on architecture(s) for cooperative systems (ISO/TS 17427:2014)	Active	Published	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
FprCEN ISO/TR 17424 (WI=00278269)	Intelligent transport systems - Co-operative systems - State of the art of Local Dynamic Maps concepts	Under Approval	Not Published																									
FprCEN ISO/TS 18750 (WI=00278347)	Intelligent transport systems - Cooperative systems - Definition of a global concept for Local Dynamic Maps (ISO/PRF TS 18750:2014)	Under Approval	Not Published																									



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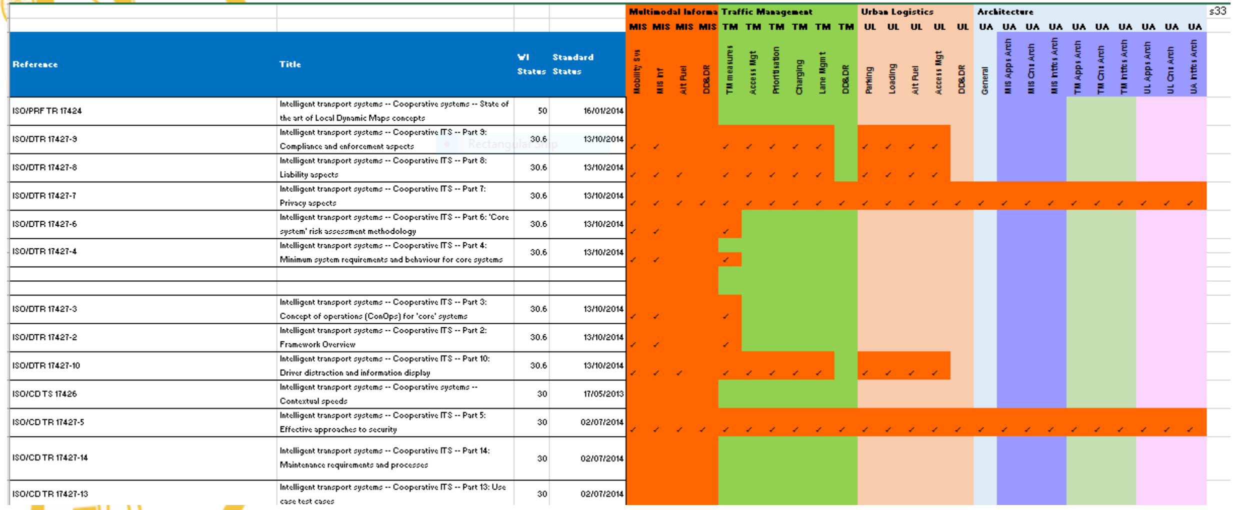
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	**Title**	**WI Status**	**Standard Status**	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cms Arch	MIS Intfcs Arch	TM Apps Arch	TM Cms Arch	TM Intfcs Arch	UL Apps Arch	UL Cms Arch	UA Intfcs Arch	
FprCEN ISO/TS 19321:2014 (WI=00278360)	Intelligent transport systems - Cooperative ITS - Dictionary of in-vehicle information (IVI) data structures (ISO/PRF TS 19321:2014)	Under Approval	Not Published				✓						✓					✓	✓										
prCEN ISO/TS 17425 (WI=00278287)	Intelligent transport systems - Co-operative systems - Specification for in-vehicle presentation of external road and traffic related data	Under Drafting	Not Published	✓	✓			✓									✓												
prCEN ISO/TS 17426 (WI=00278289)	Intelligent transport systems - Co-operative systems - Contextual speeds	Under Drafting	Not Published																										
prCEN ISO/TS 17429 (WI=00278288)	Intelligent Transport Systems - Cooperative Systems - Profiles for processing and transfer of information between ITS stations for applications related to transport infrastructure management, control and guidance	Under Drafting	Not Published	✓	✓			✓																					
ISO/TS 17427:2014	**Intelligent transport systems -- Cooperative systems -- Roles and responsibilities in the context of cooperative ITS based on architecture(s) for cooperative systems**	**60.6**	**04/07/2014**																✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ISO/TS 17423:2014	Intelligent transport systems -- Cooperative systems -- ITS application requirements and objectives for selection of communication profiles	60.6	02/04/2014																										
ISO/TS 17419:2014	Intelligent transport systems -- Cooperative systems -- Classification and management of ITS applications in a global context	60.6	02/04/2014	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓			✓			✓			✓			
ISO/PRF TS 19321	Intelligent transport systems -- Cooperative ITS -- Dictionary of in-vehicle information (IVI) data structures	50.20	05/11/2014	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓											
ISO/PRF TS 18750	Intelligent transport systems -- Cooperative systems -- Definition of a global concept for Local Dynamic Maps	50.20	12/11/2014																										



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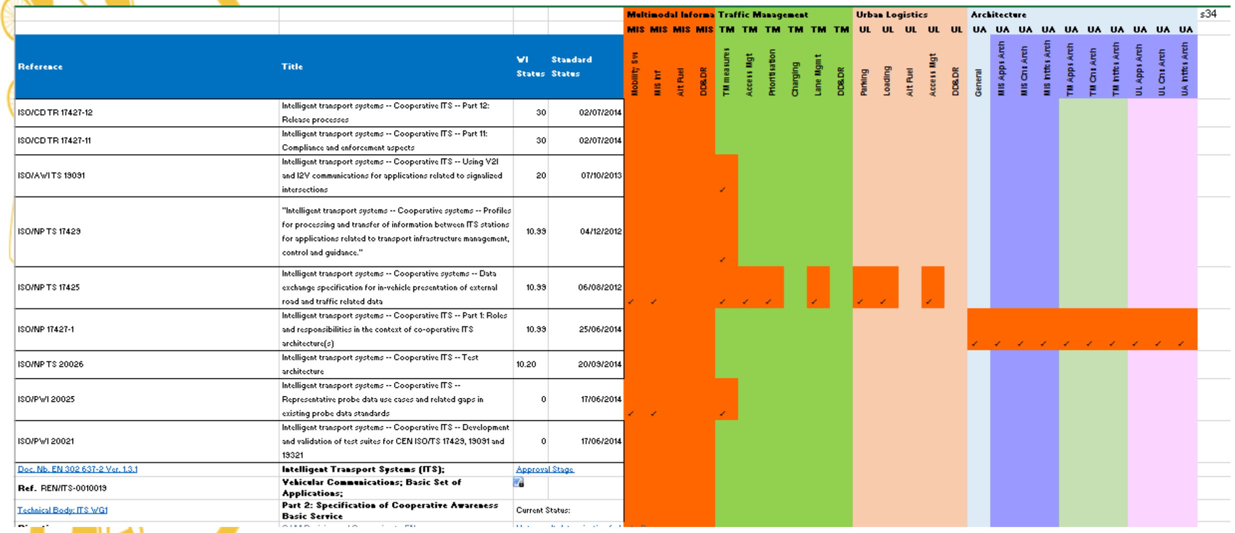
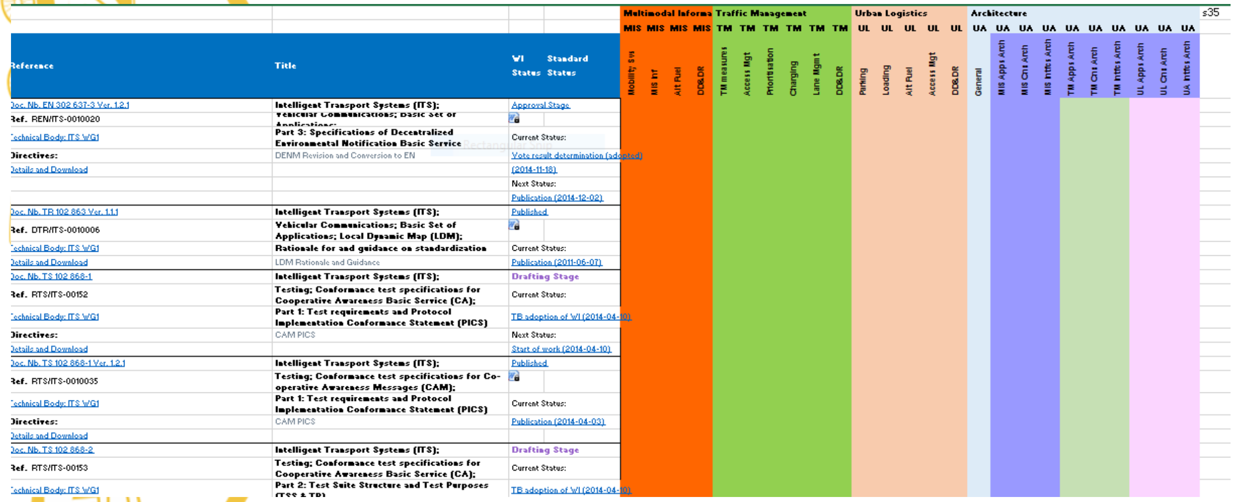
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cnt Arch	MIS Intfcs Arch	TM Apps Arch	TM Cnt Arch	TM Intfcs Arch	UL Apps Arch	UL Cnt Arch	UA Intfcs Arch	
ISO/PRF TR 17424	Intelligent transport systems -- Cooperative systems -- State of the art of Local Dynamic Maps concepts	50	16/01/2014																										
ISO/DTR 17427-9	Intelligent transport systems -- Cooperative ITS -- Part 9: Compliance and enforcement aspects	30.6	13/10/2014	✓	✓			✓	✓	✓	✓	✓		✓	✓	✓	✓												
ISO/DTR 17427-8	Intelligent transport systems -- Cooperative ITS -- Part 8: Liability aspects	30.6	13/10/2014	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
ISO/DTR 17427-7	Intelligent transport systems -- Cooperative ITS -- Part 7: Privacy aspects	30.6	13/10/2014	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ISO/DTR 17427-6	Intelligent transport systems -- Cooperative ITS -- Part 6: 'Core system' risk assessment methodology	30.6	13/10/2014	✓	✓			✓																					
ISO/DTR 17427-4	Intelligent transport systems -- Cooperative ITS -- Part 4: Minimum system requirements and behaviour for core systems	30.6	13/10/2014	✓	✓			✓																					
ISO/DTR 17427-3	Intelligent transport systems -- Cooperative ITS -- Part 3: Concept of operations (ConOps) for 'core' systems	30.6	13/10/2014	✓	✓			✓																					
ISO/DTR 17427-2	Intelligent transport systems -- Cooperative ITS -- Part 2: Framework Overview	30.6	13/10/2014	✓	✓			✓																					
ISO/DTR 17427-10	Intelligent transport systems -- Cooperative ITS -- Part 10: Driver distraction and information display	30.6	13/10/2014	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓												
ISO/CD TS 17426	Intelligent transport systems -- Cooperative systems -- Contextual speeds	30	17/05/2013																										
ISO/CD TR 17427-5	Intelligent transport systems -- Cooperative ITS -- Part 5: Effective approaches to security	30	02/07/2014	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ISO/CD TR 17427-14	Intelligent transport systems -- Cooperative ITS -- Part 14: Maintenance requirements and processes	30	02/07/2014																										
ISO/CD TR 17427-13	Intelligent transport systems -- Cooperative ITS -- Part 13: Use case test cases	30	02/07/2014																										

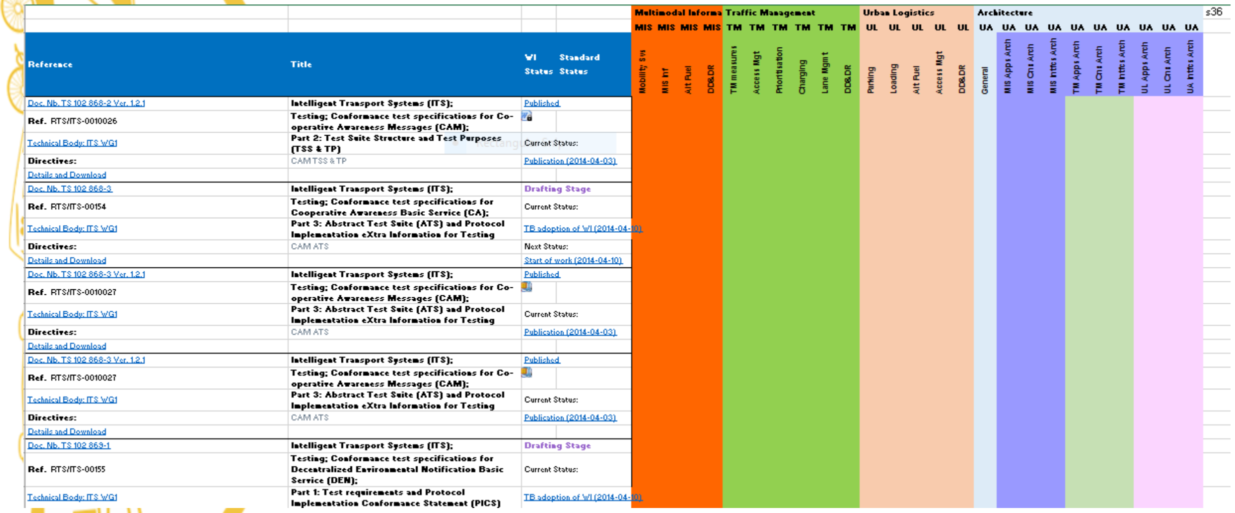


				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s34
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cms Arch	MIS Inttcs Arch	TM Apps Arch	TM Cms Arch	TM Inttcs Arch	UL Apps Arch	UL Cms Arch	UA Inttcs Arch	
ISO/CD TR 17427-12	Intelligent transport systems -- Cooperative ITS -- Part 12: Release processes	30	02/07/2014																										
ISO/CD TR 17427-11	Intelligent transport systems -- Cooperative ITS -- Part 11: Compliance and enforcement aspects	30	02/07/2014																										
ISO/AWI TS 19091	Intelligent transport systems -- Cooperative ITS -- Using V2I and I2V communications for applications related to signalized intersections	20	07/10/2013					✓																					
ISO/NP TS 17429	"Intelligent transport systems -- Cooperative systems -- Profiles for processing and transfer of information between ITS stations for applications related to transport infrastructure management, control and guidance."	10.99	04/12/2012					✓																					
ISO/NP TS 17425	Intelligent transport systems -- Cooperative systems -- Data exchange specification for in-vehicle presentation of external road and traffic related data	10.99	06/08/2012	✓	✓			✓	✓	✓		✓		✓	✓		✓												
ISO/NP 17427-1	Intelligent transport systems -- Cooperative ITS -- Part 1: Roles and responsibilities in the context of co-operative ITS architecture(s)	10.99	25/06/2014																✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ISO/NP TS 20026	Intelligent transport systems -- Cooperative ITS -- Test architecture	10.20	20/09/2014																										
ISO/PWI 20025	Intelligent transport systems -- Cooperative ITS -- Representative probe data use cases and related gaps in existing probe data standards	0	17/06/2014	✓	✓			✓																					
ISO/PWI 20021	Intelligent transport systems -- Cooperative ITS -- Development and validation of test suites for CEN ISO/TS 17429, 19091 and 19321	0	17/06/2014																										
Doc. Nb. EN 302 637-2 Ver. 1.3.1	**Intelligent Transport Systems (ITS);**	Approval Stage																											
Ref. REN/ITS-0010019	**Vehicular Communications; Basic Set of Applications;**																												
Technical Body: ITS WG1	**Part 2: Specification of Cooperative Awareness Basic Service**	Current Status:																											



Reference	Title	WI Status	Standard Status
oc. Nb. EN 302 637-3 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Approval Stage	
ef. REN/ITS-0010020	**Vehicular Communications; Basic Set of Applications;**		
echnical Body: ITS WG1	**Part 3: Specifications of Decentralized Environmental Notification Basic Service**	Current Status:	
irectives:	DENM Revision and Conversion to EN	Vote result determination (adopted)	
etails and Download		(2014-11-18)	
		Next Status:	
		Publication (2014-12-02)	
oc. Nb. TR 102 863 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published	
ef. DTR/ITS-0010006	**Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM);**		
echnical Body: ITS WG1	**Rationale for and guidance on standardization**	Current Status:	
etails and Download	LDM Rationale and Guidance	Publication (2011-06-07)	
oc. Nb. TS 102 868-1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**	
ef. RTS/ITS-00152	**Testing; Conformance test specifications for Cooperative Awareness Basic Service (CA);**	Current Status:	
echnical Body: ITS WG1	**Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS)**	TB adoption of WI (2014-04-10)	
irectives:	CAM PICS	Next Status:	
etails and Download		Start of work (2014-04-10)	
oc. Nb. TS 102 868-1 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published	
ef. RTS/ITS-0010035	**Testing; Conformance test specifications for Co-operative Awareness Messages (CAM);**		
echnical Body: ITS WG1	**Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS)**	Current Status:	
irectives:	CAM PICS	Publication (2014-04-03)	
etails and Download			
oc. Nb. TS 102 868-2	**Intelligent Transport Systems (ITS);**	**Drafting Stage**	
ef. RTS/ITS-00153	**Testing; Conformance test specifications for Cooperative Awareness Basic Service (CA);**	Current Status:	
echnical Body: ITS WG1	**Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	TB adoption of WI (2014-04-10)	

Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s35
MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cnt Arch	MIS Intfcs Arch	TM Apps Arch	TM Cnt Arch	TM Intfcs Arch	UL Apps Arch	UL Cnt Arch	UA Intfcs Arch	



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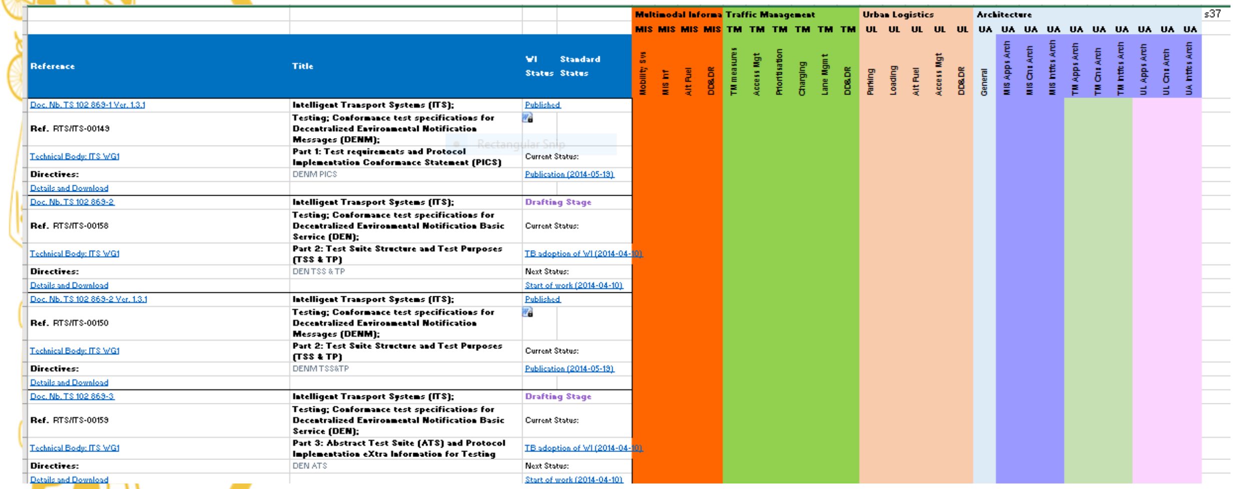
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Sys	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
Doc. Nb. TS 102 868-2 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0010026	**Testing; Conformance test specifications for Co-operative Awareness Messages (CAM);**																												
Technical Body: ITS WG1	**Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	Current Status:																											
Directives:	CAM TSS & TP	Publication (2014-04-03)																											
Details and Download																													
Doc. Nb. TS 102 868-3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00154	**Testing; Conformance test specifications for Cooperative Awareness Basic Service (CA);**	Current Status:																											
Technical Body: ITS WG1	**Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing**	TB adoption of WI (2014-04-10)																											
Directives:	CAM ATS	Next Status:																											
Details and Download		Start of work (2014-04-10)																											
Doc. Nb. TS 102 868-3 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0010027	**Testing; Conformance test specifications for Co-operative Awareness Messages (CAM);**																												
Technical Body: ITS WG1	**Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing**	Current Status:																											
Directives:	CAM ATS	Publication (2014-04-03)																											
Details and Download																													
Doc. Nb. TS 102 868-3 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-0010027	**Testing; Conformance test specifications for Co-operative Awareness Messages (CAM);**																												
Technical Body: ITS WG1	**Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing**	Current Status:																											
Directives:	CAM ATS	Publication (2014-04-03)																											
Details and Download																													
Doc. Nb. TS 102 869-1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00155	**Testing; Conformance test specifications for Decentralized Environmental Notification Basic Service (DEN);**	Current Status:																											
Technical Body: ITS WG1	**Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS)**	TB adoption of WI (2014-04-10)																											



				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s37
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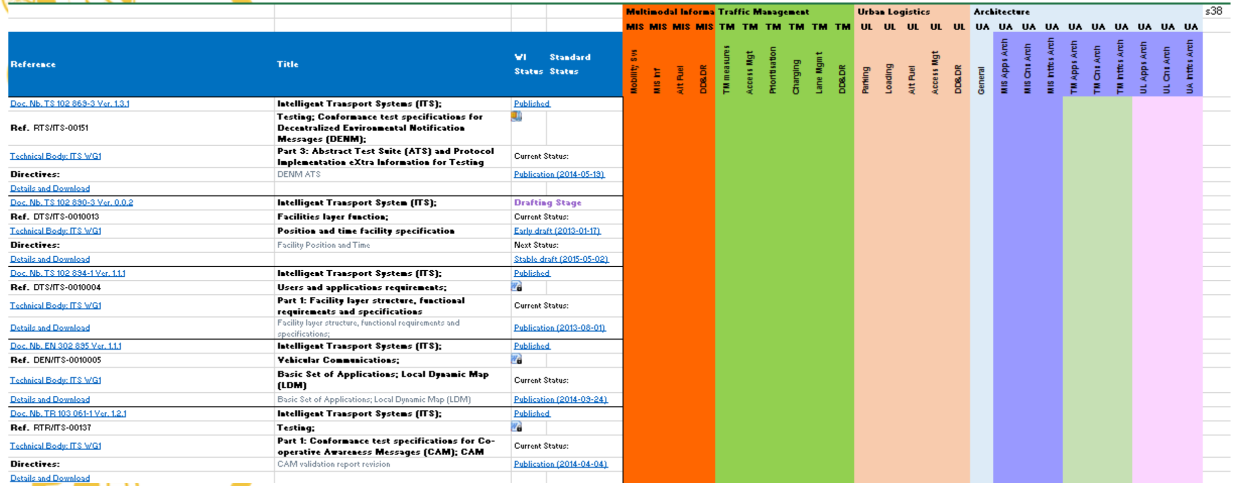
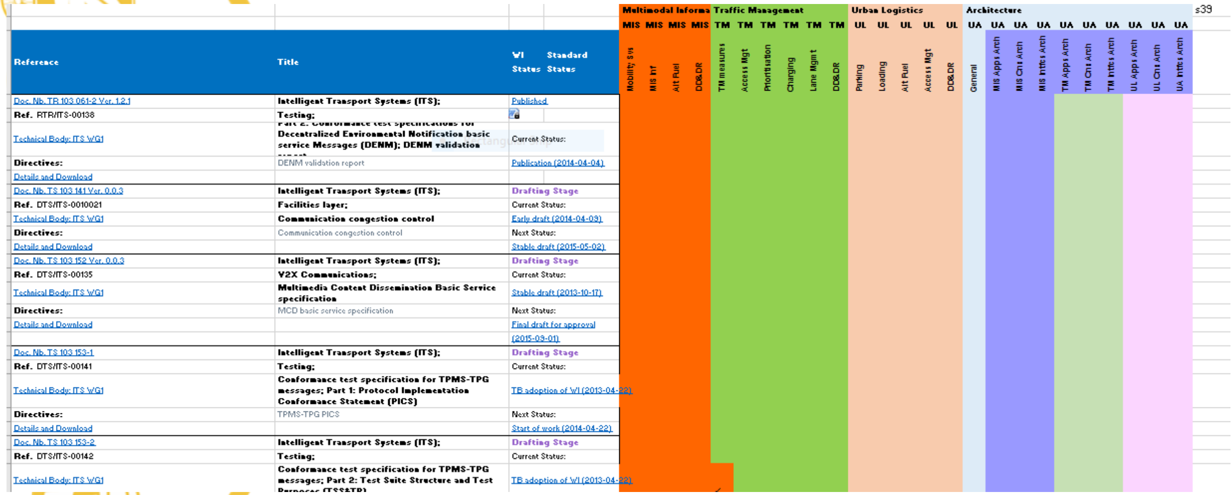
Reference	Title	WI Status	Standard Status	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cms Arch	MIS Intfcs Arch	TM Apps Arch	TM Cms Arch	TM Intfcs Arch	UL Apps Arch	UL Cms Arch	UA Intfcs Arch	
Doc. Nb. TS 102 869-1 Ver. 1.3.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-00149	**Testing; Conformance test specifications for Decentralized Environmental Notification Messages (DENM);**																												
Technical Body: ITS WG1	**Part 1: Test requirements and Protocol Implementation Conformance Statement (PICS)**	Current Status:																											
Directives:	DENM PICS	Publication (2014-05-19)																											
Details and Download																													
Doc. Nb. TS 102 869-2	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00158	**Testing; Conformance test specifications for Decentralized Environmental Notification Basic Service (DEN);**	Current Status:																											
Technical Body: ITS WG1	**Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	TB adoption of WI (2014-04-10)																											
Directives:	DEN TSS & TP	Next Status:																											
Details and Download		Start of work (2014-04-10)																											
Doc. Nb. TS 102 869-2 Ver. 1.3.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTS/ITS-00150	**Testing; Conformance test specifications for Decentralized Environmental Notification Messages (DENM);**																												
Technical Body: ITS WG1	**Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	Current Status:																											
Directives:	DENM TSS&TP	Publication (2014-05-19)																											
Details and Download																													
Doc. Nb. TS 102 869-3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00159	**Testing; Conformance test specifications for Decentralized Environmental Notification Basic Service (DEN);**	Current Status:																											
Technical Body: ITS WG1	**Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing**	TB adoption of WI (2014-04-10)																											
Directives:	DEN ATS	Next Status:																											
Details and Download		Start of work (2014-04-10)																											



Reference	Title	WI Status	Standard Status
Doc. Nb. TS 102 869-3 Ver. 1.3.1	Intelligent Transport Systems (ITS);	Published	
Ref. RTS/ITS-00151	Testing; Conformance test specifications for Decentralized Environmental Notification Messages (DENM);		
Technical Body: ITS WG1	Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing	Current Status:	
Directives:	DENM ATS	Publication (2014-05-19)	
Details and Download			
Doc. Nb. TS 102 890-3 Ver. 0.0.2	Intelligent Transport System (ITS);	Drafting Stage	
Ref. DTS/ITS-0010013	Facilities layer function;	Current Status:	
Technical Body: ITS WG1	Position and time facility specification	Early draft (2013-01-17)	
Directives:	Facility Position and Time	Next Status:	
Details and Download		Stable draft (2015-05-02)	
Doc. Nb. TS 102 894-1 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Published	
Ref. DTS/ITS-0010004	Users and applications requirements;		
Technical Body: ITS WG1	Part 1: Facility layer structure, functional requirements and specifications	Current Status:	
Details and Download	Facility layer structure, functional requirements and specifications;	Publication (2013-08-01)	
Doc. Nb. EN 302 895 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Published	
Ref. DEN/ITS-0010005	Vehicular Communications;		
Technical Body: ITS WG1	Basic Set of Applications; Local Dynamic Map (LDM)	Current Status:	
Details and Download	Basic Set of Applications; Local Dynamic Map (LDM)	Publication (2014-09-24)	
Doc. Nb. TR 103 061-1 Ver. 1.2.1	Intelligent Transport Systems (ITS);	Published	
Ref. RTR/ITS-00137	Testing;		
Technical Body: ITS WG1	Part 1: Conformance test specifications for Co-operative Awareness Messages (CAM); CAM	Current Status:	
Directives:	CAM validation report revision	Publication (2014-04-04)	
Details and Download			

Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s38
MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	



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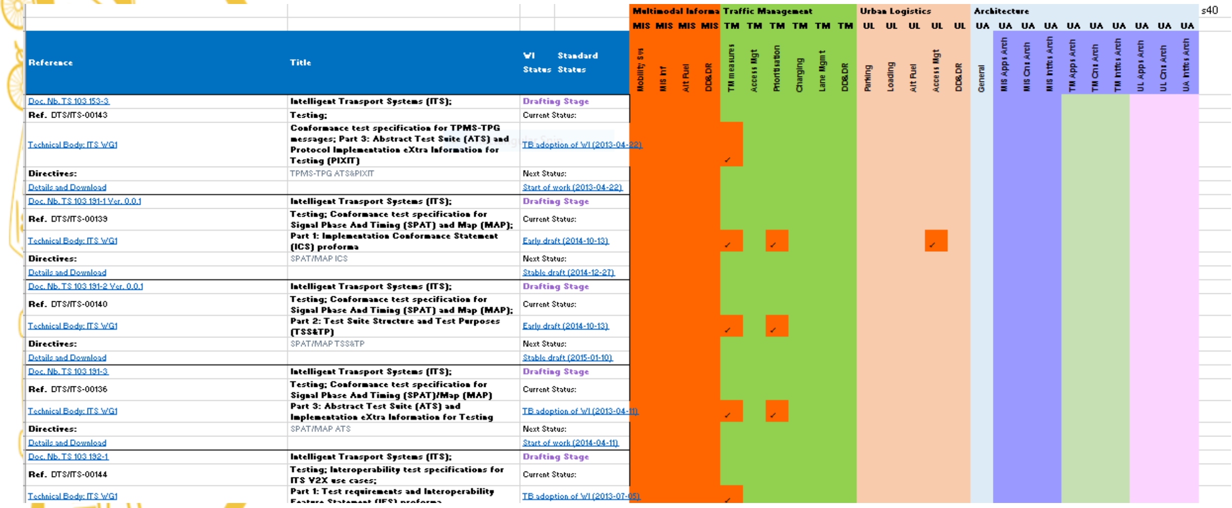
Reference	**Title**	**WI Status**	**Standard Status**	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
Doc. Nb. TR 103 061-2 Ver. 1.2.1	**Intelligent Transport Systems (ITS);**	Published																											
Ref. RTR/ITS-00138	**Testing;**																												
Technical Body: ITS WG1	**Part 2: Conformance test specifications for Decentralized Environmental Notification basic service Messages (DENM); DENM validation report**	Current Status:																											
Directives:	DENM validation report	Publication (2014-04-04)																											
Details and Download																													
Doc. Nb. TS 103 141 Ver. 0.0.3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-0010021	**Facilities layer;**	Current Status:																											
Technical Body: ITS WG1	**Communication congestion control**	Early draft (2014-04-03)																											
Directives:	Communication congestion control	Next Status:																											
Details and Download		Stable draft (2015-05-02)																											
Doc. Nb. TS 103 152 Ver. 0.0.3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-00135	**V2X Communications;**	Current Status:																											
Technical Body: ITS WG1	**Multimedia Content Dissemination Basic Service specification**	Stable draft (2013-10-17)																											
Directives:	MCD basic service specification	Next Status:																											
Details and Download		Final draft for approval																											
		(2015-09-01)																											
Doc. Nb. TS 103 153-1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-00141	**Testing;**	Current Status:																											
Technical Body: ITS WG1	**Conformance test specification for TPMS-TPG messages; Part 1: Protocol Implementation Conformance Statement (PICS)**	TB adoption of WI (2013-04-22)																											
Directives:	TPMS-TPG PICS	Next Status:																											
Details and Download		Start of work (2014-04-22)																											
Doc. Nb. TS 103 153-2	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-00142	**Testing;**	Current Status:																											
Technical Body: ITS WG1	**Conformance test specification for TPMS-TPG messages; Part 2: Test Suite Structure and Test Purposes (TSS&TP)**	TB adoption of WI (2013-04-22)																											



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Doc. Nb. TS 103 153-3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																										
Ref. DTS/ITS-00143	**Testing;**	Current Status:																										
Technical Body: ITS WG1	**Conformance test specification for TPMS-TPG messages; Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing (PIXIT)**	TB adoption of WI (2013-04-22)					✓																					
Directives:	TPMS-TPG ATS&PIXIT	Next Status:																										
Details and Download		Start of work (2013-04-22)																										
Doc. Nb. TS 103 191-1 Ver. 0.0.1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																										
Ref. DTS/ITS-00139	**Testing; Conformance test specification for Signal Phase And Timing (SPAT) and Map (MAP);**	Current Status:																										
Technical Body: ITS WG1	**Part 1: Implementation Conformance Statement (ICS) proforma**	Early draft (2014-10-13)					✓		✓							✓												
Directives:	SPAT/MAP ICS	Next Status:																										
Details and Download		Stable draft (2014-12-27)																										
Doc. Nb. TS 103 191-2 Ver. 0.0.1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																										
Ref. DTS/ITS-00140	**Testing; Conformance test specification for Signal Phase And Timing (SPAT) and Map (MAP);**	Current Status:																										
Technical Body: ITS WG1	**Part 2: Test Suite Structure and Test Purposes (TSS&TP)**	Early draft (2014-10-13)					✓		✓																			
Directives:	SPAT/MAP TSS&TP	Next Status:																										
Details and Download		Stable draft (2015-01-10)																										
Doc. Nb. TS 103 191-3	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																										
Ref. DTS/ITS-00136	**Testing; Conformance test specification for Signal Phase And Timing (SPAT)/Map (MAP)**	Current Status:																										
Technical Body: ITS WG1	**Part 3: Abstract Test Suite (ATS) and Implementation eXtra Information for Testing**	TB adoption of WI (2013-04-11)					✓		✓																			
Directives:	SPAT/MAP ATS	Next Status:																										
Details and Download		Start of work (2014-04-11)																										
Doc. Nb. TS 103 192-1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																										
Ref. DTS/ITS-00144	**Testing; Interoperability test specifications for ITS V2X use cases;**	Current Status:																										
Technical Body: ITS WG1	**Part 1: Test requirements and Interoperability Feature Statement (IFS) proforma**	TB adoption of WI (2013-07-05)					✓																					

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			MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
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Doc. Nb. TS 103 192-2	**Intelligent Transport Systems (ITS);**	Drafting Stage																										
Ref. DTS/ITS-00147	**Testing; Interoperability test specifications for ITS V2X use cases;**	Current Status:																										
Technical Body: ITS WG1	**Part 2: Test Suite Structure and Test Purposes (TSS&TP)**	TB adoption of WI (2013-07-05)					✓																					
Directives:	ITS V2X Use Cases; Part 2 TSS&TP	Next Status:																										
Details and Download		Start of work (2013-07-05)																										
Doc. Nb. TS 103 192-3	**Intelligent Transport Systems (ITS);**	Drafting Stage																										
Ref. DTS/ITS-00145	**Testing; Interoperability test specifications for ITS V2X use cases;**	Current Status:																										
Technical Body: ITS WG1	**Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing**	TB adoption of WI (2013-07-05)					✓																					
Directives:	ITS V2X Use Cases; Part 3 ATS	Next Status:																										
Details and Download		Start of work (2013-07-05)																										
Doc. Nb. TR 103 193	**Intelligent Transport Systems (ITS);**	Drafting Stage																										
Ref. DTR/ITS-00146	**Testing; Interoperability test specifications for ITS V2X use cases;**	Current Status:																										
Technical Body: ITS WG1	**Architecture of ITS Interoperability Validation Framework**	TB adoption of WI (2013-07-05)					✓																					
Directives:	Architecture of ITS Interoperability Validation Framework	Next Status:																										
Details and Download		Start of work (2013-07-05)																										
Doc. Nb. TR 103 298	**Intelligent Transport Systems (ITS);**	Drafting Stage																										
Ref. DTR/ITS-00156	**Platooning;**	Current Status:																										
Technical Body: ITS WG1	**Pre-standardization study**	TB adoption of WI (2014-10-16)									✓																	
Directives:	Platooning pre-standardization study	Next Status:	✓	✓																								
Details and Download		Start of work (2014-10-16)																										
Doc. Nb. TR 103 299	**Intelligent Transport System (ITS);**	Drafting Stage																										
Ref. DTR/ITS-00164	**Cooperative Adaptive Cruise Control (C-ACC);**	Current Status:																										
Technical Body: ITS WG1	**Pre-standardization study**	TB adoption of WI (2014-10-16)																										
Directives:	C-ACC Pre-standardization study	Next Status:									✓																	
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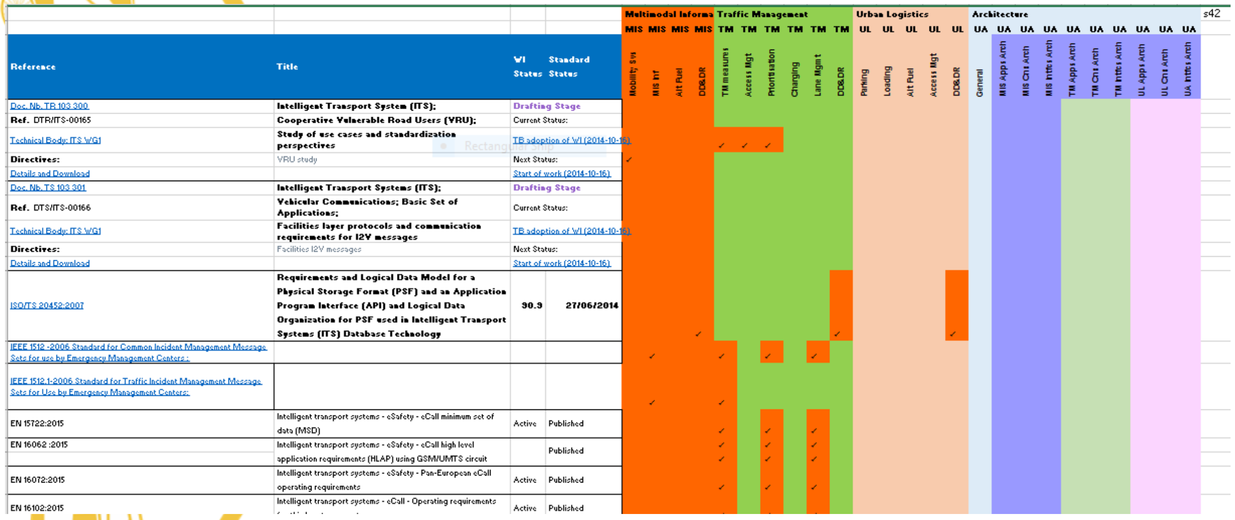

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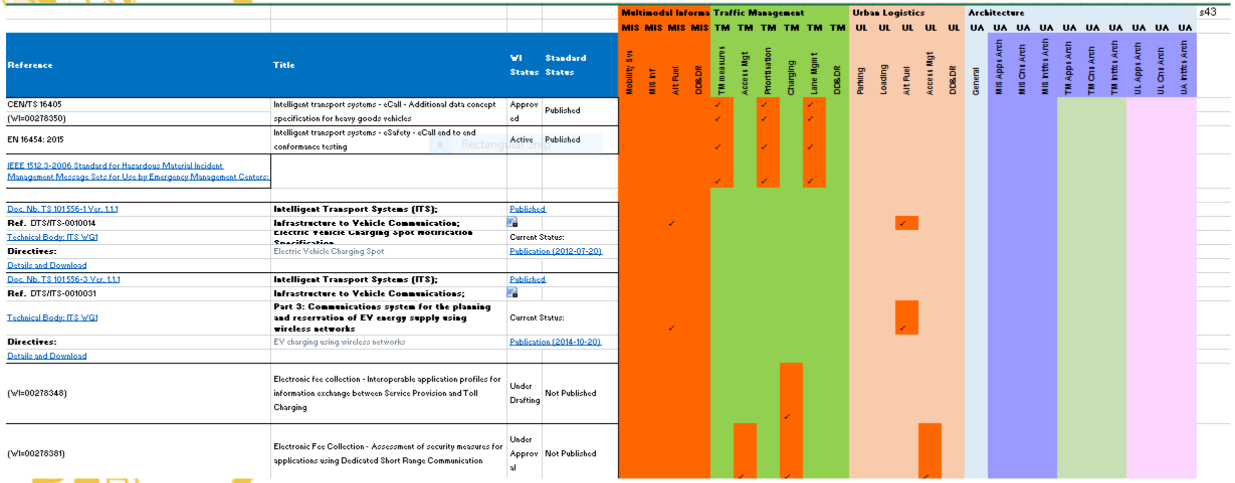
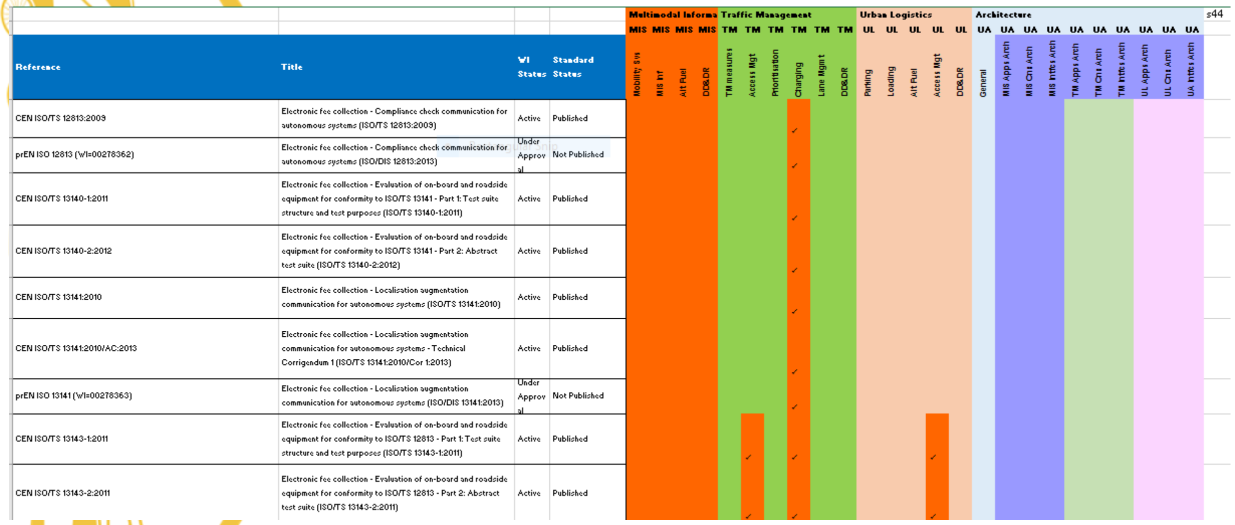
Doc. Nb. TR 103 300	**Intelligent Transport System (ITS);**	**Drafting Stage**																											
Ref. DTR/ITS-00165	**Cooperative Vulnerable Road Users (VRU);**	Current Status:																											
Technical Body: ITS WG1	**Study of use cases and standardization perspectives**	TB adoption of WI (2014-10-16)						✓	✓	✓																			
Directives:	VRU study	Next Status:		✓																									
Details and Download		Start of work (2014-10-16)																											
Doc. Nb. TS 103 301	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-00166	**Vehicular Communications; Basic Set of Applications;**	Current Status:																											
Technical Body: ITS WG1	**Facilities layer protocols and communication requirements for I2V messages**	TB adoption of WI (2014-10-16)																											
Directives:	Facilities I2V messages	Next Status:																											
Details and Download		Start of work (2014-10-16)																											
ISO/TS 20452:2007	**Requirements and Logical Data Model for a Physical Storage Format (PSF) and an Application Program Interface (API) and Logical Data Organization for PSF used in Intelligent Transport Systems (ITS) Database Technology**	**90.9**	**27/06/2014**				✓						✓					✓											
IEEE 1512 -2006 Standard for Common Incident Management Message Sets for use by Emergency Management Centers :					✓			✓		✓		✓																	
IEEE 1512.1-2006 Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers:					✓			✓																					
EN 15722:2015	Intelligent transport systems - eSafety - eCall minimum set of data (MSD)	Active	Published					✓		✓		✓																	
EN 16062 :2015	Intelligent transport systems - eSafety - eCall high level application requirements (HLAP) using GSM/UMTS circuit		Published					✓ ✓		✓ ✓		✓ ✓																	
EN 16072:2015	Intelligent transport systems - eSafety - Pan-European eCall operating requirements	Active	Published					✓		✓		✓																	
EN 16102:2015	Intelligent transport systems - eCall - Operating requirements	Active	Published																										



				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s43
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
CEN/TS 16405 (WI=00278350)	Intelligent transport systems - eCall - Additional data concept specification for heavy goods vehicles	Approved	Published					✓ ✓		✓ ✓		✓ ✓																	
EN 16454: 2015	Intelligent transport systems - eSafety - eCall end to end conformance testing	Active	Published					✓		✓		✓																	
IEEE 1512.3-2006 Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers:								✓		✓		✓																	
Doc. Nb. TS 101 556-1 Ver. 1.1.1 **Ref.** DTS/ITS-0010014 Technical Body: ITS WG1 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Infrastructure to Vehicle Communication;** **Electric Vehicle Charging Spot Notification Specification** Electric Vehicle Charging Spot	Published Current Status: Publication (2012-07-20)				✓										✓													
Doc. Nb. TS 101 556-3 Ver. 1.1.1 **Ref.** DTS/ITS-0010031 Technical Body: ITS WG1 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Infrastructure to Vehicle Communications;** **Part 3: Communications system for the planning and reservation of EV energy supply using wireless networks** EV charging using wireless networks	Published Current Status: Publication (2014-10-20)				✓										✓													
(WI=00278348)	Electronic fee collection - Interoperable application profiles for information exchange between Service Provision and Toll Charging	Under Drafting	Not Published								✓																		
(WI=00278381)	Electronic Fee Collection - Assessment of security measures for applications using Dedicated Short Range Communication	Under Approval	Not Published						✓		✓						✓												



				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s44
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cnt Arch	MIS Inftrs Arch	TM Apps Arch	TM Cnt Arch	TM Inftrs Arch	UL Apps Arch	UL Cnt Arch	UA Inftrs Arch	
CEN ISO/TS 12813:2009	Electronic fee collection - Compliance check communication for autonomous systems (ISO/TS 12813:2009)	Active	Published								✓																		
prEN ISO 12813 (WI=00278362)	Electronic fee collection - Compliance check communication for autonomous systems (ISO/DIS 12813:2013)	Under Approval	Not Published								✓																		
CEN ISO/TS 13140-1:2011	Electronic fee collection - Evaluation of on-board and roadside equipment for conformity to ISO/TS 13141 - Part 1: Test suite structure and test purposes (ISO/TS 13140-1:2011)	Active	Published								✓																		
CEN ISO/TS 13140-2:2012	Electronic fee collection - Evaluation of on-board and roadside equipment for conformity to ISO/TS 13141 - Part 2: Abstract test suite (ISO/TS 13140-2:2012)	Active	Published								✓																		
CEN ISO/TS 13141:2010	Electronic fee collection - Localisation augmentation communication for autonomous systems (ISO/TS 13141:2010)	Active	Published								✓																		
CEN ISO/TS 13141:2010/AC:2013	Electronic fee collection - Localisation augmentation communication for autonomous systems - Technical Corrigendum 1 (ISO/TS 13141:2010/Cor 1:2013)	Active	Published								✓																		
prEN ISO 13141 (WI=00278363)	Electronic fee collection - Localisation augmentation communication for autonomous systems (ISO/DIS 13141:2013)	Under Approval	Not Published								✓																		
CEN ISO/TS 13143-1:2011	Electronic fee collection - Evaluation of on-board and roadside equipment for conformity to ISO/TS 12813 - Part 1: Test suite structure and test purposes (ISO/TS 13143-1:2011)	Active	Published						✓		✓						✓												
CEN ISO/TS 13143-2:2011	Electronic fee collection - Evaluation of on-board and roadside equipment for conformity to ISO/TS 12813 - Part 2: Abstract test suite (ISO/TS 13143-2:2011)	Active	Published						✓		✓						✓												

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s45
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Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
CEN ISO/TS 16401-1:2012	Electronic fee collection - Evaluation of equipment for conformity to ISO/TS 17575-2 - Part 1: Test suite structure and test purposes (ISO/TS 16401-1:2012)	Active	Published								✓																		
CEN ISO/TS 16401-2:2012	Electronic fee collection - Evaluation of equipment for conformity to ISO/TS 17575-2 - Part 2: Abstract test suite (ISO/TS 16401-2:2012)	Active	Published								✓																		
CEN ISO/TS 16403-1:2012	Electronic fee collection - Evaluation of equipment for conformity to ISO/TS 17575-4 - Part 1: Test suite structure and test purposes (ISO/TS 16403-1:2012)	Active	Published								✓																		
CEN ISO/TS 16403-2:2012	Electronic fee collection - Evaluation of equipment for conformity to ISO/TS 17575-4 - Part 2: Abstract test suite (ISO/TS 16403-2:2012)	Active	Published								✓																		
CEN ISO/TS 16407-1:2011	Electronic fee collection - Evaluation of equipment for conformity to ISO/TS 17575-1 - Part 1: Test suite structure and test purposes (ISO/TS 16407-1:2011)	Active	Published								✓																		
CEN ISO/TS 16407-2:2012	Electronic fee collection - Evaluation of equipment for conformity to ISO/TS 17575-1 - Part 2: Abstract test suite (ISO/TS 16407-2:2012)	Active	Published								✓																		
CEN ISO/TS 16410-1:2011	Electronic fee collection - Evaluation of equipment for conformity to ISO/TS 17575-3 - Part 1: Test suite structure and test purposes (ISO/TS 16410-1:2011)	Active	Published								✓																		
CEN ISO/TS 16410-2:2012	Electronic fee collection - Evaluation of equipment for conformity to ISO/TS 17575-3 - Part 2: Abstract test suite (ISO/TS 16410-2:2012)	Active	Published								✓																		
CEN ISO/TS 17444-1:2012	Electronic fee collection - Charging performance - Part 1: Metrics (ISO/TS 17444-1:2012)	Active	Published								✓																		
CEN ISO/TS 17444-2:2013	Electronic fee collection - Charging performance - Part 2: Examination Framework (ISO/TS 17444-2:2013)	Active	Published								✓																		

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				Multimodal Informa				Traffic Management						Urban Logistics					Architecture									
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch
CEN ISO/TS 17575-1:2010	Electronic fee collection - Application interface definition for autonomous systems - Part 1: Charging (ISO/TS 17575-1:2010)	Active	Published								✓																	
prEN ISO 17575-1 (WI=00278356)	Electronic fee collection - Application interface definition for autonomous systems - Part 1: Charging (ISO/DIS 17575-1:2013)	Under Approval	Not Published								✓																	
CEN ISO/TS 17575-2:2010	Electronic fee collection - Application interface definition for autonomous systems - Part 2: Communication and connection to the lower layers (ISO/TS 17575-2:2010)	Active	Published								✓																	
prEN ISO 17575-2 (WI=00278364)	Electronic fee collection - Application interface definition for autonomous systems - Part 2: Communication and connection to the lower layers (ISO/DIS 17575-2:2013)	Under Approval	Not Published								✓																	
CEN ISO/TS 17575-3:2011	Electronic fee collection - Application interface definition for autonomous systems - Part 3: Context data (ISO/TS 17575-3:2011)	Active	Published								✓																	
CEN ISO/TS 17575-3:2011/AC:2013	Electronic fee collection - Application interface definition for autonomous systems - Part 3: Context data - Technical Corrigendum 1 (ISO/TS 17575-3:2011/Cor 1:2013)	Active	Published								✓																	
CEN ISO/TS 17575-4:2011	Electronic fee collection - Application interface definition for autonomous systems - Part 4: Roaming (ISO/TS 17575-4:2011)	Active	Published								✓																	
CEN ISO/TS 25110:2013	Electronic fee collection - Interface definition for on-board account using integrated circuit card (ICC) (ISO/TS 25110:2013)	Active	Published								✓																	
CEN/TR 16040:2010	Electronic fee collection - Requirements for urban dedicated short-range communication	Active	Published								✓			✓			✓											

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s47
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Reference	**Title**	**WI Status**	**Standard Status**	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
CEN/TR 16092:2011	Electronic fee collection - Requirements for pre-payment systems	Active	Published								✓																		
CEN/TR 16152:2011	Electronic fee collection - Personalisation and mounting of first mount OBE	Active	Published								✓			✓			✓												
CEN/TR 16219:2011	Electronic Fee Collection - Value added services based on EFC on-board equipment	Active	Published								✓																		
CEN/TS 16331:2012	Electronic fee collection - Interoperable application profiles for autonomous systems	Active	Published								✓																		
CEN/TS 16439:2013	Electronic fee collection - Security framework	Active	Published						✓		✓			✓			✓												
CEN/TS 16702-1:2014	Electronic fee collection - Secure monitoring for autonomous toll systems - Part 1: Compliance checking	Active	Published								✓																		
EN 15509:2014	Electronic fee collection - Interoperability application profile for DSRC	Active	Published								✓																		
EN 15876-1:2010+A1:2012	Electronic fee collection - Evaluation of on-board and roadside equipment for conformity to EN 15509 - Part 1: Test suite structure and test purposes	Active	Published								✓																		
EN ISO 14906:2011	Electronic fee collection - Application interface definition for dedicated short-range communication (ISO 14906:2011)	Active	Published						✓		✓			✓			✓												
EN ISO 14906:2011/AC:2013	Electronic fee collection - Application interface definition for dedicated short-range communication - Technical Corrigendum 1 (ISO 14906:2011/Cor 1:2013)	Active	Published						✓		✓			✓			✓												
EN ISO 14906:2011/FprA1:2014 (WI=00278357)	Electronic fee collection - Application interface definition for dedicated short-range communication (ISO 14906:2011/FDAM 1:2014)	Under Approval	Not Published						✓		✓			✓			✓												
FprCEN/TS 16702-2 (WI=00278338)	Electronic fee collection - Secure monitoring for autonomous toll systems - Part 2: Trusted recorder	Under Approval	Not Published								✓																		

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s48
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inftrs Arch	TM Apps Arch	TM Cns Arch	TM Inftrs Arch	UL Apps Arch	UL Cns Arch	UA Inftrs Arch	
prCEN ISO/TS 19299 (WI=00278358)	Electronic fee collection - Security framework	Under Approval	Not Published						✓		✓			✓			✓												
prEN ISO 17575-3 (WI=00278365)	Electronic fee collection - Application interface definition for autonomous systems - Part 3: Context data (ISO/DIS 17575-3:2013)	Under Approval	Not Published						✓		✓			✓			✓												
prEN ISO 17575-4 (WI=00278366)	Electronic fee collection - Application interface definition for autonomous systems - Part 4: Roaming (ISO/DIS 17575-4:2013)	Under Approval	Not Published						✓		✓			✓			✓												
	Framework Architecture, Roles and Responsibilities to support Intelligent Truck Parking Information and Reservations services.	Waiting	Not Published											✓	✓		✓									✓	✓	✓	
	ITS Standardisation requirements for Intelligent Truck Parking Information and Reservations services	Waiting	Not Published											✓	✓		✓									✓	✓	✓	
ISO 17687:2007	**Transport Information and Control Systems (TICS) -- General fleet management and commercial freight operations -- Data dictionary and message sets for electronic identification and monitoring of hazardous materials/dangerous**	**90.9**	**15/07/2010**															✓											
ISO/TS 24533:2012	Intelligent transport systems -- Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Road transport information exchange methodology	90.92	07/08/2014															✓											
ISO/TS 26683-1:2012	Intelligent transport systems -- Freight land conveyance content identification and communication (FLC-CIC) -- Part 1: Context, architecture and referenced standards	95.99	14/03/2013												✓			✓											
ISO/TS 26683-2:2012	Intelligent transport systems -- Freight land conveyance content identification and communication (FLC-CIC) -- Part 2: Application interface profiles	95.99	15/02/2013												✓			✓											

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s49
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	Title	WI Status	Standard Status	Mobility Sys	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
ISO 15638-1	TARV - Framework and architecture (4.8)	Appro	11/04/2012											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
ISO 15638-2	TARV - Common platform parameters using CALM	Appro	29/08/2012											✓	✓	✓	✓	✓	✓										
ISO 15638-3	Operating requirements, 'Approval Authority' approval procedures, and enforcement provisions for the providers of regulated services	Appro	16/08/2012											✓	✓	✓	✓	✓	✓										
ISO WD 15638-4	TARV - System security requirements	WD												✓	✓	✓	✓	✓	✓										
ISO 15638-5	TARV - Generic vehicle information	Appro	16/08/2012											✓	✓	✓	✓	✓	✓										
ISO 15638-6	TARV - Regulated applications	Appro	03/10/2013											✓	✓	✓	✓	✓	✓										
ISO 15638-7	TARV - Other applications	Appro	15/10/2012											✓	✓	✓	✓	✓	✓										
ISO 15638-8	TARV - Vehicle access management and monitoring	Appro	03/10/2013											✓			✓	✓											
ISO/TS 15638-9	TARV - Remote digital tachograph monitoring		01/12/2012															✓											
ISO/TS 15638-10	TARV - Emergency messaging system / eCall		01/12/2012															✓											
ISO 15638-11	TARV- Driver work records	Appro	03/10/2013															✓											
ISO 15638-12	TARV - Vehicle mass monitoring	Appro	03/10/2013														✓	✓											
ISO/DTS 15638-13	TARV - Mass information for control and enforcement		24/06/2014														✓	✓											
ISO 15638-14	TARV - Vehicle access control	Appro	03/10/2013														✓	✓											
ISO 15638-15	TARV - Vehicle location monitoring	Appro	03/10/2013															✓											
ISO 15638-16	TARV - Vehicle speed monitoring	Appro	03/10/2013															✓											
ISO 15638-17	TARV - Consignment and location monitoring	Appro	03/10/2013											✓	✓			✓											
ISO/TS 15638-18	TARV - ADR (Dangerous Goods) monitoring		01/12/2012											✓	✓		✓	✓											
ISO/TS 15638-19	TARV - Vehicle parking facilities		01/12/2012											✓				✓											
ISO/NP 15638-20	TARV- Weigh in Motion		16/09/2015															✓											
ISO/NP 15638-21	TARV - Roadside sensors																	✓											
ISO/TS 17187:2013	**Intelligent transport systems -- Electronic information exchange to facilitate the movement of freight and its intermodal transfer -- Governance rules to sustain electronic information**	**60.6**	**26/11/2013**															✓											

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				Multimodal Informa				Traffic Management						Urban Logistics					Architecture									
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttcs Arch	TM Apps Arch	TM Cns Arch	TM Inttcs Arch	UL Apps Arch	UL Cns Arch	UA Inttcs Arch
ISO 17572-3:2008	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 3: Dynamic location references (dynamic profile)	90.92	10/01/2013	✓	✓		✓																					
ISO 17572-2:2008	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 2: Pre-coded location references (pre-coded profile)	90.92	10/01/2013	✓	✓		✓																					
ISO 17572-1:2008	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 1: General requirements and conceptual model	90.92	10/01/2013	✓	✓																							
ISO 17267:2009	Intelligent transport systems -- Navigation systems -- Application programming interface (API)	90.2	15/10/2014	✓	✓																							
ISO 17572-3:2008/Cor 1:2009	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 3: Dynamic location references (dynamic profile) -- Technical Corrigendum 1	60.6	09/07/2009	✓	✓		✓																					
ISO 14825:2011 (Ed. 2)	Intelligent transport systems -- Geographic Data Files (GDF) -- GDF5.0	60.6	08/07/2011	✓	✓		✓																					
ISO 17572-3	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 3: Dynamic location references (dynamic profile)	60	30/09/2014	✓	✓		✓																					
ISO 17572-2	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 2: Pre-coded location references (pre-coded profile)	60	30/09/2014	✓	✓		✓																					
ISO 17572-1	Intelligent transport systems (ITS) -- Location referencing for geographic databases -- Part 1: General requirements and conceptual model	60	30/09/2014	✓	✓															✓									
ISO/DIS 14296	Intelligent transport systems -- Extension of map database specifications for applications of cooperative ITS	40.2	12/11/2014	✓	✓		✓																					

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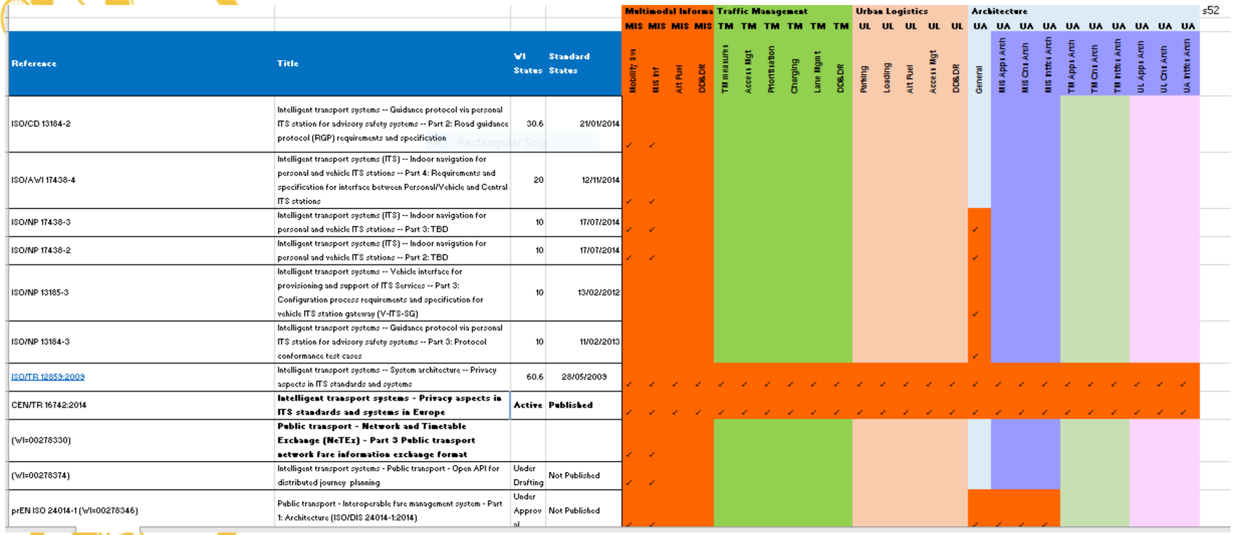
				Multimodal Informa				Traffic Management						Urban Logistics					Architecture									
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
Reference	**Title**	**WI Status**	**Standard Status**	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch
EN ISO 15005:2002	**Road vehicles - Ergonomic aspects of transport information and control systems - Dialogue management principles and compliance procedures**	**Active**	**Published**	✓																								
EN ISO 15006:2011	Road vehicles - Ergonomic aspects of transport information and control systems - Specifications for in-vehicle auditory presentation (ISO 15006:2011)	Active	Published	✓																								
EN ISO 15007-1:2014	Road vehicles - Measurement of driver visual behaviour with respect to transport information and control systems - Part 1: Definitions and parameters (ISO 15007-1:2014)	Active	Published	✓																								
EN ISO 17287:2003	Road vehicles - Ergonomic aspects of transport information and control systems - Procedure for assessing suitability for use while driving (ISO 17287:2003)	Active	Published	✓																								
IEEE 1570-2002 Standard for the Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection:																												
ISO/TR 13185-1:2012	**Intelligent transport systems -- Vehicle interface for provisioning and support of ITS services -- Part 1: General information and use case definition**	**60.6**	**11/05/2012**																✓									
ISO 13184-1:2013	Intelligent transport systems -- Guidance protocol via personal ITS station for advisory safety systems -- Part 1: General information and use case definitions	60.6	22/03/2013																✓									
ISO/DIS 13185-2	Intelligent transport systems -- Vehicle interface for provisioning and support of ITS services -- Part 2: Unified gateway protocol (UGP) requirements and specification for vehicle ITS station gateway (V-ITS-SG) interface	40.6	29/04/2014																✓									
ISO/DIS 17438-1	Intelligent transport systems -- Indoor navigation for personal and vehicle ITS station -- Part 1: General information and use cases definition	40.20	30/09/2014																✓									



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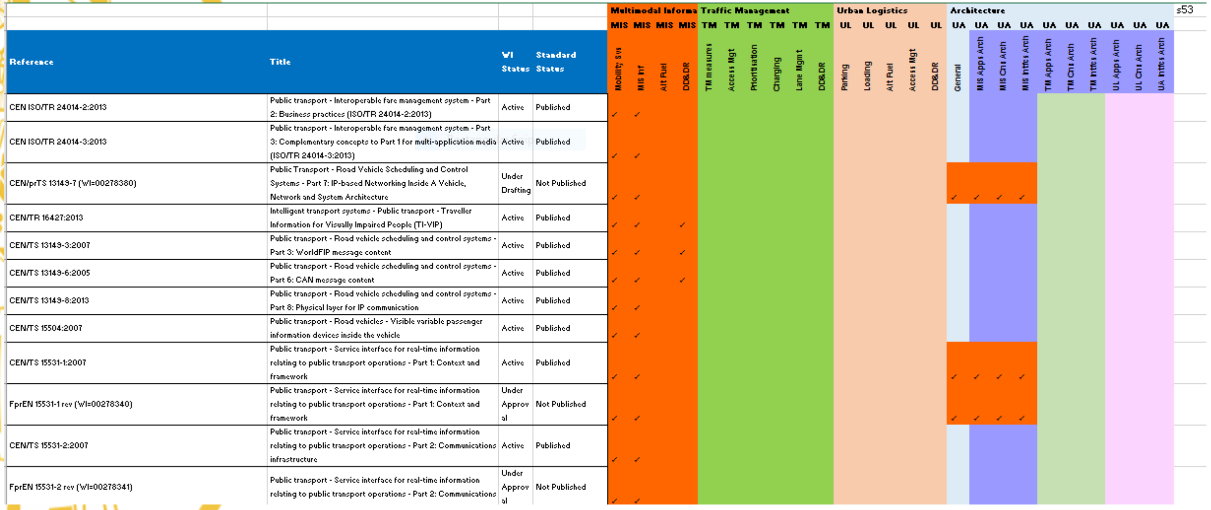
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cm Arch	MIS Intfcs Arch	TM Apps Arch	TM Cm Arch	TM Intfcs Arch	UL Apps Arch	UL Cm Arch	UA Intfcs Arch	
ISO/CD 13184-2	Intelligent transport systems -- Guidance protocol via personal ITS station for advisory safety systems -- Part 2: Road guidance protocol (RGP) requirements and specification	30.6	21/01/2014	✓	✓																								
ISO/AWI 17438-4	Intelligent transport systems (ITS) -- Indoor navigation for personal and vehicle ITS stations -- Part 4: Requirements and specification for interface between Personal/Vehicle and Central ITS stations	20	12/11/2014	✓	✓																								
ISO/NP 17438-3	Intelligent transport systems (ITS) -- Indoor navigation for personal and vehicle ITS stations -- Part 3: TBD	10	17/07/2014	✓	✓														✓										
ISO/NP 17438-2	Intelligent transport systems (ITS) -- Indoor navigation for personal and vehicle ITS stations -- Part 2: TBD	10	17/07/2014	✓	✓														✓										
ISO/NP 13185-3	Intelligent transport systems -- Vehicle interface for provisioning and support of ITS Services -- Part 3: Configuration process requirements and specification for vehicle ITS station gateway (V-ITS-SG)	10	13/02/2012																✓										
ISO/NP 13184-3	Intelligent transport systems -- Guidance protocol via personal ITS station for advisory safety systems -- Part 3: Protocol conformance test cases	10	11/02/2013																✓										
ISO/TR 12859:2009	Intelligent transport systems -- System architecture -- Privacy aspects in ITS standards and systems	60.6	28/05/2009	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
CEN/TR 16742:2014	**Intelligent transport systems - Privacy aspects in ITS standards and systems in Europe**	**Active**	**Published**	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
(WI=00278330)	**Public transport - Network and Timetable Exchange (NeTEx) - Part 3 Public transport network fare information exchange format**			✓	✓																								
(WI=00278374)	Intelligent transport systems - Public transport - Open API for distributed journey planning	Under Drafting	Not Published	✓	✓																								
prEN ISO 24014-1 (WI=00278346)	Public transport - Interoperable fare management system - Part 1: Architecture (ISO/DIS 24014-1:2014)	Under Approval	Not Published	✓	✓														✓	✓	✓	✓							



				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s53
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Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttfcs Arch	TM Apps Arch	TM Cns Arch	TM Inttfcs Arch	UL Apps Arch	UL Cns Arch	UA Inttfcs Arch	
CEN ISO/TR 24014-2:2013	Public transport - Interoperable fare management system - Part 2: Business practices (ISO/TR 24014-2:2013)	Active	Published	✓	✓																								
CEN ISO/TR 24014-3:2013	Public transport - Interoperable fare management system - Part 3: Complementary concepts to Part 1 for multi-application media (ISO/TR 24014-3:2013)	Active	Published	✓	✓																								
CEN/prTS 13149-7 (WI=00278380)	Public Transport - Road Vehicle Scheduling and Control Systems - Part 7: IP-based Networking Inside A Vehicle, Network and System Architecture	Under Drafting	Not Published	✓	✓														✓	✓	✓	✓							
CEN/TR 16427:2013	Intelligent transport systems - Public transport - Traveller Information for Visually Impaired People (TI-VIP)	Active	Published	✓	✓		✓																						
CEN/TS 13149-3:2007	Public transport - Road vehicle scheduling and control systems - Part 3: WorldFIP message content	Active	Published	✓	✓		✓																						
CEN/TS 13149-6:2005	Public transport - Road vehicle scheduling and control systems - Part 6: CAN message content	Active	Published	✓	✓		✓																						
CEN/TS 13149-8:2013	Public transport - Road vehicle scheduling and control systems - Part 8: Physical layer for IP communication	Active	Published	✓	✓																								
CEN/TS 15504:2007	Public transport - Road vehicles - Visible variable passenger information devices inside the vehicle	Active	Published	✓	✓																								
CEN/TS 15531-1:2007	Public transport - Service interface for real-time information relating to public transport operations - Part 1: Context and framework	Active	Published	✓	✓														✓	✓	✓	✓							
FprEN 15531-1 rev (WI=00278340)	Public transport - Service interface for real-time information relating to public transport operations - Part 1: Context and framework	Under Approval	Not Published	✓	✓														✓	✓	✓	✓							
CEN/TS 15531-2:2007	Public transport - Service interface for real-time information relating to public transport operations - Part 2: Communications infrastructure	Active	Published	✓	✓																								
FprEN 15531-2 rev (WI=00278341)	Public transport - Service interface for real-time information relating to public transport operations - Part 2: Communications	Under Approval	Not Published	✓	✓																								

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s54
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CEN/TS 15531-3:2007	Public transport - Service interface for real-time information relating to public transport operations - Part 3: Functional service interfaces	Active	Published	✓	✓																✓	✓							
FprEN 15531-3 rev (WI=00278342)	Public transport - Service interface for real-time information relating to public transport operations - Part 3: Functional service interfaces	Under Approval	Not Published	✓	✓																✓	✓							
CEN/TS 15531-4:2011	Public transport - Service interface for real-time information relating to public transport operations - Part 4: Functional service interfaces: Facility Monitoring	Active	Published	✓	✓																								
CEN/TS 15531-5:2011	Public transport - Service interface for real-time information relating to public transport operations - Part 5: Functional service interfaces - Situation Exchange	Active	Published	✓	✓																								
CEN/TS 16406:2013	Intelligent transport systems - Public transport - Indirect Fulfilment for Rail	Active	Published	✓	✓																								
CEN/TS 16614-1:2014	Public transport - Network and Timetable Exchange (NeTEx) - Part 1: Public transport network topology exchange format	Active	Published	✓	✓		✓															✓							
CEN/TS 16614-2:2014	Public transport - Network and Timetable Exchange (NeTEx) - Part 2: Public transport scheduled timetables exchange format	Active	Published	✓	✓		✓															✓							
EN 12896:2006	Road transport and traffic telematics - Public transport - Reference data model	Active	Published	✓	✓		✓												✓										
prEN 12896 rev (WI=00278387)	Public transport - Reference data model - Informative documentation	Under Drafting	Not Published	✓	✓																								
prEN 12896-1 (WI=00278371)	Public Transport - Reference Data Model - Part 1: Common Concepts	Under Approv	Not Published	✓	✓		✓																						
prEN 12896-2 (WI=00278367)	Public Transport - Reference Data Model - Part 2: Public Transport Network	Under Approv	Not Published	✓	✓		✓												✓										

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s55
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prEN 12896-3 (WI=00278368)	Public Transport - Reference Data Model - Part 3: Timing Information and Vehicle Scheduling	Under Approval	Not Published	✓	✓		✓																						
EN 13149-1:2004	Public transport - Road vehicle scheduling and control systems - Part 1: WORLDFIP definition and application rules for onboard data transmission	Active	Published	✓	✓																✓								
EN 13149-2:2004	Public transport - Road vehicle scheduling and control systems - Part 2: WORLDFIP cabling specifications	Active	Published	✓	✓																✓								
EN 13149-4:2004	Public transport - Road vehicle scheduling and control systems - Part 4: General application rules for CANopen transmission buses	Active	Published	✓	✓															✓	✓	✓							
EN 13149-5:2004	Public transport - Road vehicle scheduling and control systems - Part 5: CANopen cabling specifications	Active	Published	✓	✓															✓	✓	✓							
EN ISO 24014-1:2007	Public transport - Interoperable fare management system - Part 1: Architecture (ISO 24014-1:2007)	Active	Published	✓	✓														✓	✓									
ENV 12694:1997	Public transport - Road vehicles - Dimensional requirements for variable electronic external signs	Active	Published	✓	✓																								
ENV 12796:1997	Road transport and traffic telematics - Public transport - Validators	Active	Published	✓	✓		✓																						
ENV 13093:1998	Public transport - Road vehicles - Driver's console mechanical interface requirements - Minimum display and keypad parameters	Active	Published																										
ENV 13998:2001	Road transport and traffic telematics - Public transport - Non-interactive dynamic passenger information on ground	Active	Published	✓	✓		✓																						
FprCEN/TS 16794-1 (WI=00278372)	Public transport - Communication between contactless readers and fare media - Part 1: Implementation requirements for ISO IEC 14443	Under Approval	Not Published																		✓								

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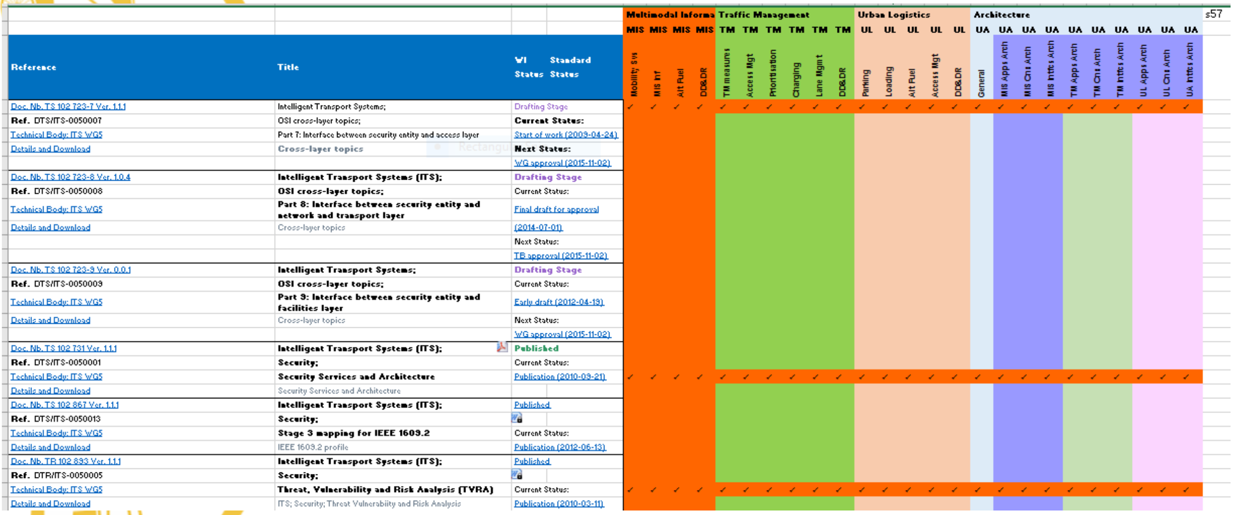
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cnt Arch	MIS Intfcs Arch	TM Apps Arch	TM Cnt Arch	TM Intfcs Arch	UL Apps Arch	UL Cnt Arch	UA Intfcs Arch	
FprCEN/TS 16794-2 (WI=00278373)	Public transport - Communication between contactless readers and fare media - Part 2: Test plan for ISO IEC 14443	Under Approval	Not Published																		✓								
ISO 24014-1:2007	**Public transport -- Interoperable fare management system -- Part 1: Architecture**	**90.9**	**22/09/2010**	✓	✓														✓	✓	✓	✓							
ISO 22951:2009	Data dictionary and message sets for preemption and prioritization signal systems for emergency and public transport vehicles (PRESTO)	90.93	05/11/2014	✓	✓		✓																						
ISO/TR 24014-3:2013	Public transport -- Interoperable fare management system -- Part 3: Complementary concepts to Part 1 for multi-application media	60.6	04/04/2013	✓	✓		✓																						
ISO/TR 24014-2:2013	Public transport -- Interoperable fare management system -- Part 2: Business practices	60.6	07/08/2013	✓	✓																								
ISO/DIS 24014-1	Public transport -- Interoperable fare management system -- Part 1: Architecture	40.99	07/11/2014	✓	✓														✓	✓									
ISO/AWI 19083-2	Intelligent transport systems -- Public transport -- Emergency evacuation and disaster response and recovery -- Part 2: Data flow	20	06/03/2014	✓	✓																								
ISO/NP 19083-1	Intelligent transport systems -- Public transport -- Emergency evacuation and disaster response and recovery -- Part 1: Framework	10.99	10/12/2013	✓	✓																								
ISO/NP 19083-3	Intelligent transport systems -- Public transport -- Emergency evacuation and disaster response and recovery -- Part 3: Use cases	10	15/06/2013	✓	✓																								
ISO/PWI 18525	Intelligent transport systems -- Public transport/emergency -- Transit enterprise reference architecture (TERA)	0	12/09/2012	✓	✓															✓	✓	✓							



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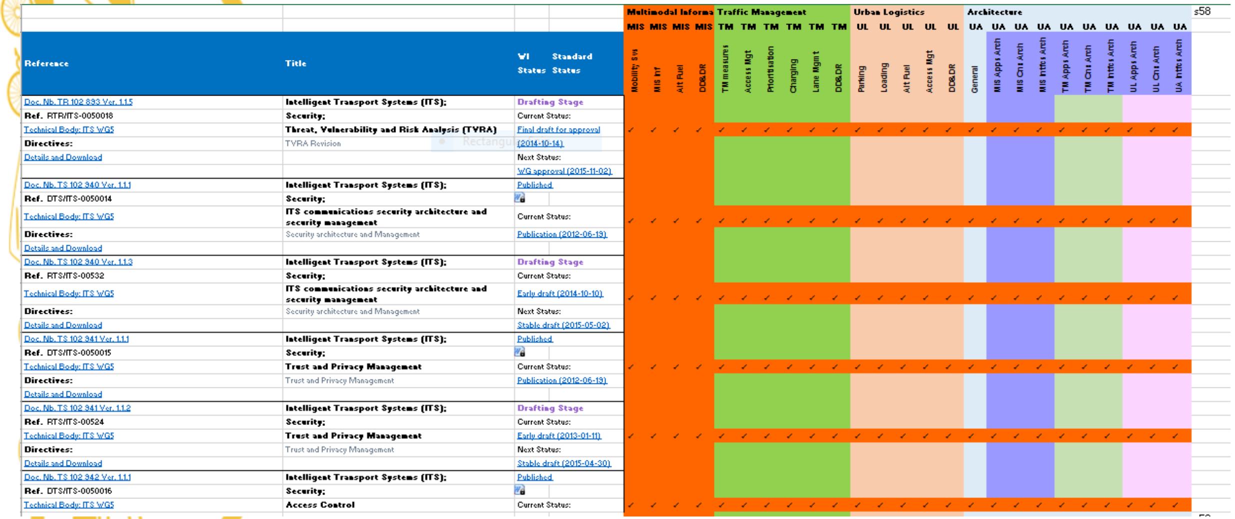
Doc. Nb. TS 102 723-7 Ver. 1.1.1	Intelligent Transport Systems;	Drafting Stage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Ref. DTS/ITS-0050007	OSI cross-layer topics;	**Current Status:**																										
Technical Body: ITS WG5	Part 7: Interface between security entity and access layer	Start of work (2009-04-24)																										
Details and Download	**Cross-layer topics**	**Next Status:**																										
		WG approval (2015-11-02)																										
Doc. Nb. TS 102 723-8 Ver. 1.0.4	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																										
Ref. DTS/ITS-0050008	**OSI cross-layer topics;**	Current Status:																										
Technical Body: ITS WG5	**Part 8: Interface between security entity and network and transport layer**	Final draft for approval																										
Details and Download	Cross-layer topics	(2014-07-01)																										
		Next Status:																										
		TB approval (2015-11-02)																										
Doc. Nb. TS 102 723-9 Ver. 0.0.1	**Intelligent Transport Systems;**	**Drafting Stage**																										
Ref. DTS/ITS-0050009	**OSI cross-layer topics;**	Current Status:																										
Technical Body: ITS WG5	**Part 9: Interface between security entity and facilities layer**	Early draft (2012-04-19)																										
Details and Download	Cross-layer topics	Next Status:																										
		WG approval (2015-11-02)																										
Doc. Nb. TS 102 731 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	**Published**																										
Ref. DTS/ITS-0050001	**Security;**	Current Status:																										
Technical Body: ITS WG5	**Security Services and Architecture**	Publication (2010-09-21)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Details and Download	Security Services and Architecture																											
Doc. Nb. TS 102 867 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																										
Ref. DTS/ITS-0050013	**Security;**																											
Technical Body: ITS WG5	**Stage 3 mapping for IEEE 1609.2**	Current Status:																										
Details and Download	IEEE 1609.2 profile	Publication (2012-06-13)																										
Doc. Nb. TR 102 893 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Published																										
Ref. DTR/ITS-0050005	**Security;**																											
Technical Body: ITS WG5	**Threat, Vulnerability and Risk Analysis (TVRA)**	Current Status:	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Details and Download	ITS; Security; Threat Vulnerabiity and Risk Analysis	Publication (2010-03-11)																										



			Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s58
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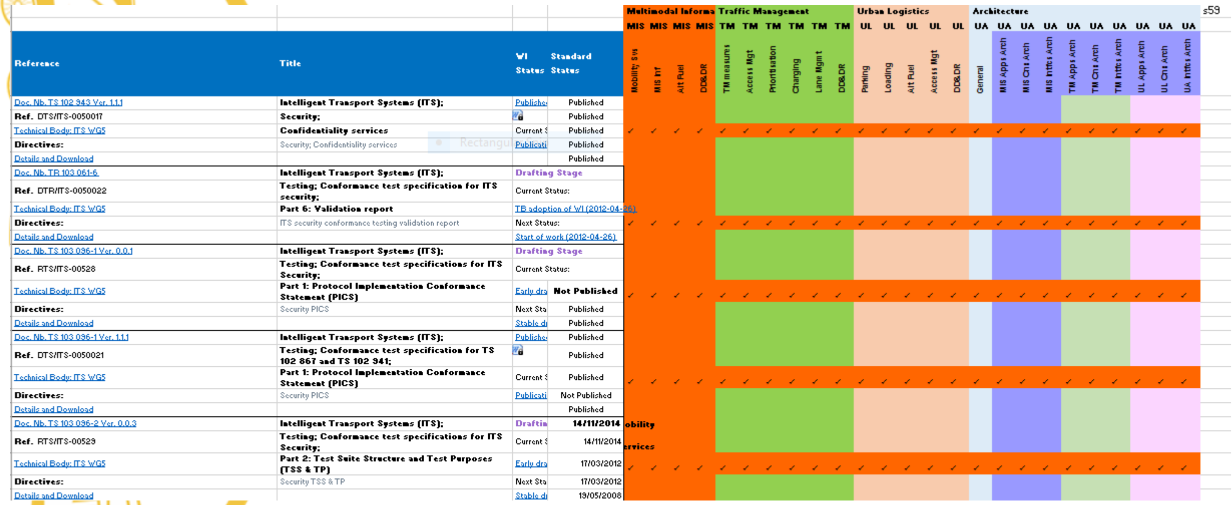
Doc. Nb. TR 102 893 Ver. 1.1.5 **Ref.** RTR/ITS-0050018 Technical Body: ITS WG5 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Security;** **Threat, Vulnerability and Risk Analysis (TVRA)** TVRA Revision	Drafting Stage Current Status: Final draft for approval (2014-10-14) Next Status: WG approval (2015-11-02)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Doc. Nb. TS 102 940 Ver. 1.1.1 **Ref.** DTS/ITS-0050014 Technical Body: ITS WG5 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Security;** **ITS communications security architecture and security management** Security architecture and Management	Published Current Status: Publication (2012-06-19)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Doc. Nb. TS 102 940 Ver. 1.1.3 **Ref.** RTS/ITS-00532 Technical Body: ITS WG5 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Security;** **ITS communications security architecture and security management** Security architecture and Management	Drafting Stage Current Status: Early draft (2014-10-10) Next Status: Stable draft (2015-05-02)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Doc. Nb. TS 102 941 Ver. 1.1.1 **Ref.** DTS/ITS-0050015 Technical Body: ITS WG5 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Security;** **Trust and Privacy Management** Trust and Privacy Management	Published Current Status: Publication (2012-06-19)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Doc. Nb. TS 102 941 Ver. 1.1.2 **Ref.** RTS/ITS-00524 Technical Body: ITS WG5 **Directives:** Details and Download	**Intelligent Transport Systems (ITS);** **Security;** **Trust and Privacy Management** Trust and Privacy Management	Drafting Stage Current Status: Early draft (2013-01-11) Next Status: Stable draft (2015-04-30)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Doc. Nb. TS 102 942 Ver. 1.1.1 **Ref.** DTS/ITS-0050016 Technical Body: ITS WG5	**Intelligent Transport Systems (ITS);** **Security;** **Access Control**	Published Current Status:	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	



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Doc. Nb. TS 102 943 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Publishe	Published																										
Ref. DTS/ITS-0050017	**Security;**		Published																										
Technical Body: ITS WG5	**Confidentiality services**	Current S	Published	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Directives:	Security; Confidentiality services	Publicati	Published																										
Details and Download			Published																										
Doc. Nb. TR 103 061-6	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. DTR/ITS-0050022	**Testing; Conformance test specification for ITS security;**	Current Status:																											
Technical Body: ITS WG5	**Part 6: Validation report**	TB adoption of WI (2012-04-26)																											
Directives:	ITS security conformance testing validation report	Next Status:		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Details and Download		Start of work (2012-04-26)																											
Doc. Nb. TS 103 096-1 Ver. 0.0.1	**Intelligent Transport Systems (ITS);**	**Drafting Stage**																											
Ref. RTS/ITS-00528	**Testing; Conformance test specifications for ITS Security;**	Current Status:																											
Technical Body: ITS WG5	**Part 1: Protocol Implementation Conformance Statement (PICS)**	Early dra	**Not Published**	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
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Doc. Nb. TS 103 096-1 Ver. 1.1.1	**Intelligent Transport Systems (ITS);**	Publishe	Published																										
Ref. DTS/ITS-0050021	**Testing; Conformance test specification for TS 102 867 and TS 102 941;**		Published																										
Technical Body: ITS WG5	**Part 1: Protocol Implementation Conformance Statement (PICS)**	Current S	Published	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
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Doc. Nb. TS 103 096-2 Ver. 0.0.3	**Intelligent Transport Systems (ITS);**	**Draftin**	**14/11/2014**	**obility**																									
Ref. RTS/ITS-00529	**Testing; Conformance test specifications for ITS Security;**	Current S	14/11/2014	**ervices**																									
Technical Body: ITS WG5	**Part 2: Test Suite Structure and Test Purposes (TSS & TP)**	Early dra	17/03/2012	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
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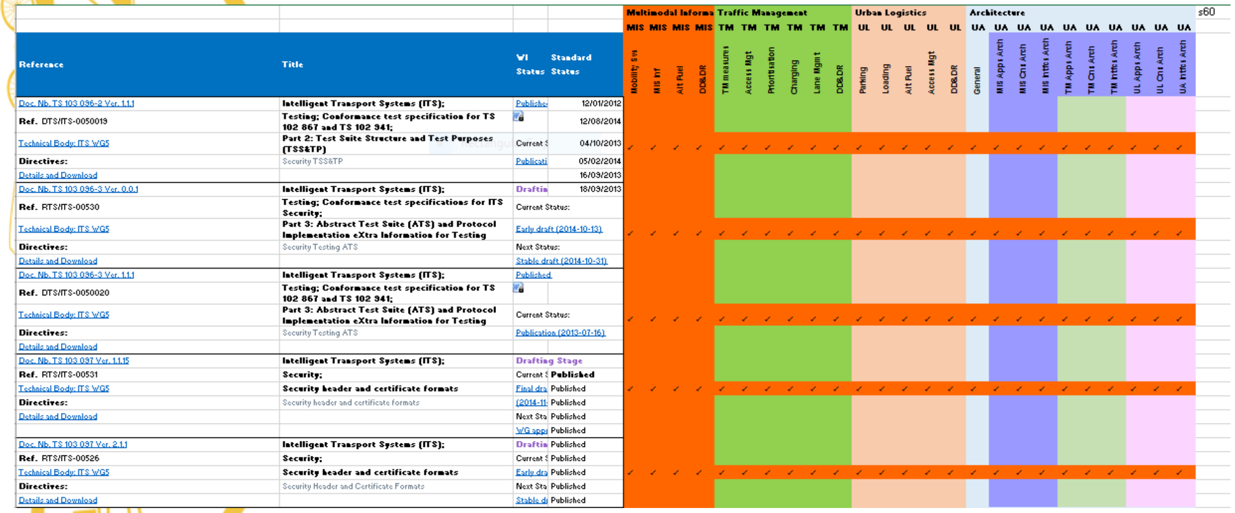

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Doc. Nb. TS 103 096-2 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Publishe	12/01/2012																										
Ref. DTS/ITS-0050019	Testing; Conformance test specification for TS 102 867 and TS 102 941;		12/08/2014																										
Technical Body: ITS WG5	Part 2: Test Suite Structure and Test Purposes (TSS&TP)	Current S	04/10/2013	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Directives:	Security TSS&TP	Publicati	05/02/2014																										
Details and Download			16/09/2013																										
Doc. Nb. TS 103 096-3 Ver. 0.0.1	Intelligent Transport Systems (ITS);	Draftin	18/09/2013																										
Ref. RTS/ITS-00530	Testing; Conformance test specifications for ITS Security;	Current Status:																											
Technical Body: ITS WG5	Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing	Early draft (2014-10-13)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Directives:	Security Testing ATS	Next Status:																											
Details and Download		Stable draft (2014-10-31)																											
Doc. Nb. TS 103 096-3 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Published																											
Ref. DTS/ITS-0050020	Testing; Conformance test specification for TS 102 867 and TS 102 941;																												
Technical Body: ITS WG5	Part 3: Abstract Test Suite (ATS) and Protocol Implementation eXtra Information for Testing	Current Status:		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Directives:	Security Testing ATS	Publication (2013-07-16)																											
Details and Download																													
Doc. Nb. TS 103 097 Ver. 1.1.15	Intelligent Transport Systems (ITS);	Drafting Stage																											
Ref. RTS/ITS-00531	Security;	Current S	**Published**																										
Technical Body: ITS WG5	Security header and certificate formats	Final dra	Published	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Directives:	Security header and certificate formats	(2014-11-	Published																										
Details and Download		Next Sta	Published																										
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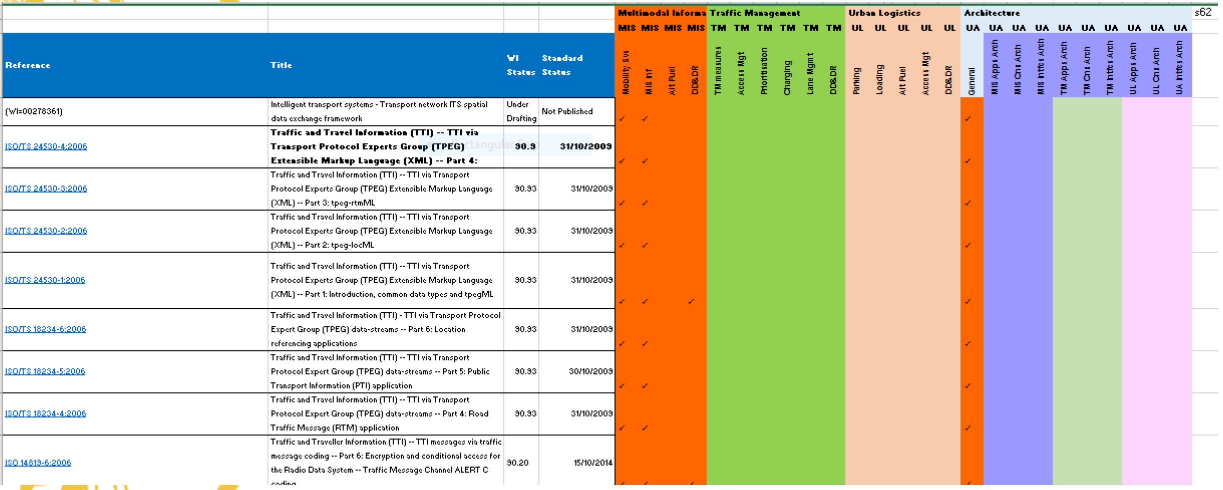
Doc. Nb. TS 103 097 Ver. 2.1.1	Intelligent Transport Systems (ITS);	Draftin	Published																										
Ref. RTS/ITS-00526	Security;	Current S	Published																										
Technical Body: ITS WG5	Security header and certificate formats	Early dra	Published	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Directives:	Security Header and Certificate Formats	Next Sta	Published																										
Details and Download		Stable dr	Published																										

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s61
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
CEN ISO/TS 18234-11:2013	Intelligent transport systems - Traffic and Travel Information (TTI) via transport protocol experts group, generation 1 (TPEG1) binary data format - Part 11: Location Referencing Container (TPEG1-LRC) (ISO/TS 18234-11:2013)	Active	Published	✓	✓														✓										
CEN ISO/TS 24530-1:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) - Part 1: Introduction, common data types and tpegML (ISO/TS 24530-1:2006)	Active	Published	✓	✓														✓										
CEN ISO/TS 24530-2:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) - Part 2: tpeg-locML (ISO/TS 24530-2:2006)	Active	Published	✓	✓														✓										
CEN ISO/TS 24530-3:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) - Part 3: tpeg-rtmML (ISO/TS 24530-3:2006)	Active	Published	✓	✓														✓										
CEN ISO/TS 24530-4:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) - Part 4: tpeg-ptiML (ISO/TS 24530-4:2006)	Active	Published	✓	✓														✓										
EN ISO 14819-6:2006	Traffic and Traveller Information (TTI) - TTI messages via traffic message coding - Part 6: Encryption and conditional access for the Radio Data System - Traffic Message Channel ALERT C coding (ISO 14819-6:2006)	Active	Published	✓	✓														✓										
ENV 12313-4:2000	Traffic and Traveller Information (TTI) - TTI Messages via Traffic Message Coding - Part 4: Coding Protocol for Radio Data System - Traffic Message Channel (RDS-TMC) - RDS-TMC using ALERT Plus with ALERT C	Active	Published	✓	✓														✓										



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				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttcs Arch	TM Apps Arch	TM Cns Arch	TM Inttcs Arch	UL Apps Arch	UL Cns Arch	UA Inttcs Arch	
(WI=00278361)	Intelligent transport systems - Transport network ITS spatial data exchange framework	Under Drafting	Not Published	✓	✓														✓										
ISO/TS 24530-4:2006	**Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 4:**	**90.9**	**31/10/2009**	✓	✓														✓										
ISO/TS 24530-3:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 3: tpeg-rtmML	90.93	31/10/2009	✓	✓														✓										
ISO/TS 24530-2:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 2: tpeg-locML	90.93	31/10/2009	✓	✓														✓										
ISO/TS 24530-1:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Experts Group (TPEG) Extensible Markup Language (XML) -- Part 1: Introduction, common data types and tpegML	90.93	31/10/2009	✓	✓		✓												✓										
ISO/TS 18234-6:2006	Traffic and Travel Information (TTI) - TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 6: Location referencing applications	90.93	31/10/2009	✓	✓														✓										
ISO/TS 18234-5:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 5: Public Transport Information (PTI) application	90.93	30/10/2009	✓	✓														✓										
ISO/TS 18234-4:2006	Traffic and Travel Information (TTI) -- TTI via Transport Protocol Expert Group (TPEG) data-streams -- Part 4: Road Traffic Message (RTM) application	90.93	31/10/2009	✓	✓														✓										
ISO 14819-6:2006	Traffic and Traveller Information (TTI) -- TTI messages via traffic message coding -- Part 6: Encryption and conditional access for the Radio Data System -- Traffic Message Channel ALERT C coding	90.20	15/10/2014	✓	✓		✓												✓										

				Multimodal Informa				Traffic Management						Urban Logistics					Architecture										s63
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Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inftrs Arch	TM Apps Arch	TM Cns Arch	TM Inftrs Arch	UL Apps Arch	UL Cns Arch	UA Inftrs Arch	
ISO/TS 21219-2:2014	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 2: UML modelling rules	60.6	17/09/2014	✓	✓														✓										
ISO/TS 18234-9:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 9: Traffic event compact (TPEG1-TEC)	60.6	10/10/2013	✓	✓														✓										
ISO/TS 18234-8:2012	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 8: Congestion and Travel Time application (TPEG1-CTT)	60.6	02/10/2012	✓	✓														✓										
ISO/TS 18234-7:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 7: Parking information (TPEG1-PKI)	60.6	10/10/2013	✓	✓		✓							✓					✓										
ISO/TS 18234-3:2013 (Ed. 2)	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 3: Service and network information (TPEG1-SNI)	60.6	14/01/2013	✓	✓														✓										
ISO/TS 18234-11:2013	Intelligent transport systems -- Traffic and Travel Information (TTI) via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 11: Location Referencing Container (TPEG1-LRC)	60.6	15/01/2013	✓	✓														✓										
ISO/TS 18234-10:2013	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 10: Conditional access information (TPEG1-CAI)	60.6	10/10/2013	✓	✓														✓										

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Reference	Title	WI Status	Standard Status	Mobility Sys	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
ISO/TS 18234-2:2013 (Ed. 2)	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 2: Syntax, semantics and framing structure (TPEG1-SSF)	60.6	10/10/2013	✓	✓														✓										
ISO/TS 18234-1:2013 (Ed. 2)	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 1 (TPEG1) binary data format -- Part 1: Introduction, numbering and versions (TPEG1-INV)	60.6	10/10/2013	✓	✓														✓										
ISO 14819-3:2013 (Ed. 2)	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 3: Location referencing for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C	60.6	21/11/2013	✓	✓														✓										
ISO 14819-2:2013 (Ed. 2)	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 2: Event and information codes for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C	60.6	21/11/2013	✓	✓														✓										
ISO 14819-1:2013 (Ed. 2)	Intelligent transport systems -- Traffic and travel information messages via traffic message coding -- Part 1: Coding protocol for Radio Data System -- Traffic Message Channel (RDS-TMC) using ALERT-C	60.6	21/11/2013	✓	✓														✓										
ISO/TS 21219-6	Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2(TPEG2) -- Part 6: Message management container (TPEG2-MMC)	60	20/10/2014	✓	✓														✓										
ISO/TS 21219-5	Intelligent transport systems - Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 5: Service framework (TPEG2-SFW)	60	20/10/2014	✓	✓														✓										

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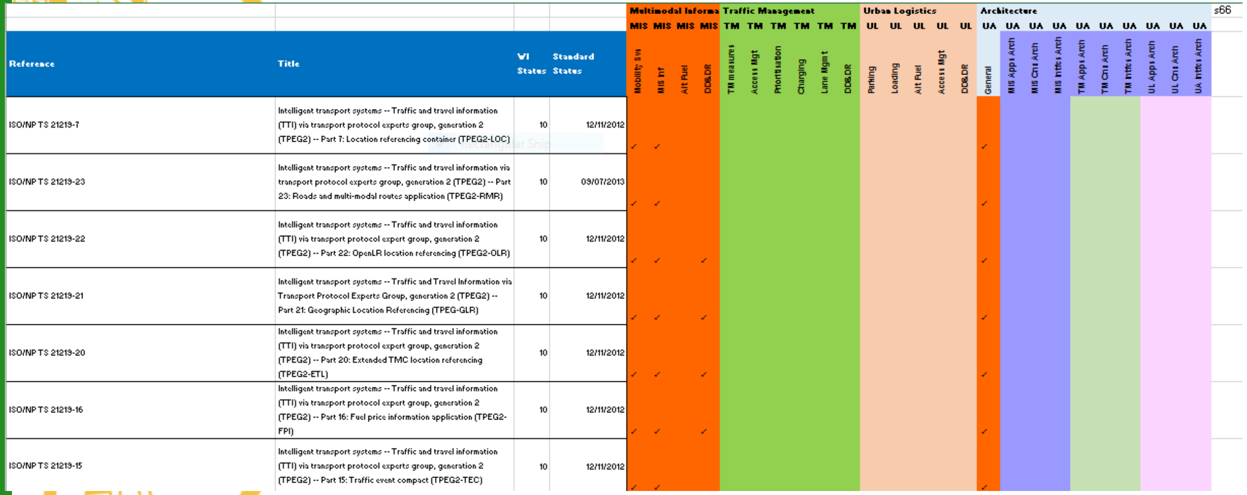
				MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA
Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cms Arch	MIS Inttcs Arch	TM Apps Arch	TM Cms Arch	TM Inttcs Arch	UL Apps Arch	UL Cms Arch	UA Inttcs Arch
ISO/TS 21219-4	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 4: UML to XML conversion rules	60	06/10/2014	✓	✓														✓									
ISO/TS 21219-3	Intelligent transport systems - Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 3: UML to binary conversion rules	60	06/10/2014	✓	✓														✓									
ISO/TS 21219-18	Intelligent transport systems - Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 18: Traffic flow and prediction application (TPEG2-TFP)	60	20/10/2014	✓	✓		✓												✓									
ISO/NP TS 21219-9	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 9: Service and network information (TPEG2-SNI)	10.6	17/10/2014	✓	✓		✓												✓									
ISO/NP TS 21219-19	Intelligent transport systems -- Traffic and travel information (TTI) via Transport protocol expert group, generation 2 (TPEG2) -- Part 19: Weather information application (TPEG2-WEA)	10.6	17/10/2014	✓	✓		✓												✓									
ISO/NP TS 21219-10	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 10: Conditional access information (TPEG2-CAI)	10.6	17/10/2014	✓	✓		✓												✓									
ISO/NP TS 21219-1	Intelligent transport systems -- Traffic and Travel Information via Transport Protocol Experts Group, generation 2 (TPEG2) -- Part 1: Introduction, numbering and versions (TPEG2-INV)	10.6	17/10/2014	✓	✓														✓									



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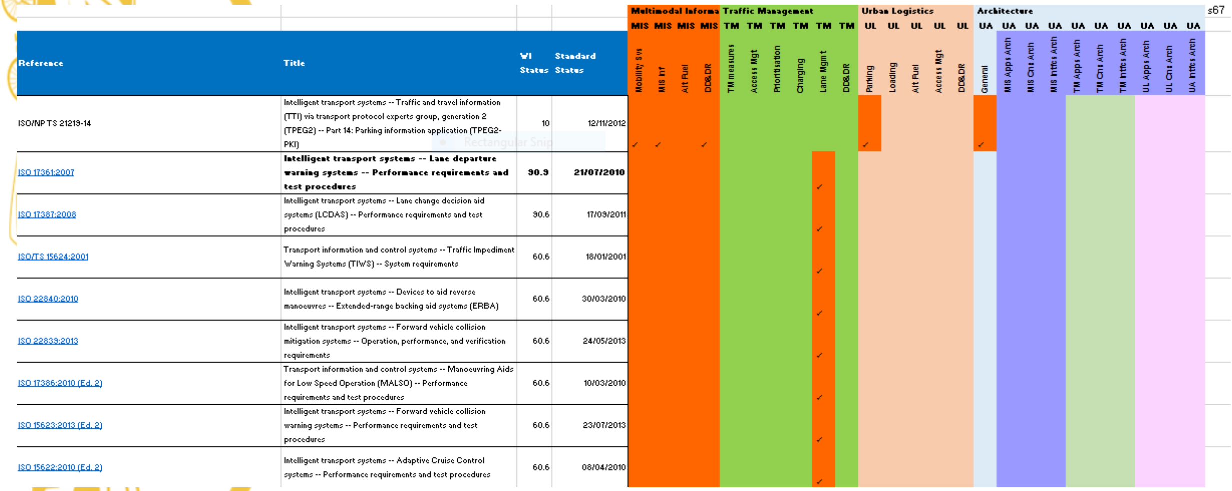
Reference	Title	WI Status	Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttcs Arch	TM Apps Arch	TM Cns Arch	TM Inttcs Arch	UL Apps Arch	UL Cns Arch	UA Inttcs Arch	
ISO/NP TS 21219-7	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 7: Location referencing container (TPEG2-LOC)	10	12/11/2012	✓	✓														✓										
ISO/NP TS 21219-23	Intelligent transport systems -- Traffic and travel information via transport protocol experts group, generation 2 (TPEG2) -- Part 23: Roads and multi-modal routes application (TPEG2-RMR)	10	09/07/2013	✓	✓														✓										
ISO/NP TS 21219-22	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) -- Part 22: OpenLR location referencing (TPEG2-OLR)	10	12/11/2012	✓	✓		✓												✓										
ISO/NP TS 21219-21	Intelligent transport systems -- Traffic and Travel Information via Transport Protocol Experts Group, generation 2 (TPEG2) -- Part 21: Geographic Location Referencing (TPEG-GLR)	10	12/11/2012	✓	✓		✓												✓										
ISO/NP TS 21219-20	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) -- Part 20: Extended TMC location referencing (TPEG2-ETL)	10	12/11/2012	✓	✓		✓												✓										
ISO/NP TS 21219-16	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol expert group, generation 2 (TPEG2) -- Part 16: Fuel price information application (TPEG2-FPI)	10	12/11/2012	✓	✓		✓												✓										
ISO/NP TS 21219-15	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 15: Traffic event compact (TPEG2-TEC)	10	12/11/2012	✓	✓														✓										



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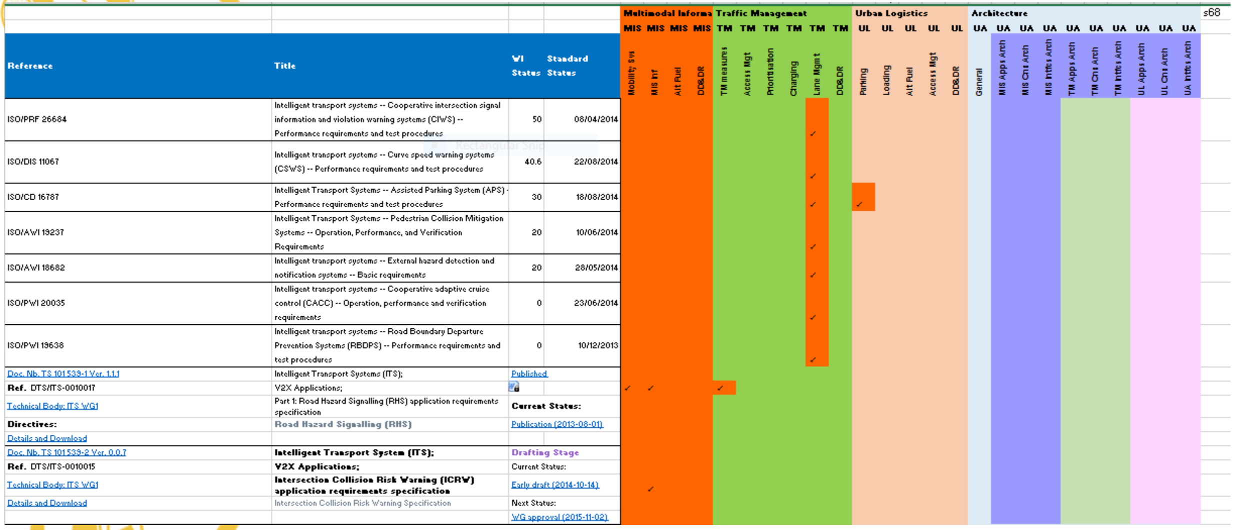
Reference	**Title**	**WI Status**	**Standard Status**	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Intfcs Arch	TM Apps Arch	TM Cns Arch	TM Intfcs Arch	UL Apps Arch	UL Cns Arch	UA Intfcs Arch	
ISO/NP TS 21219-14	Intelligent transport systems -- Traffic and travel information (TTI) via transport protocol experts group, generation 2 (TPEG2) -- Part 14: Parking information application (TPEG2-PKI)	10	12/11/2012	✓	✓		✓							✓					✓										
ISO 17361:2007	**Intelligent transport systems -- Lane departure warning systems -- Performance requirements and test procedures**	**90.9**	**21/07/2010**									✓																	
ISO 17387:2008	Intelligent transport systems -- Lane change decision aid systems (LCDAS) -- Performance requirements and test procedures	90.6	17/09/2011									✓																	
ISO/TS 15624:2001	Transport information and control systems -- Traffic Impediment Warning Systems (TIWS) -- System requirements	60.6	18/01/2001									✓																	
ISO 22840:2010	Intelligent transport systems -- Devices to aid reverse manoeuvres -- Extended-range backing aid systems (ERBA)	60.6	30/03/2010									✓																	
ISO 22839:2013	Intelligent transport systems -- Forward vehicle collision mitigation systems -- Operation, performance, and verification requirements	60.6	24/05/2013									✓																	
ISO 17386:2010 (Ed. 2)	Transport information and control systems -- Manoeuvring Aids for Low Speed Operation (MALSO) -- Performance requirements and test procedures	60.6	10/03/2010									✓																	
ISO 15623:2013 (Ed. 2)	Intelligent transport systems -- Forward vehicle collision warning systems -- Performance requirements and test procedures	60.6	23/07/2013									✓																	
ISO 15622:2010 (Ed. 2)	Intelligent transport systems -- Adaptive Cruise Control systems -- Performance requirements and test procedures	60.6	08/04/2010									✓																	



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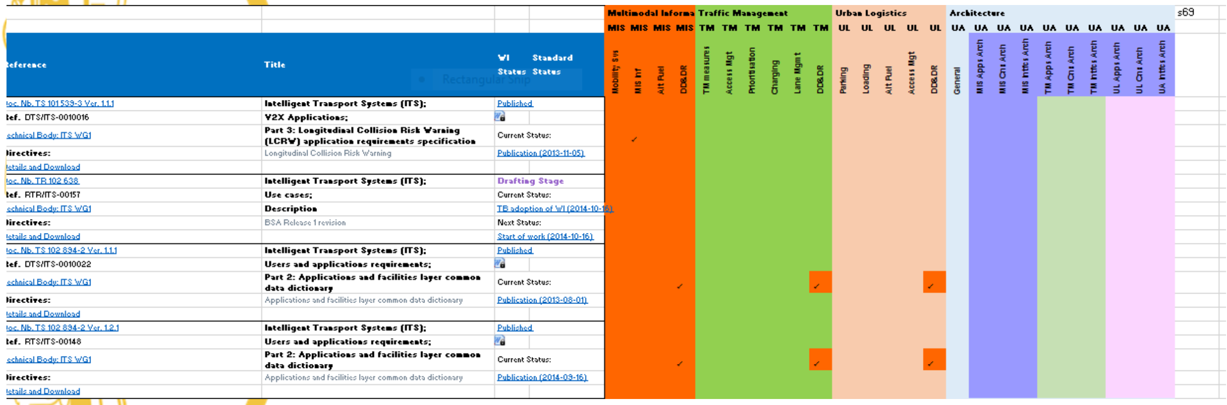
Reference	Title	WI Status	Standard Status	Mobility svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cm Arch	MIS Inftcs Arch	TM Apps Arch	TM Cm Arch	TM Inftcs Arch	UL Apps Arch	UL Cm Arch	UA Inftcs Arch	
ISO/PRF 26684	Intelligent transport systems -- Cooperative intersection signal information and violation warning systems (CIWS) -- Performance requirements and test procedures	50	08/04/2014									✓																	
ISO/DIS 11067	Intelligent transport systems -- Curve speed warning systems (CSWS) -- Performance requirements and test procedures	40.6	22/08/2014									✓																	
ISO/CD 16787	Intelligent Transport Systems -- Assisted Parking System (APS) - Performance requirements and test procedures	30	18/08/2014									✓		✓															
ISO/AWI 19237	Intelligent Transport Systems -- Pedestrian Collision Mitigation Systems -- Operation, Performance, and Verification Requirements	20	10/06/2014									✓																	
ISO/AWI 18682	Intelligent transport systems -- External hazard detection and notification systems -- Basic requirements	20	28/05/2014									✓																	
ISO/PWI 20035	Intelligent transport systems -- Cooperative adaptive cruise control (CACC) -- Operation, performance and verification requirements	0	23/06/2014									✓																	
ISO/PWI 19638	Intelligent transport systems -- Road Boundary Departure Prevention Systems (RBDPS) -- Performance requirements and test procedures	0	10/12/2013									✓																	
Doc. Nb. TS 101 539-1 Ver. 1.1.1	Intelligent Transport Systems (ITS);	Published																											
Ref. DTS/ITS-0010017	V2X Applications;			✓	✓			✓																					
Technical Body: ITS WG1	Part 1: Road Hazard Signalling (RHS) application requirements specification	**Current Status:**																											
Directives:	**Road Hazard Signalling (RHS)**	Publication (2013-08-01)																											
Details and Download																													
Doc. Nb. TS 101 539-2 Ver. 0.0.7	**Intelligent Transport System (ITS);**	**Drafting Stage**																											
Ref. DTS/ITS-0010015	**V2X Applications;**	Current Status:																											
Technical Body: ITS WG1	**Intersection Collision Risk Warning (ICRW) application requirements specification**	Early draft (2014-10-14)			✓																								
Details and Download	Intersection Collision Risk Warning Specification	Next Status:																											
		WG approval (2015-11-02)																											



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			MIS	MIS	MIS	MIS	TM	TM	TM	TM	TM	TM	UL	UL	UL	UL	UL	UA	UA	UA	UA	UA	UA	UA	UA	UA	UA	
eference	Title	WI Status Standard Status	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cns Arch	MIS Inttfcs Arch	TM Apps Arch	TM Cns Arch	TM Inttfcs Arch	UL Apps Arch	UL Cns Arch	UA Inttfcs Arch	
oc. Nb. TS 101 539-3 Ver. 1.1.1 ef. DTS/ITS-0010016 echnical Body: ITS WG1 irectives: etails and Download	**Intelligent Transport Systems (ITS);** **V2X Applications;** **Part 3: Longitudinal Collision Risk Warning (LCRW) application requirements specification** Longitudinal Collision Risk Warning	Published Current Status: Publication (2013-11-05)		✓																								
oc. Nb. TR 102 638 ef. RTR/ITS-00157 echnical Body: ITS WG1 irectives: etails and Download	**Intelligent Transport Systems (ITS);** **Use cases;** **Description** BSA Release 1 revision	**Drafting Stage** Current Status: TB adoption of WI (2014-10-16) Next Status: Start of work (2014-10-16)																										
oc. Nb. TS 102 894-2 Ver. 1.1.1 ef. DTS/ITS-0010022 echnical Body: ITS WG1 irectives: etails and Download	**Intelligent Transport Systems (ITS);** **Users and applications requirements;** **Part 2: Applications and facilities layer common data dictionary** Applications and facilities layer common data dictionary	Published Current Status: Publication (2013-08-01)				✓						✓					✓											
oc. Nb. TS 102 894-2 Ver. 1.2.1 ef. RTS/ITS-00148 echnical Body: ITS WG1 irectives: etails and Download	**Intelligent Transport Systems (ITS);** **Users and applications requirements;** **Part 2: Applications and facilities layer common data dictionary** Applications and facilities layer common data dictionary	Published Current Status: Publication (2014-09-16)				✓						✓					✓											

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Reference	**Title**	**WI Status**	**Standard Status**	Mobility Svs	MIS Inf	Alt Fuel	DD&DR	TM measures	Access Mgt	Prioritisation	Charging	Lane Mgmt	DD&DR	Parking	Loading	Alt Fuel	Access Mgt	DD&DR	General	MIS Apps Arch	MIS Cms Arch	MIS Intfcs Arch	TM Apps Arch	TM Cms Arch	TM Intfcs Arch	UL Apps Arch	UL Cms Arch	UA Intfcs Arch	
CEN/TS 16157-1:2011	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 1: Context and framework							✓																					
CEN/TS 16157-2:2011	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 2: Location referencing							✓																					
CEN/TS 16157-3:2011	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 3: Situation publication							✓																					
CEN/TS 16157-4:2014, publication	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 4: Variable message sign publication							✓																					
CEN/TS 16157-5:2014, I	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part5: Measured and elaborated data																												
CEN/TS 16157-6:2015,	Intelligent transport systems — DATEX II data exchange specifications for traffic management and information — Part 6: Parking publication																												

Technical Report: Intelligent Transport Systems
Standards and actions necessary to enable urban infrastructure coordination to support Urban-ITS

Annex P Outreach Responses; Outreach contacts, contributors, and effects on Recommendations

P.1 Organisations and individuals consulted during the preparation of the interim and final reports

The following organisations were consulted, and most participated by responding in some form during phase 1 and/or phase 2 of the PT1701 outreach activities. The following lists include participation via the PT1701 website (www.urbanits.eu), although most participation was via response to the recommendations of the Interim report, or direct contact with a PT1701 expert. Some have participated actively and others have simply been informed.

1. Aalborg Kommune
2. AFIMB - Agence Française pour Information Multimodale et Billetique (French Ministry of Transport)
3. AFNOR CN03/GT7 Multimodal Traveller Info
4. Alstom Transport
5. Austrian Standards Institute (ASI)
6. Automobile Association (UK)
7. Automotive.nl (Bram Hendriks)
8. Mobility Service, Barcelona City Council
9. Institut Municipal d’Informàtica (IMI) – Barcelona City Council
10. BBV (Ministry Transport & Environment
11. Bilbao Council
12. Birmingham City Council - ITS
13. BISON (Beheer Informatie Standaarden Openbaar vervoer Nederland)
14. BKK Centre for Budapest Transport
15. Bovim Consultants (Norway)
16. Cambridge Consulting
17. CEN TC278 Plenary, Chair, WG2 Freight and Fleet, WG12 AVI;
18. CEN TC301
19. CEN TC278
20. CENTRO (Birmingham PT)
21. CEREMA
22. City of Amsterdam
23. City of Hamburg (LSBG)
24. City of Helmond
25. City region The Hague
26. City of Utrecht
27. City of York, Transport Systems Manager
28. City of York Council
29. Connekt, ITS Netherlands
30. Continental Corporation
31. DATEX II organisation
32. DITCM
33. Dutch Profiles Table:
    34. Siemens
    35. Swarco

   36. Imtech
   37. CGI
   38. MAPtm
   39. RHDHV
   40. PPA (Amsterdam)
   41. Ministry I&M
   42. NDW
   43. Connecting Mobility
   44. RWS
   45. TNO
   46. RDW
   47. Vialis
   48. Grontmij
   49. TNO
   50. Connecting Mobility
   51. Sistron
52. ERTICO
53. ETSI TC-ITS
54. ETSI
55. EU-US Task Force HTG6
56. European Commission’s Joint Research Centre
57. European Commission INSPIRE
58. European Cyclists Federation
59. Freie und Hansestadt Hamburg,
60. FRAME
61. GART -Association of Transport Authorities
62. Glasgow City Council
63. Greater Lyon
64. HIDO (Japan)
65. Hogia Public Transport Systems AB
66. Hybris
67. Ifsttar (Fr)
68. Imtech Traffic and Infra
69. IRU
70. ISO TC204 Plenary; ISO TC204 WG7 General fleet management and commercial/freight
71. ISO TC22
72. ITSO (UK)
73. Kapsch
74. Kassel
75. Kudoh
76. Landesbetrieb Straßen, Brücken und Gewässer
77. Transport for Greater Manchester
78. Michelin
79. Netherlands, National Data Warehouse for Traffic Information
80. NNG
81. OCA
82. OCIT
83. Opticities Project
84. OPTICITIES / Métropole de Lyon
85. Plusservice
86. POLIS
87. Province Noord Holland
88. Province Noord-Holland , City of The Hague
89. Province Noord-Brabant
90. Reading Borough Council

91. Royal Automobile Club (UK)
92. RTIG - Real Time Information Group (PT) (UK)
93. Siemens AG
94. Stadt Kassel
95. Stadt Frankfurt am Main, Traffic
96. Independent ITS(C-ITS & IT-Consultant) Germany
97. Stadt Herford,
98. Stadt Zurich
99. STIF (Public Transport Ile de France Region)
100. SWARCO TRAFFIC SYSTEMS GmbH
101. Tiefdanasteilung Stadt Frankfurt
102. TISA
103. TomTom
104. Transport for Greater Manchester, UTC Manager
105. Transport for London: a) Head of TfL Online
106. Transport for London: b) Head of Buses Technical Services Group
107. Transport for London: c) Technology Asset Management Directorate (various and several experts)
108. TransportLogic (UK)
109. Trondheim/Norwegian Public Roads
110. UITP
111. UK ITS community (Several)
112. UTMC Development Group 9
113. VDV
114. Verkehrslunkung Berlin
115. YRP
116. Warwick University

Also the following individuals, with no company association, participated via the website:
C.Cuervac,
Ortgiese,
Christophe Red,
B. Marks,
F. Malbrunot,

P.2 Organisations and individuals circulated with the Interim Report for comments and prioritisation

The interim report was shared with the outreach contributors shown in P.1 above.

The interim report was made available and comment invited via www.urbanITS.eu.

The interim report was discussed with CEN TC278 Plenary.

And the Interim Report was discussed with the European Commission (DG GROW and DG MOVE).

A two day outreach meeting was held 11/12th February 2016, and ISO TC204 Ad-hoc group for mobility and CEN TC301 (Road Vehicles), among others, participated.

PT1701 experts actively solicited response to the recommendations of the Interim report. It must be noted that responses reflect individual viewpoints and do not necessarily reflect the official view of the organisations by whom they are employed.

P.3 Feedback from outreach following circulation of interim report

P.3.1 Overview

Ensuring input and influence from real implementers- *the urban authorities* – (whether or not they effect the implementation directly or via industry partners) on the basis that the objective of this pre-study is to focus the recommendations on *their* needs in order to enable them to quickly enable and implement Urban-ITS, is a recurrent theme of this pre-study, and a clear goal of the sponsors of this work – the European Commission, and the Chair of CEN TC278 (who first proposed the pre-study).

It has to be stated that the compact timescale of the pre-study (effectively the 6 months covering the 4th quarter 2015 and 1st quarter 2016), was not conducive to obtaining constructive outreach consideration and feedback, particularly from such complex organisations as Urban Administrations, and in some cases to complex technical recommendations, in such a short period of time. However, some 116 organisations across Europe were consulted, particularly in respect of providing feedback to the recommendations of the Interim Report. Despite these timetable issues in obtaining responses to the 103 recommendations of the Interim report, some 41 responses were received, of which 28 were from individuals from Urban Authorities or related agencies, and some 13 from other respondents such as those involved with Universities, standards committees, advisors, equipment and system providers, some EC supported projects, the EC's own 'Joint Research Council', and other support agencies and organisations. Generally, a ratio of about 2:1 UA's: Others; which the PT believes provides a well-balanced feedback. However, it cannot be stressed enough that this feedback is from relevant individual respondents, and is not the formal feedback of organisations; and it should be noted, as commented elsewhere that among UA responses there was a high proportion of responses from Traffic Management contributors, and responses did not equally represent all countries of the EU.

By far the bulk of the feedback received has indicated that those in Urban Administrations recognise that implementing urban ITS is important, significant and putting the standardisation building blocks in place is necessary and urgent. But as to what standardisation building blocks are required, they, the individuals working in urban authorities, generally consider that they are not in a position to advise us what is needed, but they look to our study for that expert advice. Thus providing PT1701 with a conundrum.

To ask Urban Administrations for their standardisation priorities for Urban-ITS, is, as one respondent stated, "*a little like asking someone at their first lesson in Algebra, what equations they need to know to pass an exam in five year's time, when, in lesson one, they probably have not yet grasped understanding what an equation is*". The problem is that, unless they have already studied Urban-ITS, or some aspect of it, they do not yet know what standardisation building blocks they need. This feedback is important, but does not help the pre-study prioritise its recommendations for standardisation requirements.

Further, while the modus operandi of the PT has been to identify its recommendations from a combination of the experience of its members and phase 1 outreach, and then use phase 2 outreach to affirm the recommendations and construct a shortlist of standardisation priority areas that should be prioritised as support projects for the CID. If the feedback that, '*unless they have already studied Urban-ITS, or some aspect of it, they do not yet know what standardisation building blocks they need'* is correct, then we have to be very careful how we interpret the feedback received, particularly from UA's. Lack of positive response to a recommendation cannot therefore be taken to imply that there would be no useful take-up of such a specification, only that the respondent is not yet aware of such a requirement. (in many cases the interest of UAs may well be more focussed on the Use Cases than the standards needed to underpin and enable them)

Where comments of the "least useful" subjects are received, the PT has to look to the reason behind that antipathy, to establish whether it is based on a reason for that antipathy because of experience, or whether it is simply that the commenter just does not have knowledge of the need and cannot yet see its point.

PT1701 has therefore separately analysed feedback response into two categories – responses from Urban Administrations and closely associated bodies; and responses from advisers, equipment and system providers, standards developers, central policy makers etc. That is not to say that information from these sources is less important than that from Urban Administrations (indeed in many cases these sources will be better informed about the requirements than someone at the day-to-day 'coalface' of operating managers and engineers). But their views are likely to, and indeed do, differ, and the PT has to consider these differences.

The most organised feedback comes from areas where Urban Administrations have already cooperated and some organisational studies have been conducted. OCA in the German speaking states, UTMC in the United Kingdom, the 'Dutch Profiles Table' in the Netherlands, and AFIMB in France, etc. A few authorities in complex and developed cities, such as TfL (London), STIF (Public transport Authority for the Ile-de-France Region), Amsterdam, etc., have already started to encounter these issues and have made solid proposals, and it is no coincidence that experts associated with all of these activities were put forward to be members, and selected as experts for the pre-study team.

Of those authorities and organisations who have already invested resource, the recommendations all centre on avoiding vendor lock-in, standardising data concepts and enabling data exchange, and updating and expanding the underlying architecture behind public transport (Transmodel/IFOPT and NeTEx, SIRI, etc.), and getting guidance in this complex and largely unknown paradigm of Urban-ITS, although responses and situations vary significantly from country to country, UA to UA, and expert group to expert group.

In respect of specific services, harmonising location referencing has been a recurrent issue across different domains and, overall, attracted the biggest number of positive responses, and was ranked as a priority by both Urban Administrations and "Other" categories; thus confirming the initial outreach meeting conclusion that this should be one of the top ten areas of attention and project support under the CID. See HLRa below.

Mixed vendor environment recommendations (avoiding vendor lock-in) in the context of traffic and transport management also attracted high positive response from both categories, but particularly from Urban Administrations. Thus confirming the outreach meeting conclusion that this should be one of the top ten areas of attention and project support under the CID. See HLRb below.

Another area that ranked highly, especially with advisors to UAs and implementers, is the recommendation for an EU-ICIP (HLRe); And this gelled well also with the "algebra student" analogy (stating that they first needed to know more about how it all worked and fitted together before they could make definitive or sensible recommendations for priorities). Clearly EU-ICIP would address these issues, although it will be, as one respondent pointed out, "*ambitious and will entail much work for development and maintenance*", so if it is to be undertaken, needs to be funded properly and adequately. And once again the outreach feedback confirms the prioritisation made at the February outreach meeting.

A subject not significantly considered in the first stage of the work, but raised during both stages by Urban Administrations, and particularly the second stage of outreach, was emissions management. This raised very significant interest by, and importance to, some Urban Administrations (but generally little interest to advisors), but at the same time raised antipathy from others who did not see the need.

But it is clear that for some of the major cities in Europe this is a very high priority. (For example, London has stated that if there are no European standards available to assist in measuring and controlling emission, particularly harmonised data, it will have to develop and impose its own). On consideration, the PT raised this to be a significant issue that could be dealt with quite quickly.

Another area that raised mixed reaction was that of the availability of a harmonised meta-data registry. This scored highly for some Urban Administrations and advisors (others), and was seen by most of the project team as important, and by some as fundamental and essential. On the other hand, it attracted some negative comments. It was pointed out that ISO, US and UK attempts to do this had not been successful, and Austrian Standards went as far as saying "*Please delete this recommendation. It is considered premature to start a meta-data registry/data dictionary development project since there is so far no common understanding of what would be suitable governance for such a system, nor how the procedures are defined in a way that supports the standards writers and users*."

However, the PT, while agreeing that these obstacles remain, and need to be solved, were of the opinion that this does not take away the need for common and interoperable data, and did not take away the need to solve these issues; indeed, a meta-data and harmonisation process provided the only means to address and manage these issues. ISO 14817 does define a suitable governance system for ITS data registries and one that is consistent with ISO 11179 (the international standard for representing metadata for an organization in a metadata registry.) The problems that US and efforts faced was existing use of terms that were protected by intellectual property, and the problem for ISO has been the lack of a viable funding mechanism for the work. But in any event. the problems of a global meta-data registry to cover all aspects of all of the ITS paradigm, are different and more complex than the task to establish and maintain a meta-data limited to identified data used and exchanged in the provision of Urban-ITS within Europe.

The European Commission's Joint Research Centre (JRC), endorsing the recommendation, observed that "*The INSPIRE Directive and other initiatives like the European Open Data Portal should also be taken into account, in view of reusing existing approaches to metadata management. It could also be worth referring to the geographical dimension of the DCAT – AP, Geo DCAT. This is also related to the European Catalogue of standards that is being put in place by DG GROW and DG Connect. The content of such registry (at least the metadata) should be made available openly to others*."

Given the make-up of the PT experts and their association with these urban organisations, that these responses align with the prime recommendations made by the PT, we cannot consider to be either a coincidence, nor an endorsement, … in any event it is no surprise. But perhaps it does provide the clearest advice on the areas where the CID should concentrate its support measures.

The last of the priorities identified by the outreach meeting was to elaborate further the Use Cases that had been identified by the PT as relevant to urban-ITS, but where there was inadequate information available to elaborate a Use Case properly or completely enough to identify standardisation needs. This was identified at the interim report/outreach meeting as a priority, as some of these subject areas may be of significant importance, but could not be directly addressed by the CID. It is hoped that the OPTICITIES project, who have identified the title of many of these Use Cases at a strategic level, will be able to detail these Use Cases as their project progresses, or one of the several other initiatives for city transport will take on this task.

The lifespan of the CID is just four years, and if the five priorities nominated at the outreach meeting, together with garnering, as the project progresses, an understanding of where the Urban-ITS initiative should move in its next phase after the CID lifespan, then the pre-study, and the CID, will have done a good job providing these first steps. However, this second and final stage of the Project uses outreach feedback and comments to identify a further 5 priorities suitable to be supported by the CID; identifies candidates for standardisation measures by other ESO’s and committees; and identifies candidates for support measures outside of the CID. In this final report PT1701 also withdraws 15 of its interim recommendations for further consideration, as the result of negative feedback received. This does not, however mean that these projects are not needed nor important, only that there are higher priorities for the CID, and these recommendations require further consideration.

P.3.2 Outreach feedback in relation to the priority areas identified at the Outreach meeting

This section summarises the results of the outreach meeting held in February 2016, following circulation of the Interim Report.

It was agreed that many of the recommendations were closely related/clustered and should be garnered into a series of “High Level Recommendations” (HLR).

These are numbered sequentially as they were discussed and agreed, the numbering does not reflect any ranking of priority.

One of the reasons for this ‘grouping’ exercise was to respond to an EC request to provide them with more targeted interim guidance, so that they could take initiatives before the final report is issued, in the event that they receive project applications once funding became available.

P.3.2.1 **HLR1**- High level recommendation 1: Guide EU-ICIP

Project team (multi-discipline) to develop a Technical Specification or Technical Report, “European ITS communications and information protocols “(EU-ICIP) followed by an ongoing maintenance programme.
Use Case ULG-0001.

RECOMMENDATION: Rc_PI01

HLR1-1 EU-ICIP Protocols.	Project Team. (Team of 3. Estimate 100 days).
HLR1-2 EU-ICIP Guide.	Project Team. (Team of 7. Estimate 250 days).

P.3.2.1.1 **HLR1**- Outreach Feedback response

20% of support in outreach respondents supported this work item. Every respondent that identified the need, identified it as the highest priority in their list. No negative responses received.
Comments received:

a) Please find attached my feedback on the Urban ITS Requirements Analysis. I'm mostly interested in the topics EU-ICIP, meta-data registry, data model harmonisation and enhancement and harmonisation of location referencing methods.

b) A guide ‘European ITS Communications, Information and Protocols’, (EU-ICIP) will be necessary, and is urgently required.

c) The EU-ICIP guidance document is ambitious and will entail much work for development and maintenance. It is of interest to JRC.H06, in view of a possible specific section on spatial data standards for ITS.

d) The recommendation for an EU-ICIP guide is a good one but if this preliminary document is 600+ pages, how many pages would be in the definitive guide and how would it be maintained as the standards evolve? These are critical questions. Also having such a guide will not remove the need for experts, as is suggested.

(NOTE: PT1701 notes the comment (d) but observes that in the Interim Report it implied that the availability of an EU-ICIP would REDUCE dependency on experts, it did not intend to imply that it would REMOVE the need for experts.)

P.3.2.1.2 HLR1- PT1701 conclusion

PT1701 observes that the need for EU-ICIP is significantly supported by outreach response, although awareness of its need is more prevalent to advisors and others outside of Urban Administrations. Urban Administrations, in general, have yet to identify clearly the need for, or benefits of, EU-ICIP. Interestingly however, administrations outside of Europe (such as Turkey) have been asking for a "European Equivalent of the US NTCIP" so they can better understand the needs of EU regarding ITS, for some years. PT1701 notes, however, the comment (see above) by one UA (and similar comments by others) on the lines that asking UA's about the need for these support measures is "*a little like asking someone at their first lesson in Algebra, what equations they need to know to pass an exam in five years time, when, in lesson one, they probably have not yet grasped what an equation is*".

The availability of an EU-ICIP guide can likely provide the first educational guide in that road to learning the algebra of Urban-ITS, and thus enable and empower Urban Administrations to make more rapid progress in the introduction and support of Urban-ITS. The prioritisation of this requirement is considered confirmed by outreach response.

Becomes **1701-HLRe** in the final report.

P.3.2.2 HLR2 Location referencing

Project team to develop Technical Specification regarding provision of a real time continuous location referencing data for the Urban-ITS environment. The referencing system should allow for planned and real-time data. To be clear, the objective is to best use, harmonise, provide translate existing LR systems, not to invent yet another.

USE CASES: GEN-0001; ULG-0001; ULG-0002; MIS-0002; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0007; MIS-0008; TM-0001; TM-0005; TM-0006.
RECOMMENDATIONS: Rc_GN01; Rc_GN02; Rc_GN02a; Rc_Gn12; Rc_SO03; Rc_SM09

HLR2 Location Referencing Harmonisation Project Team. (Team of 5. Estimate 250 days).

P.3.2.2.1 HLR2 Outreach Feedback response

Rc_Gn01:	10% of outreach respondents supported this recommendation, one of which deemed it its highest priority.
Rc_Gn02:	5% of outreach respondents supported this recommendation.
Rc_Gn012:	42% of outreach respondents supported this recommendation, four of which deemed it their highest priority.
Rc_SM09:	3% of outreach respondents supported this recommendation.
Rc_SO03:	One positive and one negative response.

Comments received:

a) Gn01: We do recognize the importance to establish a standard for centre to centre communication, but we are of the opinion that this is not a specific Urban ITS topic: the Datex II standard for the data model is already in place; a standard for “Platform independent model specifications for data exchange protocols” is under work in CEN TC 278 WG8. This will be the basis for future standardized exchange protocols. Therefore we suggest participating to ongoing standardization activities rather than setting up a new PT specific for Urban ITS needs. We also suggest taking a look at what has been done in the European Corridor project in this regard (e.g. the ECo-AT project in Austria).(2 identical comments from different respondents.

b) Hot topic !

c) I'm mostly interested in the topics EU-ICIP, meta-data registry, data model harmonisation and enhancement and harmonisation of location referencing methods. Actually, I intended to also mention some architectural topics, but they are all tied to FRAME and I'm not sure if this is a future-oriented approach.

d) Interoperable location referencing (all domains, mostly harmonization and sometimes need for a new standard: intersections topology). Necessary for data exchange for ITS services (essential for planned and real-time data processing and information dissemination, but also for in-vehicle signage).

e) GN12 These standards should be developed with emerging data standards for the Internet of Things in mind. We’d welcome delegations to the UK to become better informed of the emerging global HyperCAT standard, that a UK consortium of major industry partners such as Cisco and BT, have got behind. It is an open, interoperable and scalable architecture that would be ideal for this application.

f) Gn12/TM01/TM02/MI12/MI24/UL02 In all cases (TM, MI, & UL), and adapted to new modes as well.

g) GN11 GN12 That’s probably an ambitious challenge. It’s definitively linked to reference data model for network topology. That’s particularity true of FCD data, which can hardly be re-mapped to existing referential, without the use of complex algorithms proprietary of a few actors from the geographic sector market.

h) All DATEXII recommendations are important to our organisation. So also Rc_SO02, Rc_SO03- are applicable, however, not with the same urgency as Tm01 and 02, because of the different Use Cases.

i) As a data handler and broker, seamless data exchange and location referencing are within the applicable domains the two most important issues for NDW. In the future, when we also might handle PT data, all recommendations concerning seamless data exchange and location referencing in these area’s (MIS) might become very important as well. So, our here stated judgement is from a quite narrow perspective.

j) Interoperable location referencing (intersections geography and topology). Essential for planned and real-time data processing and information dissemination, but also for in-vehicle C-ITS services).

k) Similarly, location referencing is a fundamental building block.

l) Location Referencing The experience of the TN-ITS protocol in implementing the INSPIRE linear referencing should be taken into account. More countries are in the process of adopting the same exchange mechanisms between road authorities and commercial navigation system providers (see CEF project EU-ITS Platform) and TN-ITS WG1 on location referencing, as well as the INSPIRE Thematic Cluster on Transport networks. Moreover, the various recommendations on location referencing appear to overlap significantly and should perhaps be combined into a single recommendation.

m) The recommendation to develop an EU delivery vehicle real time mapping/route optimisation matrix is interesting and raises a number of questions: a) this is at the heart of commercial logistics. Why should the Commission get involved? b) what would such a ‘matrix’ contain? INSPIRE would be relevant; (c) there will be numerous other similar real time mapping / optimisation applications as well. (d) the difference could be in ‘door-to-door’ deliveries where at an urban level you need to have good information on buildings, entrances to sites, delivery points, reception locations etc. (INSPIRE would be relevant, as well as much improved data on the part of public administrations).

n) We support the findings of the report in concluding that an EU wide referencing stardust for geo-location is required. The ability to standardise spatial references down to site and even equipment level would simplify the migration of data between C-ITS and similar systems by ensuring compatible data structures. As above, this would increase the opportunities for building C-ITS systems from different manufacturer’s components and Urban Administrations andsimplify competition.

P.3.2.2.2 HLR2 PT1701 conclusion

This subject obtained the highest number of positive responses, including 5 responses indicating that it was their highest priority. This recommendation attracted a high level of support from both Urban Administrations and advisors. The findings of the outreach meeting and HLR2 proposal is therefore confirmed as a priority, indeed, probably the highest priority of all of the recommendations.

However, it is to be clear that the objective is to best use, harmonise, provide translate existing LR systems, not to invent yet another.

Becomes **1701-HLRa** in final report.

P.3.2.3 HLR3 – Vendor lock-in/legacy systems and migration paths

(primarily in the context of Traffic Management systems)

NOTE: mixed vendor systems have already been enabled in the MIS area through the use of Transmodel, IFOPT, NeTEx and SIRI).

High level recommendation 3: Mixed Vendor Environments. (MVE)
USE CASES: TM-0001; TM-0003; TM-0009; UL-0301
RECOMMENDATIONS: Rc_GN01; Rc_TM05; Rc_TM06; Rc_TM07.;Rc_Gn15

This high level recommendation comprises 3 stages:

Stage A: MVE Protocols. A project team to collect technical and implementations details per method; propose a translator (Rosetta Stone); write guideline of when and how to use which method.

HLR3-1 Mixed vendor environments Methodologies & Translators
Project Team. (Team of 3. Estimate 170 days).

Stage B: MVE Guide. A project team to analyse and describe which interfaces need to be 'open'; describe migration path from current situation to open interfaces; propose policies for authorities. (Concept of Operations' (CONOPs)).

HLR3-2 Mixed Vendor Environment Guide (CONOPS) Project Team (Team of 3. Estimate 200 Man Days)

Stage C: MVE Standards. (assumes completion of Stage A and availability of EU-ICIP). Define conversion specifications for each relevant interface.

(Cannot be commenced until after Stage 1 [HLR 3-1] complete).

HLR3-3 Mixed Vendor Environment Standards Project Team (Team of 3. Estimate 120 Man Days).

P.3.2.3.1 HLR3 Outreach Feedback response

GN01: 10% of outreach respondents supported this recommendation., including one who rated this its highest priority.

TM05 32% of outreach respondents supported this recommendation. There was one negative feedback, (from same source as negative feedback to TM06/TM07), but 9% rated this issue their highest priority.

TM06 15% of outreach respondents supported this recommendation. There was one negative feedback (from same source as negative feedback to TM05/TM07)

TM07 24% of outreach respondents supported this recommendation. There was one negative feedback (from same source as negative feedback to TM05/TM06), but 6% rated this issue their highest priority.

Comments:

a) TM05-TM10 For Mobility Services, signals systems operation & maintenance is the largest part of the budget. Further local deliberation is needed to identify which of these activities is most urgent.
b) TM05 To avoid vendor lock-in, esp urgent for launching customers !
c) TM05 - 07 Data exchange between signals controllers and UTC are not an "urgency" in term of ITS applications services to end users (bring better and/or news services, to drivers, cyclists, PT vehicles and pedestrians).
d) The main goad is to be able to exchange data between UTC and other actors in order to deploy new ITS applications.
e) I'm mostly interested in the topics EU-ICIP, meta-data registry, data model harmonisation and enhancement and harmonisation of location referencing methods.
f) Or course, bringing an open market at European level is a good issue. Being able to connect any signal controllers to any UTC can't be seen as a bad idea but due to long-time life cycle of equipment, and UTS systems it will have no effect for many years in a context of lack of public funding at local authorities level.
g) Vendor lock-in free procurement of ITS systems and vendor independent usage of IT systems for synchronized Traffic Management.
h) Seamless and vendor independent data exchange within and between ITS systems and services for synchronized traffic control, signage (road side and in-vehicle) and multi-modal information services.
i) Vendor lock-in free procurement of ITS systems and vendor independent usage of IT systems for synchronized Traffic Management.

j) Gn15: This has been started within OPTICITIES and it would be of high use for European cities to complement and disseminate this work.

k) gn15 A guide is needed to help organise a standards steering group within Local Authority organisations. Unless they work together using common EU-level guidance the progress will be slower, less convergent.

l) Trying to build a standard at the European level will be extremely difficult. Years ago WG4 from TC 226 tries to produce a traffic control terminology which is a fundamental basis before producing any standards on traffic control data exchange. This document was not published and work was stopped in 1995 . The main reasons were the gaps between traffic controls concepts and the facts that traffic controllers and signalized intersection are very complex objects. For example the concept of signal phase which is at the hard of traffic control is different from a country to another.

Anyway, in many countries and particularly in Asia, South America, Middle-East and Africa, the North America standards NTCIP is often required in many calls for proposals. This standard should be considered in the potential standards. Discussion at CEN level must be conducted whether it can improve interoperability or not at in Europe ; and help the industry to export European-made products outside our continent.

P.3.2.3.2 **HLR3** PT1701 conclusion

Standards to enable/ensure mixed vendor environments- i.e. the avoidance of vendor lock-in is a high priority area, and HLR3 is confirmed, although it should be noted that in some cases, Urban Administrations are outsourcing the service, which lessens the ability, or even wish, to avoid vendor lock-in. Where such outsourcing is not in place, along with location referencing, this subject has attracted the highest positive outreach response.

Becomes **1701-HLRb** in final report.

P.3.2.4 **HLR4** Emissions management in urban areas

Development of Technical Specification(s): Standards and data definitions for Emission management in urban areas.
USE CASES:

UL-0301	Emissions monitoring –General
UL-0302	Urban Low Emission Zone Management
UL-0303	Monitor Emissions Compliance in Urban Zone Use Case: Low Emission Zones

Content:
- Functional Specifications based on Use Cases
- Design consistent data concepts and interfaces
- Geofencing management requirements for hybrid vehicle busses, taxis, (potentially private vehicles) for use of EV modes in pollution hotspots and residential areas

RECOMMENDATIONS: Rc_UL03; Rc_UL04; Rc_SM10. Rc_UL001c; Rc_UL001cc;
HLR4 Emission Management in Urban areas Project Team (Team of 3. Estimate 140 Man Days).

P.3.2.4.1 **HLR4** Outreach Feedback response

Rc_UL01 (A combined project “Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics” is therefore recommended whose scope is to (at least) include:
Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement. (I.5.)).

No outreach respondents supported this recommendation.

Rc_UL01: This recommendation (UL01) is therefore Withdrawn for further consideration. (no outreach support)

Rc_UL03 (Emissions monitoring - Project Team to determine standard for Air Quality outstations and Traffic Management Systems) 3% of outreach respondents supported this recommendation, and reduction of pollution in urban environments is a clear and declared EU objective. However, in discussions there was significant interest and this area was identified of significant importance to major cities, who will define their own standards if this is not done at a European level.

Comments:

a) Development of emissions monitoring. For instance: Energy efficient intersections services.

b) Standards for emissions monitoring, geofencing, delivery vehicle real-time mapping/route optimisation, are desirable". TfL is currently creating a standard for geofencing, data for mapping/route optimisation and emissions monitoring with local authorities, freight operators and businesses.

c) UL08 The focus on border enforcement is understandable, but it is not clear how this links to urban logistics.

Rc_SM10 Interchangeability, within this context, having a choice of the mode of transport means, is more a design, investment and management issue than a standards issue. But the process of deciding if and when to interchange between transport means (bus to metro to train to tram; long-haul hydrocarbon based truck to non-emission last mile delivery), multimodality- is only possible with the availability of dynamic data. In order to enable physical interchangeability, standardised physical interfaces are therefore required.

No outreach respondents supported this recommendation. There were two adverse responses and one comment:

a) "Gn09-SM10 The Local Authority regulates the services it contracts. To what extent should it help promote information supporting inter-modality is a delicate question. When Mobility Services participated in SuperHub project it ended up passing the budget to TMB to agree data supply with app developers since it did not have the data. Travellers make little use of real-time trip planning
– they revise behaviour based on bad experiences and imposed constraints.

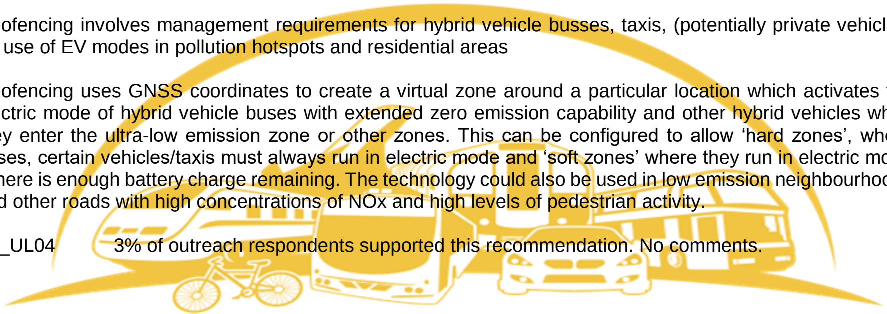
Rc_SM10: This recommendation is therefore Withdrawn for further consideration. (no support + negative outreach feedback)

Rc_UL04: Geofencing: A project team is probably required in respect of standardising geofencing protocols.
See I.2.3.1.12 Use Case UL 0112

Geofencing involves management requirements for hybrid vehicle busses, taxis, (potentially private vehicles) for use of EV modes in pollution hotspots and residential areas

Geofencing uses GNSS coordinates to create a virtual zone around a particular location which activates the electric mode of hybrid vehicle buses with extended zero emission capability and other hybrid vehicles when they enter the ultra-low emission zone or other zones. This can be configured to allow 'hard zones', where buses, certain vehicles/taxis must always run in electric mode and 'soft zones' where they run in electric mode if there is enough battery charge remaining. The technology could also be used in low emission neighbourhoods and other roads with high concentrations of NOx and high levels of pedestrian activity.

Rc_UL04 3% of outreach respondents supported this recommendation. No comments.



P.3.2.4.2 HLR4 PT1701 conclusion

There is, as yet, no enthusiasm to develop data concepts except in the areas of emissions management. Although not yet of interest to many, and especially, smaller, cities, this has become a priority for some of the major cities in EU, and is in alignment with EU sustainable cities objectives.

In the final report, the recommendation therefore evolves into:

1701-HLR**i** Emission Management in Urban areas,

P.3.2.5 HLR5-Data exchange/data management

P.3.2.5.1 Establish data registry

(Support Action)

HLR5-1- High level recommendation 5-1: A project team to review existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry.

This requires ‘Support Measures’ (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures. Set-up costs circa €150k; annual maintenance/operating cost, circa €75k)

USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL 0102; UL 0103; UL 0104; UL 0105; UL 0106; UL 0107 ; UL 0108; UL 0109; UL 0110; UL 0111; UL 0203; UL 0204; UL 0206; UL 0207 ; UL 0208; UL 0209; UL 0210; UL 0213; UL 0214; UL 0215; UL 0217; UL 0220; UL 0221; UL 0226; UL 0301; UL 0302; UL 0303; UL 0304; UL 0401; UL 0501; UL 0601; UL 0602; UL 1001; UL 1003; UL 1004; UL 1101; UL 1201

RECOMMENDATIONS:
Data Registry: Rc_SM01; Rc_SM01a; Rc_SM01b; Rc_SM01c; Rc_SM01d; Rc_SM01e; Rc_SM02; Rc_SM02a; Rc_SM03; Rc_SM04; Rc_SM04a; Rc_SM05; Rc_SM06; Rc_SM07.
Data Exchange: Rc_GN02; Rc_GN02; Rc_GN03; Rc_Gn06; Rc_MI18; Rc_MI22; Rc_UL001; Rc_UL001b; Rc_UL001bb; Rc_UL001c; Rc_UL001cc; Rc_UL001d;Rc_UL001dd Rc_UL001dd; Rc_UL001e; Rc_UL001ee; Rc_SM12.

HLR5-1 Support Measure Establish EU ITS/Urban-ITS Meta-Data Registry (Support Action [not CEN] Set-up costs circa €150k; annual maintenance/operating cost, circa €75k)

P.3.2.5.2 Harmonise Data Concepts

(Support Action)

HLR5-2 Harmonization project team to find common data concepts and migration paths for extant ‘silo’ developed work items.
Cost circa €250k

USE CASES: MIS-0001; MIS-0002; MIS-0002-1; MIS-0003; MIS-0003-1; MIS-0003-2; MIS-0004 ; MIS-0004-1; MIS-0005; MIS-0005-1; MIS-0005-2; MIS-0005-3; MIS-0005-4; MIS-0005-5; MIS-0006; MIS-0007; MIS-0008; TM-0001; TM-0002a ; TM-0002b; TM-0003; TM-0004; TM-0008; UL 0102; UL 0103; UL 0104; UL 0105; UL 0106; UL 0107 ; UL 0108; UL 0109; UL 0110; UL 0111; UL 0203; UL 0204; UL 0206; UL 0207 ; UL 0208; UL 0209; UL 0210; UL 0213; UL 0214; UL 0215; UL

0217; UL 0220; UL 0221; UL 0226; UL 0301; UL 0302; UL 0303; UL 0304; UL 0401; UL 0501; UL 0601; UL 0602; UL 1001; UL 1003; UL 1004; UL 1101; UL 1201

RECOMMENDATIONS: Rc_SM05; Rc_SM06.

P.3.2.5.3 **HLR5** Outreach Feedback Response

Comments:

a) DATEX Community: What we really recommend in the report is a meta data registry. This should not be limited to the urban domain. Traffic is unaware of organisational boundaries. Current developments in the domain of cooperative ITS and automated driving show that a common registry definitions is really valuable for the interoperability of information throughout the complex information chains that emerge. Experience however that standardising definition is an extremely challenging exercise. But the urgency to achieve this gets more clear every day.

b) I'm mostly interested in the topics EU-ICIP, meta-data registry, data model harmonisation and enhancement and harmonisation of location referencing methods.

c) If the European Commission wishes to enable Urban Administrations to implement Urban-ITS, it needs to establish and maintain such a central meta-data registry.

d) “a harmonisation programme” needing to be undertaken “to identify these (data) inconsistencies, bring the relevant parties together to find a common future standard data format, and to identify a translation/migration path for presently implemented solutions.

e) Standardised Data Formats and Standardised Transaction Profiles to support Urban-ITS Logistics” are required. Our Freight ITS, Data and Systems programme sets out our approach to increase the level of information made available to freight operators. Our project covers vehicle access management, oversize vehicle management, Automatic Number Plate Recognition data exchange and kerbside loading space management.

f) Please delete recommendation. It is considered premature to start a meta-data registry/data dictionary development project since there is so far no common understanding of what would be suitable governance for such a system, nor how the procedures are defined in a way that supports the standards writers and users. Present attempts (eg CIDCR) are still in early stages and have not tackled the above issues.

g) It is not advisable for a PT without application domain expertise to try to harmonise data concepts within different areas where there is already a significant deployment of standards compliant products and systems.

h) it may be a good idea to create a meta-data registry however Americans (and the British too) have tried to do that more than 10 years ago and I don't think it was maintained so why would it work today? It this is launched, at least everything should be published in open access.

i) SM01/07 On ITS metadata registry The INSPIRE Directive and other initiatives like the European Open Data Portal should also be taken into account, in view of reusing existing approaches to metadata management. It could also be worth referring to the geographical dimension of the DCAT – AP, Geo DCAT. This is also related to the European Catalogue of standards that is being put in place by DG GROW and DG Connect. The content of such registry (at least the metadata) should be made available openly to others.

Rc_SM01; Rc_SM01a; Rc_SM01b; Rc_SM01c; Rc_SM01d; Rc_SM01e; No outreach respondents supported this recommendation.
Rc_SM02; Rc_SM02a; 10% of outreach respondents supported this recommendation.
Rc_SM03; 3% of outreach respondents supported this recommendation.
Rc_SM04; Rc_SM04a; No outreach respondents supported this recommendation.
Rc_SM05; No outreach respondents supported this recommendation.

Rc_SM06;	No outreach respondents supported this recommendation.
Rc_SM07.	No outreach respondents supported this recommendation. There was one negative feedback.

Data Exchange:

Rc_GN02;	No outreach respondents supported this recommendation.
Rc_GN03;	No outreach respondents supported this recommendation.
Rc_Gn06;	No outreach respondents supported this recommendation.
Rc_MI18;	No outreach respondents supported this recommendation. There was one negative feedback.
Rc_MI22;	8% of outreach respondents supported this recommendation.
Rc_UL001; Rc_UL001b; Rc_UL001bb; Rc_UL001c; Rc_UL001cc; Rc_UL001d; Rc_UL001dd; Rc_UL001e; Rc_UL001ee;	No outreach respondents supported this recommendation.
Rc_SM12.	No outreach respondents supported this recommendation.

P.3.2.5.4 HLR5 PT1701 conclusion

This HLR, or rather the constituent recommendations comprising it, attracted some support, but the support was not widespread. However, this is a specialist area, and written comments received, from core groups associated with ITS, such as the DATEX community, ITS architecture experts, and those who understand how data harmonisation and interoperability is achieved, strongly recommend this HLR.

It has to be said that there were some adverse comments, largely on the grounds it was premature or too difficult.

Most PT1701 experts are of the opinion, that, whilst in the short term these issues may not seem to be the highest priority, if the interoperability/inter-intra mobility required for Urban-ITS is to materialise, a meta-data registry is required.

This is a support action and not a CID standards deliverable, but deemed to be essential.

Previous attempts have failed because there is no clear commercial business case to sponsor this activity as a stand-alone proposition. But some members of the Project Team are of the opinion that if the EU, Member States, or Cities wish to realise the potential of Urban-ITS, as envisioned in the CID documentation, they will have to find the (very limited) amount of financial resources required to support the creation and operation of a meta-data registry, and a data harmonisation process.

Becomes **1701-HLRk** (other support action) in the final report.

P.3.2.6 HLR6 Elaborate new urban logistics Use Cases (Support Action)

HLR6 Elaboration of new urban logistic Use Cases.

Some use-cases identified in the report appear only to be defined at a very high level. Needs a research project to provide substance and detail to the Use Case proposals

USE CASES: UL-0101; UL 0103; UL 0104; UL 0105; UL 0106; UL 0107 ; UL-0216; UL-0217; UL-0218; UL-0219; UL-0221; UL-0222; UL-0223; UL-0224; UL-0225; UL-0303; UL-0401; UL-0501

RECOMMENDATION: Rc_UL09; Rc_UL03; Rc_UL04;

P.3.2.6.1 HLR6-1

Project team to elaborate immature Use Cases. Size to be estimated once OPTICITES definitions completed.

P.3.2.6.2 HLR6-2

Funded European Project Team to study the Urban-ITS issues associated with the introduction of autonomous/automated vehicles. The work will study operational, technical and relevant legal issues related to introduction for AVs in the Urban environment. The PT will analyse the current status of AV standards, and propose new work that is needed for safe operation and seamless integration in the challenging urban environment.

USE CASE UL-1301
RECOMMENDATIONS: RcPI04; Rc_UL10.
(Team size, duration and cost: yet to be estimated. Further consultation needed. Further discussion with CEN TC301/ISO TC22 needed).

P.3.2.6.3 HLR6 Outreach Feedback response

Rc_UL03	3% of outreach respondents supported this recommendation. No comments.
Rc_UL04	3% of outreach respondents supported this recommendation. No comments.
Rc_UL09	8% of outreach respondents supported this recommendation.
Rc_UL10:	No outreach respondents supported this recommendation.
RcPI04	No outreach respondents supported this recommendation.

Comments:

a) Smart P&R bicycles services (detection, communications, parking, reservation of parking, platooning, green waves etc.).

b) UL04 Is it georeferencing? There is a danger of adding standards activities spurred by a desire to be complete, comprehensive. This tendency should be avoided. Specific innovation projects can proposed how to bring new innovations for new modes into the standards arena when they have generated market interest.

c) Joint initiatives are required “to provide new data concepts and transactions in the Urban-ITS paradigm”.

d) Many concepts for urban logistics use-cases have been proposed, but at this stage are not well enough developed to make firm proposals”. TfL is already progressing a wide range of urban logistics approaches in London for safety, environmental and efficiency gains and would be happy to share information on these in any future EC led urban logistics initiatives.

e) The proposals in Annex H - Urban Logistics, reflect much of what we are already seeking to establish in our own programmes. This includes the evaluation of the environmental impact and safety of urban logistics, the routing and data/information available and how this is best communicated.

f) UL03 : We hope to produce a set of methodologies for evaluating the environmental benefits of some of the activities we currently promote, including, re-timing, consolidation, cleaner vehicles and driver training. All this activity aligns with Rc_UL03- of Section 2.9 “Emissions monitoring”.

P.3.2.6.4 HLR6 PT1701 conclusion

While there is interest by some UAs (particularly large cities) in emissions monitoring and management, and apathy in other UAs (See HLR4 above), there seems to be very little appetite among UAs to explore further the new Use Case subject areas identified by OPTICITIES and other projects. This however contradicts comments about the need to accommodate and consider new modes. PT1701 draws the conclusion from this, not that such work is irrelevant, but that until it is fleshed out and better described to them in a way that demonstrates the needs/advantages to them, UAs have other priorities.

Projects, such as OPTICITIES should be encouraged to flesh out further these potential new Use Cases, and share the more detailed work with Urban Administrations.

HLR6-1 is, on the basis of outreach feedback received, Withdrawn for further consideration from the PT1701 list of priorities.

In respect of HLR 6-2, this was introduced into the pre-study at the express request of outreach response to the PT. It was not elaborated in the INTERIM report, nor a recommendation in the interim report, but a *response to* comment about its omission. No opportunity for comment was therefore provided as response to the interim report, and this proposal remains a priority recommended by the PT, its justification being that it is at the express request of, and product of, outreach feedback.

It becomes **1701-HLRc** in the final report.

P.3.3 Projects recommended, but under the lead of existing initiatives of CEN TC278 or other ESOCs.

A significant number of the recommendations of PT1701are in areas where there is already leadership, and often initiative, in progress or in the realm of other ESOCs, (such as DATEX), or other existing Working Groups of CEN TC278/ISO TC204, such as for the development of data models Transmodel/IFOPT, data exchange standards NeTEx/SIRI , and security standards for ITS-stations and C-ITS systems.

After consultation with EC, it is decided that such projects will obtain higher prioritisation as a result of their reference in the EU decisions, and have already prioritised recommendation for support in the EU ICT Rolling Plan. The three areas identified as key for development under the lead of other TC278 Committees, other ISO/CEN committees and other ESOCs are:

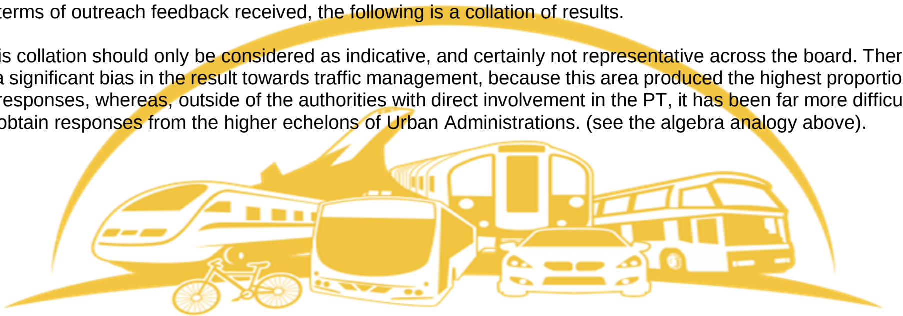
a) C-ITS security
b) Transmodel and related standards
c) DATEX II

Some recommendations refer to the harmonisation/mapping between Transmodel (and related standards) and DATEX II.

P.3.4 Outreach feedback to PT1701 recommendations

In terms of outreach feedback received, the following is a collation of results.

This collation should only be considered as indicative, and certainly not representative across the board. There is a significant bias in the result towards traffic management, because this area produced the highest proportion of responses, whereas, outside of the authorities with direct involvement in the PT, it has been far more difficult to obtain responses from the higher echelons of Urban Administrations. (see the algebra analogy above).



P.3.4.1 CEN PT1701 recommendations supported by outreach feedback

This list is ranked according to the number of affirmative responses and indications of highest priority responses received. However, caution is required as the results are based on responses received, and not a representative population. While it may be said that the first recommendation (Gn12) received statistically greater response than any other (approaching 70% more affirmative response than the next nearest) beyond this the relative markings are too close to be of any statistical significance, so should not be considered as a list ranked by its prioritization.

Rc_Gn12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
Rc_TM05	An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (I.4)
Rc_TM07	A control interface standard to link roadside devices such as signal controllers to an instation system, to support multi-vendor integration. (I.4)
Rc_TM02	A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (E.4.3.2)
Rc_TM03	A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (E.4.3.2)
Rc_PI01	PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) European ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP
Rc_SM13	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisation in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles, verification). (F.4.14)
Rc_TM01	A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (E.4.3.2) May be linked with MI20)
Rc_PI10	Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
Rc_PI11	A PT to study how C-ITS security shall be applied for Urban use. Specifically : practical advice to city authorities, and national/regional level needs to get going based on recommendations.
Rc_TM04	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. (I.4)
Rc_TM06	Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (I.4)
Rc_TM08	System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (I.4)
Rc_Gn15	PT1701 recommends that CEN develop a guide (Technical Report) to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm. The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm (D.2.3.18; E.5.1, P.3.2.3)
Rc_MI08	OESO/OEC To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4) – see recommendation MI11. (G.4.11)
Rc_MI13	To develop a standard reference data model for network topology for New Modes (car/cycle sharing areas, car pooling areas, battery recharging places) in coherence with Transmodel V6. (F.4.1)
Rc_MI24	Standard harmonisation: To specify a unique solution for the models as developed by GDF and INSPIRE in overlapping areas: road, rail, waterway network, walking paths, administrative areas, named areas, etc.). (G.4.1)
Rc_PI05	The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
Rc_SM01	This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary.

Rc_SM08	In addition to the technical standards defined by the ESOs, the EC should sponsor the creation, management and support of an open repository of practical profiles of those standards, which are suitable for both system developers and urban authorities during procurement. (I.4)
Rc_SO01	OESO/OEC :The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
Rc_Gn01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
Rc_Gn05	It is recommended that for all ITS data definition and data exchange standards, that a model driven approach is followed. (E.4.5.2, DE.4.2))
Rc_Gn11	Develop standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate. (E.4.3.5)
Rc_MI01	OESO/OEC This report recommends that the EC, as a matter of urgency, makes call for experts and offers funding for the Transmodel update project so that it can align Transmodel with the Urban-ITS paradigm and accommodate new modes. (F.1.4.2)
Rc_Gn12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
Rc_MI22	New standard development: To develop standard APIs and/or query/ data exchange format for interconnection of Journey Planning Systems in coherence with Transmodel v6 (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). (F.4.5)
Rc_MI26	New standard development: To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence. (F.4.1)
Rc_TM10	The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined. (I.4)
Rc_UL02	Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas Car Park Operators deliver information about parking space availability using DATEX. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged. To be included in work proposed in Rc_MI10. (I.2.10.3.2.1)
Rc_UL09	Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats.(Possibly part of Rc_UL01)
Rc_Gn02	To develop GDF 5.1 data model covering the connection between Transmodel and GDF and the corresponding data exchange format (G.4.11)
Rc_Gn03	It is recommended that ITS-station communications is a preferred mechanism for data exchange and provides a migration path to move from 'silos' to an urban-ITS paradigms.
Rc_Gn09	Intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).
Rc_MI15	To develop a standard data model for cycling network in coherence with Transmodel V6 and GDF. (G.4.1)
Rc_MI16	To develop a standard exchange format for New Modes planned data (topology, service description and fares). (G.4.1)
Rc_MI17	New standard development : To develop a standard data model for New Modes operational aspects (in coherence with Transmodel). (G.4.2)
Rc_PI04	It is recommended that there is a funded European project to study the ITS/Urban-ITS and regulatory framework issues associated with the introduction of autonomous vehicles.
Rc_PI13	One specific task is identifying the missing security standards regarding interfaces between Roadside/Personal/Central ITS Stations, patterned on well-established Vehicle ITS Station security standards.
Rc_Ar03	a guidance document (Technical Report/Guide) is created to help Urban Administrations with factors, issues and best practices associated with the life cycle, relationships, "value" chains, and administration of ITS services. (K.4.1)
Rc_MI02	OESO/OEC :Standard update To develop Transmodel v6 – Part 4: Operations Monitoring and Control, i.e. the update of Transmodel Operations Monitoring and Control with the requirements of SIRI standard, EBSF project & align with DATEX II part 3 (Situation Publication). (G.4.3)
MI13; MI14; MI15; MI16: MI03; MI04; MI05; MI24; SM12	To develop a standard reference data model and data exchange format for network and service description (incl. booking, fares, etc.) for New Modes (incl cycling) in coherence with Transmodel V6 Part 1 to 7 (G.4.1)
Rc_MI23	New standard development: To develop a standard a standard specification of the characteristics of trip options and modal choices to be provided by trip planners. (G.4.12

Rc_PI06	Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.
Rc_SM03	Other action: To develop a unique access point for urban data repositories, in particular an urban meta-data registry. (G.4.5)
Rc_SM09	A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services. A new or existing project is proposed to handle this issue. (E.4.3.5)
Rc_UL03	Emissions monitoring - Project Team to determine standard for Air Quality outstations and Traffic Management Systems Priority: Medium (in relation to other Urban Logistics recommendations). (I.7)
Rc_UL04	Geofencing: A project team is probably required in respect of standardising geofencing protocols.

P.3.4.2 CEN PT1701 recommendations that received no support from outreach feedback

These recommendations will normally remain as recommendations, but with no priority attached, unless PT1701 has provided a solid reason for prioritisation, or unless review of feedback by PT1701 causes a decision to withdraw.

	Rc_Gn04	It is recommended that there is generic independence of a data concept. i.e. autonomous; free from control in action, judgement, etc. and not dependent on anything else for function, validity, etc; separate. It is recommended that there is now an onus on standards developers to understand that the data concepts of their standards, and particularly foundation standards, need to be 'abstract' with regard to any particular application they are envisaged to serve, and that application standards need to specify their application specific issues within the application standard.
Withdrawn for further consideration	Rc_Gn06	When determining standard data exchange profiles, It is recommended to specify the purpose of the profile and how it refers to a reference standard data exchange format. And shall provide an open (publicly available) specification, including: to data versioning; to precise cardinalities; to restrictions to certain data values.
	Rc_Gn08	This study recommends that in all situations where document-type data is to be transferred, and there is not a particular bandwidth restriction, XML should be used as the standard transfer syntax according to ISO8825-4".
	Rc_Gn10	In order for data passed through a standardised interchangeable physical interface to be comprehensible and useable, data format and presentation standards are also required in order to achieve interoperability. (D.2.7; E.3.2)
Withdrawn for further consideration	Rc_Gn13	Development of a: Technical Report: ITS terminology and the conceptualisation of how stakeholders could benefit by cooperation and interaction.
Withdrawn for further consideration	Rc_Gn14	Development of a: Technical Specification: Common methodology for the assessment and quantitative evaluation of proposed or instantiated Urban-ITS solutions and services.
	Rc_MI03	OESO/OEC :Standard update:To develop Transmodel V6 – Part 5: Fare Management (incl. validation and control part). (G.4.1)
	Rc_MI04	OESO/OEC :Standard update: To develop Transmodel v6- Part 6: Passenger Information to take into account complex queries and filters as requested by NeTEx -informative annex. (G.4.13)
	Rc_MI05	OESO/OEC To develop Transmodel v6-Part 7: Driver Management. (G.4.3)
	Rc_MI06	OESO/OEC Standard update : To develop Transmodel v6- Part 8: Management Information & part 7: Driver Management). (G.4.3)
	Rc_MI07	OESO/OEC Standard update: To develop the update of the TR "Transmodel informative documentation". (G.1.4.2)
	Rc_MI10	OESO/OEC Other action: To develop several of the most useful profiles based on NeTEx. (G.4.1) (Although some negative feedback received, retained because it is associated with MI21)
	Rc_MI11	OESO/OEC To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files). (G.4.2)

	Rc_MI20	New standard development: To develop a standard service interface between mobile devices and car-pooling back office system (neutral to the car-pooling algorithm itself). (G.4.10)
	Rc_MI21	New standard development: To develop a standard stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner or information service. (G.4.4)
	Rc_MI25	Standard update To develop standard data update procedures (for planned data for the usage of MIS) to be adopted in accordance to the existing standard (and adapted to the MIS context). (G.4.6)
Withdrawn for further consideration	Rc_MI27	a CEN Project Team is set up to create the standards for the form(s) in which data is to be made available from the urban access data portal, and for the minimum criteria for data that is collected/ provided use by the portal (E.4.4.2) - See MI 11/30/31/33/34.
	Rc_MI28	New standard development: To develop a standard for update frequency, timeliness of data for MIS use. (G.4.6)
	Rc_MI29	New standard development To develop a standard for the publication of information referring to planned data (update frequency, responsibility, timeliness). (G.4.6)
	Rc_MI30	New standard development To define a standard for data accuracy criteria and publication referring to space and time data. (G.4.6)
	Rc_MI31	New standard development: To develop standard validation procedures and routines for real–time data (for the usage of MIS) verification (completeness, coherence and compliance to standard formats where they exist). (G.4.7)
	Rc_MI32	New standard development: To develop standards for frequency of update and provision of real-time data for MIS use. (G.4.8)
Priority: EC Requirement to meet CID timetable	Rc_PI02	PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as “Technical Specifications” (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards.
	Rc_PI08	the following standards should be used where appropriate in the creation and publication of all ITS architectures in Europe: ISO 14813-5 (Describing Architecture); ISO 14813-6 (Data presentation using ASN.1); ISO TS 17427-1 (C-ITS Roles and responsibilities) ; ISO TR 24529;(Using UML (ISO 19501) in ITS Standards) ISO TR 26999 (Using POM in ITS Standards);ISO 24097 (using web services); ISO 24531 (Using XML in ITS Standards) ISO/IEC/IEEE 42010 (Architecture description)
	Rc_PI09	The use of ISO IS14813-1 (ITS domains; service groups and services) is promoted across Europe to ensure commonality in the content and scope of ITS services.
	Rc_SM04	b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (D.1; D.2.4; D.2.7; E.3.1)
Related to HLR 5.2	Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
Related to HLR 5.1	Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires(E.3.1)
	Rc_SM12	To develop a standard method (and possibly tool) for the development of data exchange profiles based on NeTEx (e.g. stop place profile based on NeTEx) useful in the context of travel information and associated reference generic description for local agreements referring to the profiles. (F.4.1)
	Rc_SO02	OESO/OEC Further development of DATEX II. a) An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. b) Development of standards based on ITS-station broadcasted services, to describe equivalent Local Dynamic Map elements related to: Available places; Cost of parking lot €/hr; etc… And transmit it towards vehicles. This work is probably best led by the DATEX standards community. (I.2.10.3.2)
	Rc_UL01	A combined project “Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics” is therefore recommended whose scope is to (at least) include: Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement. (I.5.)
	Rc_UL07	Adaptations of existing standards and new standards have to be engaged for future Valet Parking applications (Autonomous Vehicles). (I.2.10.3.4)
Priority: See HLR 6.2	Rc_UL10	Automated vehicles: Funded European project to study the Urban-ITS issues associated with the introduction of autonomous vehicles. See PI04 NOTE: Created as a result of phase 1 feedback (therefore no opportunity for outreach response)

P.3.4.3 CEN PT1701 recommendations that received negative feedback from outreach

These interim recommendations will normally be withdrawn from the recommendation list in the final report, unless a specific reason is provided. (example: associated with another recommendation which attracted support).

Withdrawal does not, however mean that these projects are not needed nor important, only that there are higher priorities for the CID, and these recommendations require further consideration and consultation before progressing.

Withdrawn for further consideration	Rc_Ar01	OESO/OEC: the FRAME Architecture is modified to incorporate the best parts of other ITS architecture initiatives from across Europe to provide a high-level ITS architecture that is freely available for use throughout Europe. (K.3.3)
Withdrawn for further consideration	Rc_Ar02	OESO/OEC: the FRAME Architecture is updated to ensure that it properly reflects the evolution of ITS and services travellers expect to be available, is made more user friendly and includes aspects related to business issues. (E.4.1; K.3.3; K.4.1.1)
Linked to MI06	Rc_MI09	OESO/OEC Standard update: To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw operational data needed for the Study and Control stage. (F.4.3) Linked to MI06. May be linked to TM01..
Withdrawn for further consideration	Rc_MI18	New standard development: To develop a standard data exchange format for each of the New Modes real-time data (availability, booking etc.), coherent with SIRI, in combination with DATEX II.). (G.4.9)
Withdrawn for further consideration	Rc_MI19	New standard development: To develop a standard interface between on-board equipment and mobile devices for dynamic car-pooling. (G.4.10)
Withdrawn for further consideration	Rc_PI03	PT1701 recommends that CEN considers adopting a process where once a work item is created, the first approved deliverable can be published as a TS, and the same approved work item can enable the subsequent development as a full Standard. (This is already the case in ISO, but after publication of a TS, CEN currently requires the creation and approval of a new work item to develop the TS into a full Standard, which incurs delays).
Withdrawn for further consideration	Rc_SM07	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
Assoc with HLRa	Rc_SO03	OESO/OEC :It is recommended that Standards be developed for New elements to include in Local Dynamic Map related to a Car Park internal description including :Available spots locations; Evolution of MAP standard to describe different paths to reach a spot; Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. This work is probably best led by the DATEX standards community. (I.2.10.3.4)
Withdrawn for further consideration	Rc_UL05	Delivery vehicle realtime mapping/route optimisation A project team is probably required in order to develop a delivery vehicle realtime mapping/route optimisation matrix in order that it could apply across EUPriority: Medium (in relation to other Urban Logistics recommendations). (I.5.2)
Withdrawn for further consideration	Rc_UL06	There are already adequate standards available to enable a fully interoperable UCC operation (and one that could co-exist interoperability with the international postal sector). However, guidelines on the operation of such UCCs (probably in the form of a Technical Specification, could be beneficial in finding and interpreting such available standards. (I.2.1.10; I.2.3.2.13)
Withdrawn for further consideration	Rc_Gn07	The overall recommendation for Urban-ITS security is to follow the C-ITS security process to ensure that Urban-ITS needs are met.
Withdrawn for further consideration	Rc_PI12	Urban-ITS attaches significance to the goal of conformance testing. It is recommended that a project team is formed to study conformance testing requirements specifically for Urban-ITS. Within the C-ITS context, with a view to providing essential standards in this area.

Withdrawn for further consideration	Rc_SM11	an EC funded Project is proposed to define the way in which multimodal travel data can be made freely available from an urban data access portal to European MIS service providers.
Withdrawn for further consideration	Rc_TM09	Common agreed certification standards to support EC-type examination in the TM domain. (H.4)
Withdrawn for further consideration	Rc_UL08	(this item has been combined into UL01. But have not transferred negative vote because UL01 combines several issues
Withdrawn for further consideration.	Rc_PI07	ITS meta-data/Urban-ITS meta-data concepts defined in standards or metadata registries should be defined in ASN.1. (Note: this does not preclude that the data itself may additionally also be defined in other formats if local practices require this). (C.2.3.2) NOTE: This is in any event an existing requirement for Tc204/TC278 Standards

P.4 Collated outreach responses to individual recommendations

P.4.1 Standards Policies - Urban-ITS (and general)

EU framework	HLRe Rc_PI01-	PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP	UC- ULG -0001 (F.1.12; F.1.13; F.1.14)

See P.3.2.1 above.

Policy & Strategy : Urban-ITS	Rc_PI02-	PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as “Technical Specifications” (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards.	Policy See E.8

No outreach affirmation. One negative response received. Comments:

a) streamline the process in order to get deliverables to the market place earlier” in order to increase the speed at which the standardisation occurs

“The distinction between an EN and a TS is essentially how stable the document is and the level of acceptance it enjoys. To allow for parallel development of TS and EN seems to erase this distinction. Furthermore, the delay in going for an EN directly in case of a stable document is seen as small.”

PT1701 notes that the comment misses the point of the recommendation. The PT recommends that deliverables are first developed as a TS. This is a faster process which more quickly makes a publicly available deliverable. The marketplace can then test that deliverable, revise if necessary, and then process from a TS to an EN once the deliverable is proven and stable and the need confirmed. The alternate process, because of the stages of the Standardisation consensus process, keeps the document from public review (and availability to the public) for a number of years.

Policy & Strategy : CEN	Rc_PI03-	PT1701 recommends that CEN considers adopting a process where once a work item is created, the first approved deliverable can be published as a TS, and the same approved work item can enable the subsequent development as a full Standard. (This is already the case in ISO, but after publication of a TS, CEN currently requires the creation and approval of a new work item to develop the TS into a full Standard, which incurs delays).	Policy See E.8

One negative response (from the same source as the (related) comment to PI02 above). No additional comments received.

The TC secretariat observes that CEN BC is unlikely to change its practices on the basis of a recommendation from a Project Team.

Comments:

a) No need to change CEN rules.

Nevertheless, in the view of PT1701, because getting deliverables to the marketplace more quickly is an objective of CEN, this recommendation should be made to CEN Management.

Policy & Strategy : Urban-ITS	Rc_PI04-	It is recommended that there is a funded European project to study the ITS/Urban-ITS and regulatory framework issues associated with the introduction of autonomous vehicles.	Policy See C.8

5% support in outreach responses. One comment:

a) Introduction of connected automated (not autonomous !) vehicles offers potential large benefits for cities as well as European industry. In order to allow for a structured and standardized way of introduction, guidance is urgently needed

PT1701 notes the comment and appreciates the support. This Recommendation was introduced as a result of comment form the first phase of outreach, so itself is a product of the outreach consultation.
The recommendation will be changed from “autonomous” to “automated”.

Policy & Strategy : Urban-ITS	Rc_PI05-	The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.	Policy See J.3.3 EU-US Task Force HTG6

10% support in outreach responses.

No comments.

Policy & Strategy : Data	Rc_PI06-	Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.	Policy See E.4.5.1

3% of outreach respondents supported this recommendation. No comments.

Strategy : Methodologies	Rc_PI07-	ITS meta-data/Urban-ITS meta-data concepts defined in standards or meta-data registries should be defined in ASN.1. (Note: this does not preclude that the data itself may additionally also be defined in other formats if local practices require this).	Policy See D.2.3.2

-9% of outreach respondents supported this recommendation. (only negative responses received).

a) There are already EN ISO for metadata (EN ISO 19115 & ISO/TS 19139). No added value for using ASN.1 in metadata
b) ASN1 is of no use in the field of passenger information's nowadays. UML/XSD/XLM is largely preferred.
c) PI07 is it really essential

d) According to a decision in ISO TC204 ASN.1 has been adopted as its normal syntax notation for data definitions. We consider ASN.1 an example of a platform independent model (PIM) that supports different standardized coding rules.

PT1701 notes that there is adverse reaction to the use of ASN.1 by several “public transport” respondents, who normally use xml as a standard for transfer of data.

PT1701 responds that there may have been misunderstanding. This recommendation does not affect the actual transfer of data, but is restricted to requiring that an ASN.1 definition is provided (in addition the any other data presentation format) in the entry of the meta-data concept in a central meta-data registry. This is in order to register an unambiguous and reusable data concept in the registry. (xml alone does not always provide this).

In any event, as one commenter has noted, this is already a resolution requirement of ISO TC204/CEN TC278.

Strategy : Methodologies	Rc_Pl08-	the following standards should be used where appropriate in the creation and publication of all ITS architectures in Europe: ISO 14813-5 (Describing Architecture); ISO 14813-6 (Data presentation using ASN.1); ISO TS 17427-1 (C-ITS Roles and responsibilities) ; ISO TR 24529;(Using UML (ISO 19501) in ITS Standards) ISO TR 26999 (Using POM in ITS Standards);ISO 24097 (using web services); ISO 24531 (Using XML in ITS Standards) ISO/IEC/IEEE 42010 (Architecture description)	Policy See K.3.2

No outreach respondents supported this recommendation. One related comment.

a) Pl08&Gn08 Pl08 & Gn08 are, in effect, the guide that Gn13 proposes as an activity– it just needs disseminating to the city ITS steering groups. Linking with evaluation helps to avoid it being just a filter, the idea being that the standards get put into procurement tenders and are used to assess services contracted.
b) No obvious link between operational architecture and the proposed documents.

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Strategy : Methodologies	Rc_Pl09-	The use of ISO IS14813-1 (ITS domains; service groups and services) is promoted across Europe to ensure commonality in the content and scope of ITS services.	Policy See K.3.2

No outreach respondents supported this recommendation.

Security	Rc_Pl10-	Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.	Policy See J.3.3

11% of outreach respondents supported this recommendation. Half of these rated this Recommendation as their highest priority. One comment

a) PL10 Pl11 Now starting to deploy in real life operations C-ITS RSU’s in our city. Road safety and hence security is highest priority for road authorities, both form legal point as well as societal impact

Security	Rc_Pl11-	A PT to study how C-ITS security shall be applied for Urban use. Specifically : practical advice to city authorities, and national/regional level needs to get going based on recommendations.	Policy See J.3.3

15% of outreach respondents supported this recommendation. Equally split between UAs and 'other'. one comment

a) PL10 Pl11 Now starting to deploy in real life operations C-ITS RSU's in our city. Road safety and hence security is highest priority for road authorities, both form legal point as well as societal impact

Security	Rc_Pl12-	Urban-ITS attaches significance to the goal of conformance testing. It is recommended that a project team is formed to study conformance testing requirements specifically for Urban-ITS. Within the C-ITS context, with a view to providing essential standards in this area.	Policy See J.3.3

No outreach respondents supported this recommendation. A couple of respondents voted this their lowest priority item. Comments:

a) Whereas conformance testing is very important, we do not see how Urban ITS would add more significance to it or why it should be studied in the context of Urban ITS. Conformance testing for Urban ITS must be done against the Urban ITS requirements, but not in different way than for non-Urban ITS.

Security	Rc_Pl13-	One specific task is identifying the missing security standards regarding interfaces between Roadside/Personal/Central ITS Stations, patterned on well-established Vehicle ITS Station security standards.	Policy See J.3.3

15% of outreach respondents supported this recommendation. One comment received.

a) The interface roadside and central system is mostly a system internal interface which does not have to deal with interoperability aspects. Moreover security should be based on a holistic approach. Rather than identifying a supposedly missing standard for one interface, we think that it would be worth defining a holistic security concept for ITS systems, similar to what has been done for ETC in ISO 19299.
b) as this is a common priority it is assumed this will go ahead and we vote for our other (additional) interests

PT1701 Response: ISO 19299 defines security in an application system (EFC). Its scope is limited to "*security framework for all organizational and technical entities of an EFC scheme and in detail for the interfaces between them….. The security framework describes a set of requirements and associated security measures for stakeholders to implement and thus ensure a secure operation of their part of an EFC system as required for a trustworthy environment according to its security policy*."

The subject of Recommendation Pl13 is ITS-station<>ITS-station operational security that is not limited to one application and a defined set of stakeholders, but is a general C-ITS security issue. The comment that security should be based on a holistic approach is noted and supported. However, 'holistic' in a defined application context (such as EFC) is a different paradigm to holism in a multi-application/multi-technology environment. A number of SDO's, notably ISO/IEEE/ETSI/SAE are working to address these issues, and the objective of this recommendation is to stress the importance of this work and to urge completion of this essential work.

P.4.2 Panoptic-Across the Board

Location referencing	1701-HLRa	Develop standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate. (E.4.3.5)	GEN-0002

	Rc_Gn11-		

See P.3.2.2 above

location referencing	1701-HLRa Rc_Gn12-	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)	GEN-0001; GEN-0002; MIS-0001; MIS-0005; MIS-0007; MIS-0008

Commented [BW3]:

See P.3.2.2above

infrastructure	HLRb Rc_Gn01-	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.	General See C.7.6

See P.3.2.3 above.

Urban-ITS : Strategic support	HLRb Rc_Gn15-	PT1701 recommends that CEN develop a guide (Technical Report) to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm. The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm	General See E.5

See P.3.2.3 above

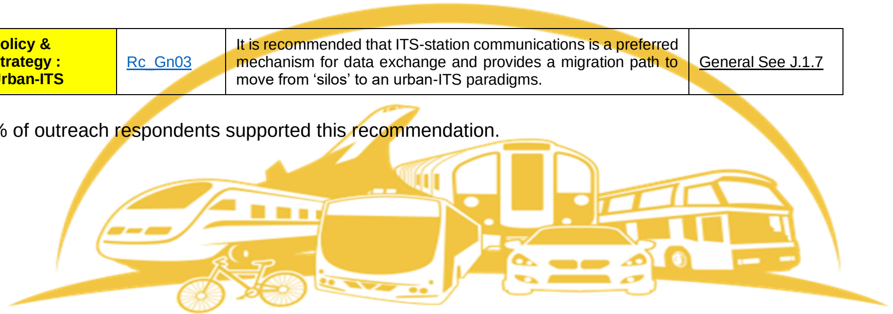
infrastructure	Rc_Gn02	To develop GDF 5.1 data model covering the connection between Transmodel and GDF and the corresponding data exchange format (G.4.11)	MIS-0005-2

5% of outreach respondents supported this recommendation.

One comment: Gn02 Bus stop identifiers are a key data element for planning services, street improvements etc. Other data objects are important (cycle routes implemented on what was road carriageway, un/loading, off-street parking spaces, etc. There are a lot of activities proposed – is the picture of how urban development data elements feed MIS and TM clear?

Policy & Strategy : Urban-ITS	Rc_Gn03	It is recommended that ITS-station communications is a preferred mechanism for data exchange and provides a migration path to move from 'silos' to an urban-ITS paradigms.	General See J.1.7

5% of outreach respondents supported this recommendation.



Policy & Strategy : Data	Rc_Gn04-	It is recommended that there is generic independence of a data concept. i.e. autonomous; free from control in action, judgement, etc. and not dependent on anything else for function, validity, etc; separate. It is recommended that there is now an onus on standards developers to understand that the data concepts of their standards, and particularly foundation standards, need to be 'abstract' with regard to any particular application they are envisaged to serve, and that application standards need to specify their application specific issues within the application standard.	General. See C.5.

No outreach respondents supported this recommendation. Comments:

a) The domain/application in which a data concept is used is important. It is not feasible to always separate data concepts into foundation standards and the definition of their usage in application standards, which is what the recommendation seems to imply.

Policy & Strategy: Data	Rc_Gn06-	When determining standard data exchange profiles, It is recommended to specify the purpose of the profile and how it refers to a reference standard data exchange format. And shall provide an open (publicly available) specification, including: to data versioning; to precise cardinalities; to restrictions to certain data values.	General See E.4.2

No outreach respondents supported this recommendation.

Policy & Strategy: Security	Rc_Gn07-	The overall recommendation for Urban-ITS security is to follow the C-ITS security process to ensure that Urban-ITS needs are met.	General See J.3.3

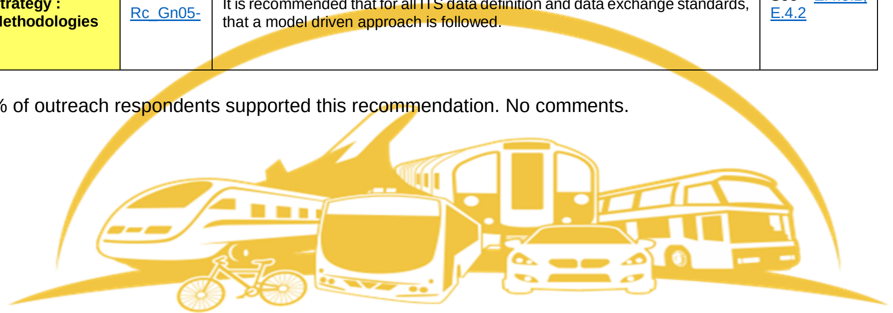
No outreach respondents supported this recommendation. There were two adverse markings and one comment:

We agree that it is important that the Urban-ITS needs are met but we do not know what the C-ITS security process is. Please clarify.

Strategy : Methodologies	Rc_Gn05-	It is recommended that for all ITS data definition and data exchange standards, that a model driven approach is followed.	See E.4.5.2; E.4.2

8% of outreach respondents supported this recommendation. No comments.

:



Strategy : Methodologies	Rc_Gn08-	This study recommends that in all situations where document-type data is to be transferred, and there is not a particular bandwidth restriction, XML should be used as the standard transfer syntax according to ISO8825-4".	General See D.2.3.1

No outreach respondents supported this recommendation One comment received,

a) although it would appear to be the wrong reference: GN05: According to a decision in ISO TC204 ASN.1 has been adopted as its normal syntax notation for data definitions. We consider ASN.1 an example of a platform independent model (PIM) that supports different standardized coding rules. We suggest that this example (ASN.1 as suitable PIM) is written into the recommendation.

Data Urban-ITS : trip planning	Rc_Gn09-	Intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).	General See E.3.3

5% of outreach respondents supported this recommendation.

DATA: Urban-ITS : traffic raw data	Rc_Gn10-	In order for data passed through a standardised interchangeable physical interface to be comprehensible and useable, data format and presentation standards are also required in order to achieve interoperability. (D.2.7; E.3.2)	General See D.2.7; E.3.2

3% of outreach respondents supported this recommendation. One negative response. One comment.

a) "Gn09-SM10 The Local Authority regulates the services it co tracts. To what extent should it help promote information supporting inter-modality is a delicate question. When Mobility Services participated in SuperHub project it ended up passing the budget to TMB to agree data supply with app developers since it did not have the data. Travellers make little use of real-time trip planning – they revise behaviour based on bad experiences and imposed constraints.

stakeholders	Rc_Gn13-	Development of a: Technical Report: ITS terminology and the conceptualisation of how stakeholders could benefit by cooperation and interaction.	General See C.6

No outreach respondents supported this recommendation. However, the following comment was received.

"PI08&Gn08 PI08 & Gn08 are, in effect, the guide that Gn13 proposes as an activity– it just needs disseminating to the city ITS steering groups. Linking with evaluation helps to avoid it being just a filter, the idea being that the standards get put into procurement tenders and are used to assess services contracted."

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evaluation	Rc_Gn14-	Development of a: Technical Specification: Common methodology for the assessment and quantitative evaluation of proposed or instantiated Urban-ITS solutions and services.	General See C.6

No outreach respondents supported this recommendation. No comments.

P.4.3 Multimodal Information

Location referencing		**HLRa** Rc_Gn12-	*Standard harmonisation :* To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)	MIS-0005; MIS-0007; MIS-0008

See P.3.2.2 above.

new modes	Rc_MI13-	To develop a *standard reference data model* for network topology for New Modes (car/cycle sharing areas, car pooling areas, battery recharging places) in coherence with Transmodel V6(G.4.1)	MIS-0001

13% of outreach respondents, a distributed mixture of Urban administrations and others, supported this recommendation. Comments:

a) With its new French AOMD status, information about new mode is going to be mandatory for , but is not yet fully covered by CEN standards. already uses TransModel, NeTEx and SIRI for Public Transport which would be compliant with new standards for other modes.
b) This has been identified by OPTICITIES as one of the standardisation gap: a work on new modes, extending Transmodel and Datex (and corresponding exchange protocol) is therefore highly expected.

new modes	Rc_MI14-	To develop a standard reference data model and data exchange format for network and service description (incl. booking, fares, etc.) for New Modes (incl cycling) in coherence with Transmodel V6 Part 1 to 7 (G.4.1)	MIS-0001

3% of outreach respondents supported this recommendation. Comments:

a) We believe the main reason the transport market is not transforming as quickly as it could be, based on the disruption that is happening in 'new modes', is a vacuum in terms of achieving interoperability of the new modes with existing modes. While it is important not to choke the innovation with too much regulation, the evidence is that market opportunities are being lost as new modes cannot work together to maximise mode-shift opportunities.

b) MI14 MI20 In our view, this is ESSENTIAL to unlock the potential for carpooling to make an impact across our core commercial city area of Manchester. While a number of businesses have adopted car-

- pooling schemes for their employees, take-up is limited by the inability to interoperate with neighbouring businesses, whose employees could be sharing trips.

new modes	Rc_MI15-	To develop a *standard data model* for cycling network in coherence with Transmodel V6 and GDF. (G.4.1)	MIS-0001

5% of outreach respondents supported this recommendation. No comments.

new modes	Rc_MI16-	To develop a *standard exchange format* for New Modes planned data (topology, service description and fares). (G.4.1)	MIS-0001

5% of outreach respondents supported this recommendation. None Urban Authorities. No comments.

new modes	Rc_MI17-	*New standard development :* To develop a standard data model for New Modes operational aspects (in coherence with Transmodel). (G.4.2)	MIS-0002

5% of outreach respondents supported this recommendation. None Urban Authorities. No comments.

new modes	Rc_MI18-	*New standard development :* To develop a standard data exchange format for each of the New Modes real-time data (availability, booking etc.), coherent with SIRI, in combination with DATEX II.). (G.4.9)	MIS-0005

One negative response (from an Urban Administration) No positive responses. No Comments.

new modes	Rc_MI19-	*New standard development:* To develop a standard interface between on-board equipment and mobile devices for dynamic car-pooling. (G.4.10)	MIS-0005-1

One negative response (from an Urban Administration) No positive responses.. No Comments.

new modes	Rc_MI20-	*New standard development:* To develop a standard service interface between mobile devices and car-pooling back office system (neutral to the car-pooling algorithm itself). (G.4.10)	MIS-0005-1

No outreach respondents supported this recommendation. Although the following comment was received.

a) MI14 MI20 In our view, this is ESSENTIAL to unlock the potential for carpooling to make an impact across our core commercial city area of Manchester. While a number of businesses have adopted car-pooling schemes for their employees, take-up is limited by the inability to interoperate with neighbouring businesses, whose employees could be sharing trips.

trip planning	Rc_MI21-	*New standard development:* To develop a standard stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner or information service. (G.4.4)	MIS-0003

No outreach respondents supported this recommendation. No comments.

trip planning	Rc_MI22-	*New standard development:* To develop standard APIs and/or query/ data exchange format for interconnection of Journey Planning Systems in coherence with Transmodel v6 (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). (G.4.5)	MIS-0003-1

8% of outreach respondents supported this recommendation. Two comments:

a) It's interesting for us to manage the mobility of tourism.

b) SG8 early work (and TRIAS on which it is based) has been selected as journey planning interface and is expected to become a European wide standard.

trip planning	Rc_MI23-	*New standard development:* To develop a standard a standard specification of the characteristics of trip options and modal choices to be provided by trip planners. (G.4.12)	MIS-0006

3% of outreach respondents supported this recommendation. One comment.

a) this is arguably more important and a required step before standardisation journey planner (APIs) themselves.

infrastructure	Rc_MI24-	*Standard harmonisation:* To specify a unique solution for the models as developed by GDF and INSPIRE in overlapping areas: road, rail, waterway network, walking paths, administrative areas, named areas, etc.). (G.4.1)	MIS-0001

10% of outreach respondents supported this recommendation. Comments:

a) It is to note that GDF and ISO TC211 standards are consistent.
b) It is worth noting that public administrations have to comply with INSPIRE Directive, so implementing this recommendation the current investment of the Member States in implementing INSPIRE should be reused as much as possible.

quality	Rc_MI25-	*Standard update* To develop standard data update procedures (for planned data for the usage of MIS) to be adopted in accordance to the existing standard (and adapted to the MIS context). (G.4.6)	MIS-0003-2

No outreach respondents supported this recommendation. No comments.

quality	Rc_MI26-	*New standard development:* To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence. (G.4.7)	MIS-0004

8% of outreach respondents supported this recommendation. One comment:

a) already uses NeTEx and SIRI for data exchanges but is facing a lack of standard validation rules and tools.

quality	Rc_MI27-	a CEN Project Team is set up to create the standards for the form(s) in which data is to be made available from the urban access data portal, and for the minimum criteria for data that is collected/ provided use by the portal (E.4.4.2) - *See MI 11/30/31/33/34.*	See E.4.4.2

One positive and one negative response for this recommendation. One comment:

a) this is a (very) important issue, but I am not sure we need standards for defining urban access data portals (as long as we have data standards already); we need maybe more recommendations: should have a very bottom-up of contacting the people working on mobility data in each EU large city, know their practices, context and needs and foster cooperation and share of experiences between them.

quality	Rc_MI28-	*New standard development:* To develop a standard for update frequency, timeliness of data for MIS use. (G.4.6)	MIS-0003-2

No outreach respondents supported this recommendation. No comments.

quality	Rc_MI29-	*New standard development* To develop a standard for the publication of information referring to planned data (update frequency, responsibility, timeliness). (G.4.6)	MIS-0003-2

No outreach respondents supported this recommendation. No comments.

quality	Rc_MI30-	*New standard development* To define a standard for data accuracy criteria and publication referring to space and time data. (G.4.6)	MIS-0003-2

No outreach respondents supported this recommendation. No comments.

quality	Rc_MI31-	*New standard development:* To develop standard validation procedures and routines for real–time data (for the usage of MIS) verification (completeness, coherence and compliance to standard formats where they exist). (G.4.7)	MIS-0004

No outreach respondents supported this recommendation. No comments.

quality	Rc_MI32-	*New standard development:* To develop standards for frequency of update and provision of real-time data for MIS use. (G.4.8)	MIS-0004-1

No outreach respondents supported this recommendation. No comments.

P.4.4 Traffic Management

TM Implementation and counters to Vendor Lock-in	**HLRb** Rc_TM05-	An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)	TM-0007

See HLRb, P.3.2.3 above.

TM Implementation and counters to Vendor Lock-in	**HLRb** Rc_TM06-	Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)	TM-0003

See HLRb, P.3.2.3 above.

TM Implementation and counters to Vendor Lock-in	**HLRb** Rc_TM07-	A control interface standard to link roadside devices such as signal controllers to an *instation* system, to support multi-vendor integration. (H.4)	TM-0003

See HLRb, P.3.2.3 above.

traffic management	Rc_TM01-	A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (E.4.3.2) *May be linked with MI20)*	TM-0006; TM-0008

21% of outreach respondents supported this recommendation. Comments:

a) Poor knowledge of what is already inside Datex II.

b) Gn12/TM01/TM02/MI12/MI24/UL02 In all cases (TM, MI, & UL), and adapted to new modes as well.

traffic management	Rc_TM02 -	A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (E.4.3.2)	TM-0001; TM-0008

23% of outreach respondents supported this recommendation, but two negative responses (1 UA 1 other). One Urban Administration ranked it its highest priority. Comments:

a) Poor knowledge of what is already inside Datex II.

b) Gn12/TM01/TM02/MI12/MI24/UL02 In all cases (TM, MI, & UL), and adapted to new modes as well.

traffic management	Rc_TM03-	A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (E.4.3.2)	TM-0001

23% of outreach respondents supported this recommendation, but two negative responses (1 UA 1 other). One Urban Administration ranked it its highest priority. Comments:

a) What is still missing in GDF?

b) TM03 SPaT stands for Signal Phasing & Timing. If this provides crossing time information exchange in a standardised way then this approach could well be a priority.

c) TM03 Connected to recommendations Rc_Gn11-Rc_Gn12- Rc_MI13-Rc_MI14- and so on...

traffic management	Rc_TM04-	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. (H.4)	TM-0009

15% of outreach respondents supported this recommendation. All responses from UAs, 2 of which ranked this recommendation their highest priority, but there were also two outreach comments against this proposal. Comments:

a) We would welcome the development of such criteria to make future procurements more competitive and easier to evaluate and subsequently monitor the performance of contract delivery.

b) In order to come to large scale deployment, CBA's are needed. This recommendation would help to do this in a transparent and standardized way

traffic management	Rc_TM08-	System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. . (H.4)	TM-0002a

15 % of outreach respondents, all Urban Administrations, supported this recommendation. No comments.

traffic management	Rc_TM09-	Common agreed certification standards to support EC-type examination in the TM domain. . (H.4)	TM-0009

No outreach respondents supported this recommendation., and there were two negative comments (both from ‘others’). Comments:

a) TM09 Required fully achievement of Rc_TM05-

b) EC-type examination already exists for TM equipment (traffic lights, VMS…). No interest for software developments.

stakeholders	Rc_TM10-	The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined. (H.4)	See H.4.3.2

8% of outreach respondents supported this recommendation. Comments:

a) TM10/SM08 Should be used both in TM, MI & UL. Must be updated frequently.
b) TM10 European procurement handbook will not work, minimum technical standards should be fixed by European legislation /minimum specs. Gives highest clarity for both suppliers as well as customers (cities).
c) TM10 See related guidance on at EU level eProcurement, including EULF guidance on procurement of geospatial technologies, available at

   https://joinup.ec.europa.eu/community/eulf/description
d) TM10 this should be done with a bottom-up approach, investing in a long lasting support action (such as EPOMM in mobility management) and taking time to work with operational staff in TM centres, and taking into account the variety of national and regional situations and practices, often quite far from the European ITS discussions.

P.4.5 Urban Logistics

Urban Logistics	HLRc Rc_UL03-	Emissions monitoring - Project Team to determine standard for Air Quality outstations and Traffic Management Systems Priority: Medium (in relation to other Urban Logistics recommendations). (I.7)	UL-0301

See HLRc, P.3.2.6, above.

Urban Logistics	**HLRc** Rc_UL04-	Geofencing: A project team is probably required in respect of standardising geofencing protocols. (I.7)	UL-0112

See HLRc, P.3.2.6 , above.

Data:Urban Logistics	Rc_UL01-	A combined project “Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics” is therefore recommended whose scope is to (at least) include: Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement. (I.5.)	UL-0110; UL-0214; UL-0302; UL-0304

No outreach respondents supported this recommendation. No comments

Urban Logistics	Rc_UL02-	Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas Car Park Operators deliver information about parking space availability using DATEX. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged. To be included in work proposed in Rc_MI10. (I.2.3.10.2.1)	UL-1001

8 % of outreach respondents supported this recommendation. Comments:

a) Car parking is one important point for multimodality and modal change. It obviously need to be harmonised across standards.
b) Important.

Urban Logistics	Rc_UL05-	Delivery vehicle realtime mapping/route optimisation A project team is probably required in order to develop a delivery vehicle realtime mapping/route optimisation matrix in order that it could apply across EUPriority: Medium (in relation to other Urban Logistics recommendations). (I.5.2)	UL-0112

No outreach respondents supported this recommendation.

There was one negative response. No comments.

Urban Logistics	Rc_UL06-	There are already adequate standards available to enable a fully interoperable UCC operation (and one that could co-exist interoperability with the international postal sector). However, guidelines on the operation of such UCCs (probably in the form of a Technical Specification, could be beneficial in finding and interpreting such available standards. (I.2.1.10; I.2.3.2.13)	UL-0102

No outreach respondents supported this recommendation.

There was one negative response. Comments:

a) We support the recommendations made in Sections 2.7 and 2.9. We are already working to increase the uptake and availability of urban consolidation methods, of which the use of urban consolidation centres is one.

b) The promotion of “UCCs” (or other public spaces like micro-platforms) is an area where an interface with logistics operators is needed (also on-street un/loading space management). The Local Authority interest is in gaining some information about volumes of goods flowing between zones of the city, but how this interfaces with RFID and IoT technologies is not clear. The proposed focus on routeing algorithms is NOT a good reason for standards activity.

Urban Logistics	Rc_UL07-	Adaptations of existing standards and new standards have to be engaged for future Valet Parking applications (Autonomous Vehicles). (I.2.3.10.4)	UL-1004

No outreach respondents supported this recommendation.

However, there was one positive comment.

a) We believe AVP to be one of the earliest concrete Use Cases for automated driving in urban areas

Urban Logistics	Rc_UL09-	Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats.(Possibly part of Rc_UL01)	UL--0110

8% of outreach respondents supported this recommendation (both UA and Other). No comments.

Urban Logistics	Rc_UL10-	Automated vehicles: Funded European project to study the Urban-ITS issues associated with the introduction of autonomous vehicles. See PI04	UL-0112

No outreach respondents supported this recommendation.

There was one negative response. No comments.

P.4.6 Architecture

stakeholders	Rc_Ar03-	a guidance document (Technical Report/Guide) is created to help Urban Administrations with factors, issues and best practices associated with the life cycle, relationships, "value" chains, and administration of ITS services. (K.4.1)	See K.4.1.2

3% of outreach respondents supported this recommendation. There were no comments.

P.4.7 Recommendations for standards deliverables from other CEN Committees/ other ESO's / recognised standards Issuers

		CEN TC278 WG3	
public transport	Rc_MI01-	This report recommends that the EC, as a matter of urgency, makes call for experts and offers funding for the Transmodel update project so that it can align Transmodel with the Urban-ITS paradigm and accommodate new modes. (G.1.4.2)	MIS 0000, and All MIS Transmodel UC's
Transmodel	Rc_MI02-	*Standard update* To develop Transmodel v6 – Part 4: Operations Monitoring and Control, i.e. the update of Transmodel Operations Monitoring and Control with the requirements of SIRI standard, EBSF project & align with DATEX II part 3 (Situation Publication). (G.4.3)	MIS-0002-1
Transmodel	Rc_MI03-	*Standard update:*To develop Transmodel V6 – Part 5: Fare Management (incl. validation and control part). (G.4.1)	MIS-0001
Transmodel	Rc_MI04-	*Standard update:* To develop Transmodel v6- Part 6: Passenger Information to take into account complex queries and filters as requested by NeTEx - informative annex. (G.4.13)	MIS-0003
Transmodel	Rc_MI05-	To develop Transmodel v6-Part 7: Driver Management. (G.4.3)	MIS-0002-1
Transmodel	Rc_MI06-	*Standard update :* To develop Transmodel v6- Part 8: Management Information & part 7: Driver Management). (G.4.3)	MIS-0002-1
Transmodel	Rc_MI07-	Standard update: To develop the update of the TR "Transmodel informative documentation". (G.1.4.2)	MIS General see G.1.4.2
Transmodel	Rc_MI08-	To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4) *– see recommendation MI11.* (G.4.11)	MIS-0005-2
public transport raw data	Rc_MI09-	Standard update : To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw operational data needed for the Study and Control stage. (G.4.3) *May be linked to TM01*	MIS-0005-2

public transport	Rc_MI10-	*Other action :* To develop several of the most useful profiles based on NeTEx. (G.4.1)	MIS-0001
public transport	Rc_MI11-	To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files). (G.4.2)	MIS-0002

MI01 8% of outreach respondents supported this recommendation.(two support responses from UAs)
MI02 3% of outreach respondents supported this recommendation. (No support from any UA)
MI03 No outreach respondents supported this recommendation.
MI04 No outreach respondents supported this recommendation.
MI05 No outreach respondents supported this recommendation.
MI06 No outreach respondents supported this recommendation.
MI07 No outreach respondents supported this recommendation.
MI08 13% of outreach respondents supported this recommendation. (Three supporting UAs)
MI09 No outreach respondents supported this recommendation. There was one negative response
MI10 No outreach respondents supported this recommendation. There was one negative response from a UA
MI11 No outreach respondents supported this recommendation.

Comments:

a) As Transmodel is the base of all already used PT data exchange standards, it is highly important to keep it up to date and, add the new transport modes starting from Transmodel, and to develop other road specific standards in a way that makes them compatible and usable with Transmodel and the related exchange protocols (i.e. SIRI and NeTEx): so all the recommendation of 2.5 Multimodal Information are of high importance.

b) What alternatives to Transmodel have been considered?

c) MI01-11 Transmodel What part of these standards is needed by local authorities? And PT operators? The Generalitat (Catalonian Government) should lead an action to answer these questions.

d) The large number of proposed actions suggest Tran model is not so developed.

e) ReMI09: As an PT Authority, needs an unbiased and unambiguous exchange with operators concerning the real status of operation

f) REMI01: already uses Transmodel, NeTEx and SIRI and this has the consequence that all its suppliers need to improve their skill on these standards: as expertise in that fields is still quite uncommon, such a support group would be highly appreciated.

g) As Transmodel is the base of all already used PT data exchange standards, it is highly important to keep it up to date and, add the new transport modes starting from Transmodel, and to develop other road specific standards in a way that makes them compatible and usable with Transmodel and the related exchange protocols (i.e. SIRI and NeTEx): so all the recommendation of 2.5 Multimodal Information are of high importance.

h) Exchanging information concerns syntax and interpretation. With the introduction of NeTEx Part a platform became available to exchange planned PT data which describes both interpretation and syntax. For real-time data SIRI services are available which are lightly based upon Transmodel. Bringing Transmodel up to date will help NeTEx and SIRI users to a uniform platform which will be better ready for the future.

i) MI08 Harmonisation between Datex II and Transmodel/SIRI/IFOPT/NetEX is necessary to allow for a smooth interoperability (traffic conditions are useful for PT operation and for true on-board multimodal information)

j) MI08 This is essential to unlock ‘Mobility as a Service’ market potential. We would also recommend investing in Open Source code assets that create robust and impactful services that make this link a reality, not just in theory.

While there was generally little support, particularly from UAs, for this work, PT1701 recognises that Transmodel and its associated standards, NeTEx, SIRI, IFOPT are significantly used by public transport systems in EU. Statistic feedback indicated SIRI and IFOPT were used across a significant range of countries and that a number of countries used Transmodel and NeTEx. It was therefore important to those countries to keep Transmodel, NeTex, SIRI, and IFOPT updated and able to play their part in urban-ITS.

This is already recognised in the EU (DG GROW) ICT Rolling Plan, which states:

In the domain of public transport, and particularly with respect to multimodal information and smart ticketing, such a need for coherence will concern a broad set of standards and technical specifications, namely:
- *Transmodel, the European Reference Data Model for Public Transport, CEN-TC278 ENV12896;*
- *IFOPT, (CEN/TS 00278207) a CEN Technical Standard defining a data model for the Identification of Fixed Objects in Public Transport (e.g. stop points, stop areas, stations, connection links, entrances, etc.);*
- *SIRI, (CEN/TS 00278181-1 to 5), a European CEN technical standard defining Service Interface for Real- Time Information relating to public transport operations;*
- *NeTEx, a prCEN/ Technical Standard currently in development. It is based on Transmodel, extended with additional concepts from IFOPT and SIRI. NeTEX is divided into three parts: Part 1 - Transport Network and Part 2 - Schedules Part 3 - Fares and data for AVL*
- *Standards supporting the emerging interoperable fare management (IFM) systems: Public Transport interoperability (IOPTA) standard ISO EN 15320 defining the functional system architecture and the application scenarios; the EN 1545 standard describing the data elements and the ISO EN 24014-1 standard, defining functional system architecture and the application scenarios.*

ACTION 13: European standardisation deliverables on reference data models, common data dictionaries and meta-data structure across the three domains and specific European standards:

CEN PT1701, recognising the role of CEN TC278 WG3 (Public Transport) and the existing prioritisation of this work in accordance with the EU 2016 ICT Rolling Plan, urges its current leadership (CEN TC278 WG3) to use this prioritisation to make submission for work to achieve PT1701 recommendations MI01 – MI11. In support of their projects PT1701 confirms significant use of SIRI, Transmodel, NeTEX, and IFOPT standards in many EU cities.

		CEN TC278 WG13/ISO TC204 WG1	
FRAME	Rc_Ar01-	the FRAME Architecture is modified to incorporate the best parts of other ITS architecture initiatives from across Europe to provide a high-level ITS architecture that is freely available for use throughout Europe. (K.3.3)	See K.3.3
FRAME	Rc_Ar02-	the FRAME Architecture is updated to ensure that it properly reflects the evolution of ITS and services travellers expect to be available, is made more user friendly and includes aspects related to business issues. (E.4.1; K.3.3; K.4.1.1)	See.K.4.1.1

No outreach respondents supported these recommendations, and there was one adverse Response (from a UA) against each of them. Comments:

a) Actually, I intended to also mention some architectural topics, but they are all tied to FRAME and I'm not sure if this is a future-oriented approach.

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If FRAME is to remain relevant, it will need to be updated, and PT1701 advises CEN TC278 WG13/ ISO TC204 WG1to consider how to achieve this. However, from these responses it appears that there is no enthusiasm by outreach respondents to use the CID as a vehicle to support this work, and statistical data collected by the project showed little use of FRAME by respondents (in comparison with level of use of DATEX, Transmodel, OCA standards).

		ETSI	
Policy & Strategy : Urban-ITS	Rc_SO01- (Rc_PI10-)	The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.	Policy See J.3.3

10% of outreach respondents supported this recommendation. There were no comments.

Urban Logistics	Rc_SO02- Rc_SO02-	Further development of DATEX II. a) An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. b) Development of standards based on ITS-station broadcasted services, to describe equivalent Local Dynamic Map elements related to: Available places; Cost of parking lot €/hr; etc… And transmit it towards vehicles. This work is probably best led by the DATEX standards community. (I.2.3.10.2)	UL-1002

No outreach respondents supported this recommendation. No comments

Urban Logistics	Rc_SO03-	It is recommended that Standards be developed for New elements to include in Local Dynamic Map related to a Car Park internal description including :Available spots locations; Evolution of MAP standard to describe different paths to reach a spot; Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. This work is probably best led by the DATEX standards community. (I.2.3.10.4)	UL1004

No outreach respondents supported this recommendation. There was one adverse response. No comments

P.4.8 Recommendations for other associated support measures and policies

location referencing	HLRa Rc_SM09-	A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services. A new or existing project is proposed to handle this issue. (E.4.3.5)	**GEN-0001**

See P.3.2.2 above

Urban-ITS : Enable Interoperability	HLRk Rc_SM02-	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation'. (D.2.6; D.2.7; F.1.5)	ALL data related Use Cases

See P.3.2.3 above.

meta data registry	HLRk Rc_SM04-	b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (D.1; D.2.4; D.2.7; E.3.1)	ALL data related Use Cases

See P.3.2.4 above.

Urban-ITS : Enable Interoperability	HLRk Rc_SM01-	This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary. As the costs for establishing and operating such a meta-data registry/data dictionary would not be significantly different, this report recommends that such an ITS meta-data registry is made freely accessible to all SDO's involved in ITS standardisation, and OEMs installing ITS products in vehicles, and of course the jurisdictions within the EU. a) A common and available meta-data registry, where the meta data of data concepts are defined and made available for use and re-use. and the support of consequential requirements (e.g. common data registries, data repositories and data access systems.) The project should include processing of existing data concepts in to the form required and inputting to the data registry. .(D.1; D.2.4; D.2.7; E.3.1; E.4.1, F.1.5)	ALL data related Use Cases

See P.3.2.5 above.

meta data registry	HLRk Rc_SM03-	*Other action:* To develop a unique access point for urban data repositories, in particular an urban meta-data registry. (G.4.5)	ALL data related Use Cases

See P.3.2.5above.

meta data registry	HLRk Rc_SM05-	That a process be supported to regularly update the meta-data registry. (E.3.1)	ALL data related Use Cases

See P.3.2.5 above.

meta data registry	HLRk Rc_SM06-	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)	ALL data related Use Cases

See P.3.2.5 above.

meta data registry	Rc_SM07-	At the 'city' or 'Urban Administration' level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)	ALL data related Use Cases

No outreach respondents supported this recommendation. There was one adverse response. Comments:

a) Is the recommendation to use standards when developing databases for Urban Administrations? The recommendation is too vague to be of use.

implementation	Rc_SM08-	In addition to the technical standards defined by the ESOs, the EC should sponsor the creation, management and support of an open repository of practical profiles of those standards, which are suitable for both system developers and urban authorities during procurement. (H.4)	See H.4.3.2

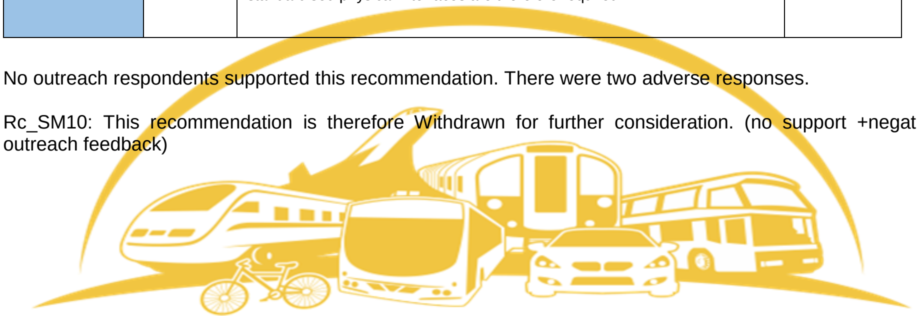
10% of outreach respondents supported this recommendation. Comments:

a) more generally, the standardisation process should be more open and agile, especially wrt data exchange standards which are very implementation oriented (as opposed to model and methods, which are more stable.

trip planning	Rc_SM10-	Interchangeability, within this context, having a choice of the mode of transport means, is more a design, investment and management issue than a standards issue. But the process of deciding if and when to interchange between transport means (bus to metro to train to tram; long-haul hydrocarbon based truck to non-emission last mile delivery), multimodality- is only possible with the availability of dynamic data. In order to enable physical interchangeability, standardised physical interfaces are therefore required.	See E.3.2

No outreach respondents supported this recommendation. There were two adverse responses.

Rc_SM10: This recommendation is therefore Withdrawn for further consideration. (no support +negative outreach feedback)



trip planning	Rc_SM11-	an EC funded Project is proposed to define the way in which multimodal travel data can be made freely available from an urban data access portal to European MIS service providers.	See E.4.4.1

No outreach respondents supported this recommendation. There were two adverse responses. Comments:

a) actually I am in favor of this study, however (as for data portal standards), only if this is done in a bottom-up way.

Rc_SM11: This recommendation is therefore Withdrawn for further consideration. (no support + negative outreach feedback)

public transport	Rc_SM12-	To develop a standard method (and possibly tool) for the development of data exchange profiles based on NeTEx (e.g. stop place profile based on NeTEx) useful in the context of travel information and associated *reference generic description* for local agreements referring to the profiles. (G.4.1)	MIS-0001

No outreach respondents supported this recommendation.

Rc_SM12: This recommendation is therefore Withdrawn for further consideration.(no support)

public transport	Rc_SM13-	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisation in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles, verification). (G.4.14)	MIS-0000

21% of outreach respondents supported this recommendation. Comments:

a) OPTICITES has made the choice to use Transmodel, NeTEx, SIRI, DATEX and GDF and this has the consequence that all concerned Cities and their suppliers need to improve their skill on these standards: as expertise in that fields is still quite uncommon, such a support group would be highly appreciated.

b) This is very important and will have a strong impact on recommendations related to Transmodel alignement Rc_MI1 and extending Transmodel to other modes of transport (Rc_MI13-), of profiling NetEx, etc.

c) EC projects should help to develop and maintain the Urban ITS standards.

P.5 Other Feedback received

Section P.4, and in respect to High Level Recommendations of the outreach meeting, Section P.3, provided the detailed feedback comments appropriate to each recommendation, next to the recommendation, and an indication of its ability to attract support, (or reticence recorded).

There were however, also a number of comments that could not be attributed to a particular recommendation, or HLR.

These are listed below.

a) "The document is clear and well structured, visibly with a important work of systematic user needs and analysis.

However it does not seem to really take into account the “digital mobility” wave, where new actors, pure players of the digital industry, entering the transport market, many of them global actors and often american (start-ups, giant web companies). These actors work besides or downstream the ITS industry, and have much shorter life cycles and are less constrained by standards. This movement should have some impact in the way we work on ITS standards; maybe at least that of opening the standardisation process and publish more documents in open access, as do consortiums such as W3C or OGC. The Standardisation process should also be more based on implementations, with a shorter life cycle, and with a focus on conformance testing, interoperability, open source tools, and operational profiles of the often very large and generic European standards. Or the strategy could be to focus CEN work on the more stable deliverable, such as conceptual models, dictionaries, methods, etc. and leave to private consortiums the work on implementation focused standards?

b) We believe the key to success of a European Standard will be the speed that the technical standards and protocols can be cascaded to the appropriate regional level. This will depend on how quickly EC research and projects can establish these standards. This speed is critical as we are already making advances in urban logistics and ITS. To make changes to the operations and protocols we are adopting would be costly and time consuming. However, we are pleased the report supports the DATEX2 data format. We are currently encouraging our local authority partners and TfL colleagues to use the DATEX2 data format more widely.

c) ·Joint initiatives are required “to provide new data concepts and transactions in the Urban-ITS paradigm”.

d) We also support the recommendations made in Section 1.9 of the Executive Summary ‘Urban Logistics’ .

e) There are three problem areas, for the traffic manager:

1. Interoperable location referencing (intersections geography and topology). Essential for planned and real-time data processing and information dissemination, but also for in-vehicle C-ITS services);
2. Vendor lock-in free procurement of ITS systems and vendor independent usage of IT systems for synchronized Traffic Management ;
3. Seamless data exchange within and between ITS systems and services for synchronized traffic control, signage (road side and in-vehicle) and multi-modal information services

f) MIS-0000 User Support. NeTEx, SIRI and Transmodel need this in order to support users understanding and implementing an EC wide and EC consistent use of these standards which can be meaningful exchanged between de EC countries.

g) In The Netherlands, many standards are already implemented on a national level. On short term, there is no real need to replace these with European standards. When (new) European standards are developed, it is advised that existing functionality of Dutch standards are included in these European standards. This will facilitate an easy eventual transition from Dutch to European standards. If there is loss of functionality, there is a high risk that Dutch road authorities will not switch to European standards.

h) No consensus available for a need of this standards! (At least Public Transport related standards; further specific discussion with experts [supply industry and PT-Operators] who will implement such standards, is needed)

i) Generally when deciding what should be prioritized we think that the EC will gain most by supporting already established standardization groups that lack funding thus assuring the consistency, quality and alignment of the already established standards in the area before continuing with new standardizations. Any new standards should be aligned with the current ones avoiding unnecessary overlaps and using and extending the current models instead of inventing conflicting models. It is thus important that already started standardization work is finalized before or done in parallel with new standardization.

j) ECF is happy to promote the work of this Project Team and provide further outreach amongst its networks of cities, academics, user organisations and industry experts. We can also talk to those at Velo-city conferences and at the bicycle trade shows (a lot of Public Bike Share operators for example attend these events now).

k) The DATEX II organisation represents road operators of 15 countries (Norway, Sweden, Finland, Denmark, United Kingdom, Ireland, Netherlands, Germany, Belgium, France, Austria, Portugal, Spain, Italy, Hungary and Greece) The community stems from NRA's and the exchange of traffic information and traffic data between TCC's from motorway operators. In the last 10 years developments in several countries have been that the motorway operators join forces with the road operators of the urban and national road networks in the domain of traffic information and traffic management. This cooperation is in several environments (like the German MDM and the Dutch NDW) operationalised by using DATEX II. The urban dimension could easily be amended both in the information model, as well as in the Location referencing models.

It was quickly recognised that harmonising and standardising these solutions would be beneficial to all. Especially the motorway operators are suffering from the wide variety of urban interfaces, as each city has its own peculiarities. This variety of interfaces is extremely costly and proves to be very inflexible.
It was recognised that the motorway operator runs the backbone of the transport system and therefore the urban requirements should be integrated as much into one common standard for exchanging data.
These developments have resulted in an Activity in the DATEX II development program 2016-2020 to integrate the Urban dimension of ITS in DATEX II. This activity is part of the overall DATEX II work programme, which is 50% funded by the EU. In the next
There is a clear relation to several recommendations mentioned in the interim report. Some of the recommendations propose the development of new standards in the Traffic Management paragraph, where the experiences already gained are that the extension of DATEX II with urban requirements fullfills the requirements of all stakeholders involved.

DATEX Community: What we really recommend in the report is a meta data registry. This should not be limited to the urban domain. Traffic is unaware of organisational boundaries. Current developments in the domain of cooperative ITS and automated driving show that a common registry definitions is really valuable for the interoperability of information throughout the complex information chains that emerge. Experience however that standardising definition is an extremely challenging exercise. But the urgency to achieve this gets more clear every day.

l) The City of Paris supports Multimodal Information ; Standards Policies - Urban-ITS (and general; Traffic Management; Urban Logistics ; Recommendations: for other associated support measures and policies in the interim report and finds Panoptic-Across the Board (Gen) and Recommendations: for standards deliverables from other ESO's / recognised standards Issuers least relevant.

The City of Paris is aware about the propositions exposed in this report, but have some remarks :
- In France, a standard is use in a lot of Traffic Management Control Center, called DIASER, which try to standardize the communication between the traffic light control and the Traffic Management Center
- The standard DATEX II is only use by the public establishment of the central State for the control of highways in Ile-de-France (Dirif : Road Department of Ile de France) to communicate with VMP and the road equipment.

- In another way, the standard ALERT-C is use by a lot of City or partner to transfer informations about road (accidents, traffic situation, etc)

m) "What is the definition of “urban ITS” actually? There should be a link with interurban / rural transport and systems of course.

n) In the field of Traffic Management, OCIT and UTMC are presented; note that we have also similar standards in France, called DIASER and LCR.

o) It is difficult to select only 5 priorities... for instance I did not mention recommendations related to the Urban Logitics but this domain is very important and its name is misleading as it encompasses very diverse things include the key domain of parking management.

p) The essential and most prioritary issue is the approach taken in the action plan : there should be a good balance between different types of action: new standard, standard update and harmonisation, support actions, and data exchange standard “profiling” (test suites, tools...). I think half of the resources should be devoted to support actions (bottom-up work on procurement practices and needs, open source conformance testing tools, open data publishing, courses / MOOCs...).

q) A lot of recommendations in this list seem be based on an approximate knowledge of the domain and mainly stems from authors’ interest (e.g. in traffic management where Datex II is not understood very well or for road equipment). There seems to be a lack of knowledge of ISO standards in some domains.

PT1701 Comment. Please see Annex O.

r) Last but not least nothing about the link between service operators and end-users, which seems strange when the approach was supposed to be user-centric (probably need for new TPEG applications).

s) "There is a growing need to register new types of vehicles (pedelecs, autonomous vehicles) which may cause/ become involved in accidents. Anything that moves on the road needs to be identified – standards are needed to generate and maintain vehicles registrations.

t) The UTC exchanges information with the UTC of the Ring Roads and TCCs of the adjoining areas. We need to clarify what standards are used and by whom- authority or service provider with locked in contract.

u) EMOTION & In-TIME projects deliverables could be useful.

v) Recommendations and standards related to ITS and mainly Intermodality and Multimodal Information are always welcome because helps to armonize both tpublic and private transport giving good service to users in Urban Areas in efficient way.

w) The Use Case approach is good but this raises ‘scope’ questions: (a) similar standards can be envisaged for similar Use Cases under the different headings; (b) different considerations may come into play when other actors requirements and approaches are taken into account, i.e. service providers; (c) what would be different for ‘country-ITS’, ‘regional-ITS’ or ‘national-ITS’? (e) relationships with EU developments in Smart Cities and Internet of Things are relevant. The concept of governance of the reference material (e.g. standards, codes…) collected should be also reflected upon. The ISA2 Programme, led by DG Informatics will include an action on Location Interoperability Solutions for eGovernment (ELISE) which could become a broker of information and expertise between the Urban-ITS and other geospatial activities (incl. smart cities, GI standardisation incl. OGC, INSPIRE, ….). The JRC.H06, coordinator of ELISE is available for further discussion and follow up on this subject.

x) There is a recommendation for an ‘urban data single access point, particularly for metadata’ but no reference to the ITS ‘single access point’ – how do all these standards and the data, together with the standards for discoverability fit in the context of the single access point envisaged by the ITS directive? And how does this apply at an urban level vs regional or national levels? Also, how does an ITS single access point at a national level relate to generalised national data access points and bordering country ITS single access points?

y) The piecemeal approach to recommendations based on Use Cases should perhaps be re-assessed and more general and broader recommendations created, taking care not to lose the detail in the individual aspects that may support particular Use Cases

PT1701 Comment. The use-case approach was a requirement in the project Scope and instruction from EC. See Annexes a)—d) to see how we avoided the issues that concern you. Please note that you have seen the interim report which lists all proposed recommendations. The marshalling of some recommendations, and elimination of others will take place following phase 2 outreach feedback

z) In section C.2.3.31 a reference to Gazetteer of Addresses is mentioned. The concept of a European Gazetteer is relevant and should be considered more thoroughly in the report. EULF Action in the ISA Programme of the European Commission is currently preparing a 'Feasibility study for an EU

Gazetteer common service'. The study aims at identifying the scope options and making a business case for an EU Gazetteer common service, analysing the characteristics of currently existing Gazetteers (supply side analysis) and the possible demand for a common EU Gazetteer (demand side analysis). The study is to provide an input to the European Commission to help identify whether and where further action may be needed and desirable. Follow up is planned under the ELISE Action (European Location Interoperability Solutions for e-Government), follow up of the EULF project, under the ISA2 Programme.

aa) In the context of the EULF transportation pilot, TN-ITS (mentioned at page 205), has been submitted to CEN/TC 278 to become a standard in the field of data exchange on changes in road attributes. This could be updated in the revised version of the report, if the standard is accepted.

ab) I would like to contribute to your project, but I must admit that I was not much more enlightened after reading the summary report. And as discussed at the meeting there were recommendations that I did not even understand. I therefore feel ill equipped for making the prioritisation both for the most important and least important recommendation. However more qualitatively I can say that we have suffered from a vendor lock-in e.g. on our traffic signals. However we have just had a compulsory competitive tendering on supervision and maintenance of our traffic signals where we have made a requirement on upgrading existing traffic signals to the open protocol RSMP (the Swedish Protocol). And hopefully this will take us out of the vendor lock-in on that area. Further we are interested in finding some common data standards for multi modal transportation to move away from transport silos and towards united systems.

ac) DATEX II extension is in progress as a part of CROCODILE project.

The trend within transportation/traffic engineering is that there is a merger between traffic/transport and computer science disciplines. Hence there should be more focus on merging existing standards and not creating new ones. One example is RC_Gn11, where is there supposed to be a separate ITS standard here or should this standard also include e.g. cell phone producer and cell phone operating systems producers.

To meet budgetary requirements and skills among the producers of equipment we need simple standards. If the standards become to big and tedious the skills required to use the standard in the correct way provides challenges to smaller firms. Hence unnecessary large standard can force smaller firms out of the market place and leading to vendor lock-in to the big actors. Datex is one example of this. The standard is quite large, extensive. But there are few open source products to operationalize the standard. From an organization it seems like the big players have their software tools to work with the standard, while the small ones do not. Hence if we are to use the full standard we must exclude the small firms that could provide good solutions.

To stop the lock-in to big companies effort and focus should be put on providing high quality well documented open source tools to operationalize the standards. In the long run this could reduce the cost of using standards for cities and hence lead to more wide spread use of standards.

In short to see more implementations of URBAN-ITS open source tools to operationalize the standards are of higher value then more standards.

ad) City of York- Documentation-C-ITS systems are probably more reliant on the data and configurations built into them when being commissioned and used than they are on the underlying hardware and software on which they are built. An effective C-ITS system will rely on a huge amount of network description data, plan and strategy data and system to system interface data (to name but three). The lack of standardised formats for documenting the configuration of specific systems places serious business continuity risks on authorities and adds complexity to the task of recruiting and training staff. An EU wide standard for recording data connected with system configuration and operation, possibly linked to the actual underlying structure of the systems would be very useful. This would ensure sufficient knowledge was available to effectively hand-over operation and management of systems between staff, would make staff recruitment simpler and would aid the free movement of ITS professionals around the EU area. It would also assist in situations where authorities are planning to externalise management of their systems or procure complete solutions that involve system provision and operation for a given period. In such cases, the effects of supplier lock-in could be limited by ensuring standardised system documentation was maintained to make the transfer of services to a new operator more straight forward.

ae) City of York – Low Level Standardisation - It is clear the ITS community is well served by data and architecture standards and if anything, with the competing standards promoted by various EU member states, is over provisioned. However, there is a lack of standardisation at the electro-mechanical, system interface level. By example, although the UK UTMC standards do a good job of standardising data structures to allow one supplier's in-station to control another supplier's on-street equipment, there is no standardisation covering how the various UTMC data objects are constructed at a database structure level. This means that although it is possible to have system interoperability within a wider ITS system, it is not possible to easily change database suppliers and port data out of a previous system into a new one. Similarly, proprietary standards still exist in traffic signal equipment that limit the ability to combine controllers and OTU equipment from different suppliers or guarantee the compatibility of one manufacturer's signal heads with another's lamp monitoring system.

It is not necessarily the case that the ITS community needs to 'invent' new standards to achieve this, in fact this would probably be entirely the wrong way to proceed. More sensibly, thought needs to be given to EU wide mandating of existing electro-mechanical level standards such as the low level media layers defined in the OSI model. It is not hard to see the similarity between (for example) traffic signal equipment and the types of devices typically connected to an IP network and so it should be possible for ITS manufacturers to provide equipment capable of interfacing using the OSI model in the same way producers of 'network ready' home and office equipment do. Similarly, software manufacturers in the ITS community should be capable of implementing data services using open OSI stack protocols without diminishing their ability to declare and defend the intellectual property rights they have in their products.

af) (Late response received, therefore not included in marking, but supportive of the work on location referencing from a very informed point of view)

I have limited time at the moment and the material is very extensive. However, I read the 4.3 section about location referencing and have the following immediate comments (a bit unsorted and "on volley"). Please note that I am not at this moment acquainted with this work, so my comments may be completely "off" and perhaps not even helpful :-P:

- In general, I think that the introduction with its description of the situation is ok.

- I think that the layered structure according to D-5 gives a necessary foundation for the recommendation in D4.3.6. The Network management layer could include also other examples such as road-/street names, road numbers, addresses, infrastructure owners (state, municipality, private) etc since there may be a lot of related information which is helpful when specifying location.

- For completeness, there is also the standard ISO 19112 which describes "Spatial referencing by geographic identifiers" which is also touching this subject, introducing concepts such as gazetteers and location instances. Definitely important for location referencing.

- I think that also ISO 19148 – Linear referencing needs to be mentioned for the report to be more complete. With regards to INSPIRE TN, the situation is similar as for ISO 19147, i.e. they unfortunately appeared a couple of years after INSPIRE TN.

- No LandGML exists as far as I know. There is an OGC SWG on Land & Infrastructure which produced a conceptual schema (in terms of alignment conceptually the same as IFC alignment from BuildingSMART), currently on public review. I think that there will be a good chance that there will be an **InfraGML** based on this conceptual model as a next step which is conceptually "equivalent" to LandXML

- I think that INSPIRE TN belongs primarily to the bottom two layers according to figure D-5 (and to some extent in the third layer). This is not particularly clear in the text. In general, I think that it would have been nice to see the “what exists now” sections in relation to the D-5 layers somehow. I also think that the statement “are out of alignment with those in common practice within the many highway administrations” could be expressed in much more generic terms, i.e. there is a typical discrepancy in the way highway administrations use location referencing vs how most e.g. mapping authorities use it. This is due to different requirements, common and historic practices etc. Furthermore, as a background for ISO 19148, it was concluded that there exists many different linear referencing systems, i.e. linear referencing is not ONE method. ISO 19148 tries to generalize these into a common set of classes and rules. Unfortunately ISO 19148 did not exist at the time of INSPIRE TN release. Some questions that pop up in my mind in this context: What is the role of different stakeholders in relation to “Urban-ITS”? What are the high level Use Cases? Perhaps this has been elaborated elsewhere in the report?

- I think that the difference in requirements/solutions exists for a reason and that the conclusion is that a recommendation according to D4.3.6 alternative d) is the most practical, i. e. I completely agree with the conclusion of the report. Another issue is how to do that…

P.6 Revised High Level Priority Recommendations for CID Support

Taking into account the outreach meeting, and the outreach feedback received, the revised High Level Priority Recommendations for CID support are now as follows:
(Please note that this list is identified as a-k (rather than 1 – 11) to avoid signifying a ranking of priorities.

These recommendations reflect the proposals of the PT that have received positive affirmation/support from outreach feedback. But no attempt is made to rank prioritisation between these recommendations, nor should their sequence be taken to imply any ranking.

That said, recommendation 1701-HLRa, Location referencing received significantly more support than any other proposal.

A	**1701- HLRa** **Location referencing Harmonisation**		
		Rc_GN01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
		Rc_GN02	To develop GDF 5.1 data model covering the connection between Transmodel and GDF and the corresponding data exchange format (G.4.11)
		Rc_GN12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
		Rc_SO03	ESO/OEC :It is recommended that Standards be developed for New elements to include in Local Dynamic Map related to a Car Park internal description including :Available spots locations; Evolution of MAP standard to describe different paths to reach a spot; Trajectory description to reach one specific spot And transmit it towards vehicles preferably by ITS-G5 or Wifi Hotspot. This work is probably best led by the DATEX standards community. (I.2.3.10.4)
		Rc_SM09	A functional translation algorithm is needed to bring together the various location referencing schemas employed by different, modes, activities and authorities in such a way that the data associated with those references can be shared to provide Urban-ITS services. A new or existing project is proposed to handle this issue. (E.4.3.5)
		Rc_Gn11	Develop standards for systems that are capable of determining the position of vehicles and travellers in the urban environment and inside structures and time in a reliable and accurate. (E.4.3.5)
		Rc_Gn12	Standard harmonisation : To develop a standard for continuous, multimodal and real-time location referencing in urban areas taking into account all existing standards. (G.4.12)
		Rc_MI30	New standard development To define a standard for data accuracy criteria and publication referring to space and time data. (G.4.6)
B	**1701- HLRb** **Mixed Vendor Environments.(MVE)**		
	1701-HLRb-1 **Mixed vendor environments Methodologies & Translators**	From Outreach meeting Rc_TM10	Stage A: MVE (mixed vendor environment) Protocols. A project team to collect technical and implementations details per method; propose a translator (Rosetta Stone); write guideline of when and how to use which method. The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined. (H.4)

	1701-HLRb-2 **Mixed Vendor Environment Guide (CONOPS)**	Rc_GN15	PT1701 recommends that CEN develop a guide (Technical Report) to provide advice and guidance to Urban Administrations to assist them to move from current organisations and practices into a multimodal business paradigm. The guide to consider organisational, management, commercial issues and change management to provide a high level concept of operations (CONOPS) in the multimodal business paradigm (D.2.3.18; E.5.1, P.3.2.3)
	1701-HLRb-3 **Mixed Vendor Environment Standards**		
		Rc_TM05	An interface standard to integrate widely used traffic adapted control and data processing methods in a traffic signal controller environment for a vendor independent use of signal controllers in vendor mixed environments. (H.4)
		Rc_TM06	Standards for the remote automatic vendor independent configuration for integrated and interconnected TM subsystems. (H.4)
		Rc_TM07	A control interface standard to link roadside devices such as signal controllers to an instation system, to support multi-vendor integration. (H.4)
		Rc_GN01	There is a need for a pan-European project to find a consensus solution for a combination of (probably existing) standards to avoid vendor lock-in for centre<>centre and centre<>field communications.
C	**1701-HLRc** **Urban-ITS issues associated with the introduction of autonomous/automated vehicles.**		NOTE: This project may be joined with EU-ICIP
		Phase 1 outreach feedback	Funded European Project Team to study the Urban-ITS issues associated with the introduction of autonomous/automated vehicles. The work will study operational, technical and relevant legal issues related to introduction for AVs in the Urban environment. The PT will analyse the current status of AV standards, and propose new work that is needed for safe operation and seamless integration in the challenging urban environment
		Rc_PI04	Automated vehicles: Funded European project to study the Urban-ITS issues associated with the introduction of autonomous vehicles. See Rc_PI04 NOTE: Created as a result of phase 1 feedback (therefore no opportunity for outreach response)
		Rc_PI04	It is recommended that there is a funded European project to study the ITS/Urban-ITS and regulatory framework issues associated with the introduction of autonomous vehicles.
D	**1701-HLRd** **Traffic Management System status, fault and quality standards**	Rc_TM04	A quality or performance criteria standard (service level agreements in terms of ITS performance e.g. availability, timeliness of data transactions or key performance indicators in terms of safety, efficiency and environmental impact) for the validation and assessment of traffic management services from suppliers. (H.4)
		Rc_TM08	System status and fault messages (particularly for the sub-systems in the field level), in order to support system monitoring and (semi-automated) fault clearance. (H.4)
E	**1701- HLRe** **EU-ICIP. European ITS communications and information protocols**		
	1701-HLRe-1 **EU-ICIP Protocols**	RcPI01	PT1701 recommends that the CID supports a pre-study for a proper evaluation of the scope, opportunities, benefits and funding options for establishing EU-ICIP. (Guide: (Technical Report) EUropean ITS Communications, Information and Protocols {EU-ICIP}) followed by a Project Team to develop EU-ICIP

	1701-HLRe-2 **EU-ICIP Guide**		
F	**1701-HLRf** **Data models and definitions for new modes**	Rc_MI13	To develop a standard reference data model for network topology for New Modes (car/cycle sharing areas, car pooling areas, battery recharging places) in coherence with Transmodel V6 and Part 7: Driver Management.. (F.4.1)
I	**1701-HLRi** **Emissions management in urban areas**		
		Rc_UL03	Emissions monitoring - Project Team to determine standard for Air Quality outstations and Traffic Management Systems Priority: Medium (in relation to other Urban Logistics recommendations). (I.7)
		Rc_UL04	Geofencing: A project team is probably required in respect of standardising geofencing protocols.
		Rc_UL01	A combined project "Standardised Data Formats and Standardised Transaction profiles to support Urban-ITS Logistics" is therefore recommended whose scope is to (at least) include: Traffic information, vehicle access management, oversize management, ANPR data exchange, and cross border enforcement. (I.5.)
J	**1701-HLRj** **Traffic Management Data Models and interfaces**		
	1701-HLRj-1 **TM Data Models**	Rc_TM02	A coherent data model covering urban traffic control & management, such as traffic volume, occupancy rates, average speed travel times, traffic condition (LoS), events & incidents and circulation and traffic management plans (TMPs). (E.4.3.2)
		Rc_TM03	A geographical (route and intersection) and topological data model for road networks, based on the requirements of known applications (ie. SPaT/MAP). (E.4.3.2)
	1701-HLRj-2 **TM interfaces and information**	Rc_TM01	A TM interface standard to enable exchange network performance data (Traffic conditions (LoS) and travel times) and planned and unplanned events/incidents (Roadworks, road/bridge/tunnel closures, bad weather and road surface conditions…) not currently covered by DATEX II. (E.4.3.2) May be linked with MI20)
		Rc_UL08	Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats.(Possibly part of Rc_UL01)

P.7 Revised Recommendations for other ESOs/Committees

			PRIORITY RECOMMENDATIONS
G	**1701-HLRg** **Update/Develop Transmodel/ IFOPT and NeTEx/SIRI.**		
		CEN TC278 WG3	These subjects are already prioritised in the ECICT Rolling Plan.PT1701 encourages and supports CEN TC278 WG3 in pursuing the following projects which are essential if these standards are to remain relevant
		Rc_SM13	It is recommended to that the EC financially and institutionally supports the creation and existence of an organisation in order to answer the expectations of NeTEx, SIRI and Transmodel users and to support the maintenance and deployment of these standards (dissemination, implementation, profiles, verification). (G.3.9)
		Rc_MI08	OESO/OEC To develop a link between DATEX II and Transmodel (Elaborate Transmodel v6 – Part 4) – see recommendation MI11. (G.4.11)
		Rc_MI01	OESO/OEC This report recommends that the EC, as a matter of urgency, makes call for experts and offers funding for the Transmodel update project so that it can align Transmodel with the Urban-ITS paradigm and accommodate new modes. (G.1.4.2)
		Rc_MI15	To develop a standard data model for cycling network in coherence with Transmodel V6 and GDF. (G.4.1)
		Rc_MI16	To develop a standard exchange format for New Modes planned data (topology, service description and fares). (G.4.1)
		Rc_MI17	New standard development : To develop a standard data model for New Modes operational aspects (in coherence with Transmodel). (G.4.2)
		Rc_MI02	OESO/OEC: Standard update To develop Transmodel v6 – Part 4: Operations Monitoring and Control, i.e. the update of Transmodel Operations Monitoring and Control with the requirements of SIRI standard, EBSF project & align with DATEX II part 3 (Situation Publication). (G.4.3)
		MI13; MI14; MI15; MI16: MI03; MI04; MI05; MI24; SM12	To develop a standard reference data model and data exchange format for network and service description (incl. booking, fares, etc.) for New Modes (incl cycling) in coherence with Transmodel V6 Part 1 to 7 (G.4.1)
	ISO TC204/IEEE/IETF/ETSI		
H	**1701-HLRh** **Application of C-ITS security in Urban-ITS paradigm (TR)**		
		Rc_PI11	A PT to study how C-ITS security shall be applied for Urban use. Specifically : practical advice to city authorities, and national/regional level needs to get going based on recommendations.
		1701-HLRh-2	**Security in the Urban-ITS Paradigm**
		Rc_PI10	Security for ITS-stations need competing quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of

			Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_PI05	The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_SO01	OESO/OEC :The standards for ITS-station security need to be completed quickly. There is already significant work done in IEEE P1609.3 and ETSI TC ITS WG5, but this needs to be transposed to the needs of Urban-ITS.A project team is proposed in order to speed up this work.
		Rc_PI13	One specific task is identifying the missing security standards regarding interfaces between Roadside/Personal/Central ITS Stations, patterned on well-established Vehicle ITS Station security standards.
	Other PT1701Recommendations that ESOs/OSCs should consider progressing		
	CEN TC278 WG3		
		Rc_MI03	OESO/OEC :Standard update: To develop Transmodel V6 – Part 5: Fare Management (incl. validation and control part). (G.4.1)
		Rc_MI04	OESO/OEC :Standard update: To develop Transmodel v6-Part 6: Passenger Information to take into account complex queries and filters as requested by NeTEx -informative annex. (G.4.13)
		Rc_MI05	OESO/OEC To develop Transmodel v6-Part 7: Driver Management. (G.4.3)
		Rc_MI06	OESO/OEC Standard update : To develop Transmodel v6-Part 8: Management Information & part 7: Driver Management). (G.4.3)
		Rc_MI07	OESO/OEC Standard update: To develop the update of the TR "Transmodel informative documentation". (G.1.4.2)
		Rc_MI11	OESO/OEC To develop a standard physical UML data model for Transmodel real-time data (coherent with SIRI XML– i.e. by reverse engineering from XML files). (G.4.2)
		Rc_MI21	New standard development: To develop a standard stop place ID coding (in coherence with the guidelines of Transmodel/IFOPT/NeTEx) to allow national stop repositories to be developed and stop places to be available and unambiguous by any trip planner or information service. (G.4.4)
		Rc_MI22	New standard development: To develop standard APIs and/or query/ data exchange format for interconnection of Journey Planning Systems in coherence with Transmodel v6 (as initially planned by CEN TC278 WG3 SG8 Open Journey Planner Interface). (G.4.5)
		Rc_MI26	New standard development: To develop standard validation routines verifying compliance to data standards (e.g. to NeTEx XML files or for associated data stored in repositories), data completeness and coherence. (G.4.1)
		Rc_UL02	Urban Transmodel/NeTEx – based repositories contain parking place data (e.g. for the use of trip planners) whereas Car Park Operators deliver information about parking space availability using DATEX. An alignment of both models has to take place (probably mapping) in order to make sure that the right information is exchanged. To be included in work proposed in Rc_MI10. (I.2.3.10.1)
		Rc_MI09	OESO/OEC Standard update : To complement NeTEx and SIRI with a Transmodel based exchanged protocol for raw

·			operational data needed for the Study and Control stage. (G.4.3) May be linked to TM01
	DATEX Community/ISO TC204/TISA		
		Rc_SO02	OESO/OEC Further development of DATEX II. a) An alignment of on street parking occupancy counting systems has to take place in order to transfer their data in DATEX II format towards city traffic management centre or traveller information providers. b) Development of standards based on ITS-station broadcasted services, to describe equivalent Local Dynamic Map elements related to: Available places; Cost of parking lot €/hr; etc… And transmit it towards vehicles. This work is probably best led by the DATEX standards community. (I.2.3.10.2)

P.8 Revised priority Recommendations for other support measures

Two priority actions, incorporating 14 of the Resolutions of the Interim Report, and one strategic recommendation, are proposed

	Priority: EC Requirement to meet CID timetable	Rc_PI02	PT1701 recommends that the standards deliverables recommended in this Technical Report are first developed, approved and published as “Technical Specifications” (TS), and then, in most cases, reasonably swiftly tested and evolved into full Standards.
	1701-HLRk		**Data exchange/data management**
	1701-HLRk-1 Establish data registry (Support Action)		A project team to review existing standards for data exchange/data management inside the domain of Urban-ITS and a) remove contentions and b) update and/or c) expand as necessary, and to establish a meta-data registry. This requires ‘Support Measures’ (which are not standards deliverables) and a funding source needs to be found (not CEN), such as EC Interoperability measures.
		Rc_SM01	This report recommends that the EC, as a matter of urgency makes call for and offers financial support for a project to establish such a meta-data registry/data dictionary.
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for ‘ITS Data Harmonisation’ .
		Rc_SM03	Other action: To develop a unique access point for urban data repositories, in particular an urban meta-data registry. (G.2.4.3.1)
		Rc_SM04	b) A harmonisation process that ensures at the least unambiguous naming, and leads to common data concept definitions for future systems. (D.1; D.2.4; D.2.7; E.3.1)
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_SM07	At the ‘city’ or ‘Urban Administration’ level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)
		Rc_PI06	Naming data concepts shall always be unambiguous. When defining the semantic of the data it is recommended to always ensure that naming and/or versioning always makes it possible to distinguish between: - planned data concepts (often called static), with a lifecycle longer than an operational day; - operational data concepts, with a short lifecycle, - statistical data concepts, i.e. raw registered data, dedicated to further processing, e.g. to create operational indicators.
		Rc_SM07	At the ‘city’ or ‘Urban Administration’ level, the availability of data, which implies the hosting of dynamic databases. Such databases will better support the interoperability/multimodality objectives if they are designed to common standards. (E.3.1)

•	**1701-HLRk-2**		**Harmonise Data concepts**
		Rc_SM02	Assuming the existence of a common meta-data registry/data dictionary, this Technical Report strongly urges the EC to make call and offer support for a Project Team for 'ITS Data Harmonisation' .
		Rc_SM05	That a process be supported to regularly update the meta-data registry. (E.3.1)
		Rc_SM06	Once the European Urban-ITS meta-data registry has been set up, measures must be put in place to ensure that it remains coherent with the evolution of ITS and the data elements it requires (E.3.1)
		Rc_Gn09	Intermodality - the sequential change of transport means in order to achieve a journey -,is significantly enhanced and made more practical by the availability of dynamic data, (which similarly has to rely on data format and presentation standards in order to achieve interoperability).

P.9 Other supported Recommendations for CID support

These recommendations also received support from outreach feedback and should be considered for support under the CID, although not at the same level of priority as those listed in P.7.

Rc_MI24	Standard harmonisation: To specify a unique solution for the models as developed by GDF and INSPIRE in overlapping areas: road, rail, waterway network, walking paths, administrative areas, named areas, etc.). (G.4.1)
Rc_SM08	In addition to the technical standards defined by the ESOs, the EC should sponsor the creation, management and support of an open repository of practical profiles of those standards, which are suitable for both system developers and urban authorities during procurement. (H.4)
Rc_Gn05	It is recommended that for all ITS data definition and data exchange standards, that a model driven approach is followed. (E.4.5.2, E.4.2)
Rc_TM10	The EC should sponsor the creation and management of a European procurement handbook for the specification, acquisition, integration and evolution of Urban TM systems, with appropriate reference to the technical standards frameworks elsewhere defined. (H.4)
Rc_UL08	Provision of relevant traffic information- congestion; green wave; etc. data :-A project team, or part of a project team, led by TM sector to clarify the information required, the practicality of access and update, and data formats.(Possibly part of Rc_UL01)
Rc_Gn03	It is recommended that ITS-station communications is a preferred mechanism for data exchange and provides a migration path to move from 'silos' to an urban-ITS paradigms.
Rc_Ar03	a guidance document (Technical Report/Guide) is created to help Urban Administrations with factors, issues and best practices associated with the life cycle, relationships, "value" chains, and administration of ITS services. (K.4.1)
Rc_MI23	New standard development: To develop a standard a standard specification of the characteristics of trip options and modal choices to be provided by trip planners. (G.4.12)

P.10 Other Recommendations for CID support (unsupported by outreach feedback)

Although these Recommendations did not attract support from outreach (we limited the response to the most important four recommendations), the list below attracted no adverse feedback and are worthy of consideration for support under the CID., although at a lower priority than those recommendations in P.6 - P.9.

	Rc_Gn04	It is recommended that there is generic independence of a data concept. i.e. autonomous; free from control in action, judgement, etc. and not dependent on anything else for function, validity, etc; separate. It is recommended that there is now an onus on standards developers to understand that the data concepts of their standards, and particularly foundation standards, need to be 'abstract' with regard to any particular application they are envisaged to serve, and that application standards need to specify their application specific issues within the application standard.
	Rc_Gn08	This study recommends that in all situations where document-type data is to be transferred, and there is not a particular bandwidth restriction, XML should be used as the standard transfer syntax according to ISO 8825-4.
	Rc_Gn10	In order for data passed through a standardised interchangeable physical interface to be comprehensible and useable, data format and presentation standards are also required in order to achieve interoperability. (D.2.7; E.3.2)
	Rc_MI20	New standard development: To develop a standard service interface between mobile devices and car-pooling back office system (neutral to the car-pooling algorithm itself). (G.4.10)
	Rc_MI25	Standard update To develop standard data update procedures (for planned data for the usage of MIS) to be adopted in accordance to the existing standard (and adapted to the MIS context). (G.4.6)
	Rc_MI31	New standard development: To develop standard validation procedures and routines for real–time data (for the usage of MIS) verification (completeness, coherence and compliance to standard formats where they exist). (G.4.7)
	Rc_MI32	New standard development: To develop standards for frequency of update and provision of real-time data for MIS use. (G.4.8)
	Rc_PI08	the following standards should be used where appropriate in the creation and publication of all ITS architectures in Europe: ISO 14813-5 (Describing Architecture); ISO 14813-6 (Data presentation using ASN.1); ISO TS 17427-1 (C-ITS Roles and responsibilities) ; ISO TR 24529;(Using UML (ISO 19501) in ITS Standards) ISO TR 26999 (Using POM in ITS Standards);ISO 24097 (using web services); ISO 24531 (Using XML in ITS Standards) ISO/IEC/IEEE 42010 (Architecture description)
	Rc_PI09	The use of ISO 14813-1 (ITS domains; service groups and services) is promoted across Europe to ensure commonality in the content and scope of ITS services.
	Rc_SM12	To develop a standard method (and possibly tool) for the development of data exchange profiles based on NeTEx (e.g. stop place profile based on NeTEx) useful in the context of travel information and associated reference generic description for local agreements referring to the profiles. (G.4.1)
	Rc_UL07	Adaptations of existing standards and new standards have to be engaged for future Valet Parking applications (Autonomous Vehicles). (I.2.3.10.4)
	Rc_Gn07	The overall recommendation for Urban-ITS security is to follow the C-ITS security process to ensure that Urban-ITS needs are met.
	Rc_PI12	Urban-ITS attaches significance to the goal of conformance testing. It is recommended that a project team is formed to study conformance testing requirements specifically for Urban-ITS. Within the C-ITS context, with a view to providing essential standards in this area.

P.11 Recommendations withdrawn as a result of outreach feedback

PT1701 withdraws the following recommendation as the result of negative feedback. This does not, however mean that these projects are not needed nor important, only that there are higher priorities for the CID, and these recommendations require further consideration and consultation before progressing.

While currently unsupported by outreach feedback, and while we do not claim complete unanimity among the members of the PT, we may reasonably say that in the opinion of the experts of the PT, while withdrawn from the current list of recommendations, most of these proposals will need to be addressed within the Urban-ITS context in the coming years.

Withdrawn for further consideration	Rc_Gn06	When determining standard data exchange profiles, It is recommended to specify the purpose of the profile and how it refers to a reference standard data exchange format. And shall provide an open (publicly available) specification, including: to data versioning; to precise cardinalities; to restrictions to certain data values.
Withdrawn for further consideration	Rc_Gn13	Development of a: Technical Report: ITS terminology and the conceptualisation of how stakeholders could benefit by cooperation and interaction.
Withdrawn for further consideration	Rc_Gn14	Development of a: Technical Specification: Common methodology for the assessment and quantitative evaluation of proposed or instantiated Urban-ITS solutions and services.
Withdrawn for further consideration	Rc_MI27	a CEN Project Team is set up to create the standards for the form(s) in which data is to be made available from the urban access data portal, and for the minimum criteria for data that is collected/ provided use by the portal (E.4.4.2) - See MI 11/30/31/33/34.
Withdrawn for further consideration	Rc_Ar01	OESO/OEC: the FRAME Architecture is modified to incorporate the best parts of other ITS architecture initiatives from across Europe to provide a high-level ITS architecture that is freely available for use throughout Europe. (K.3.3)
Withdrawn for further consideration	Rc_Ar02	OESO/OEC: the FRAME Architecture is updated to ensure that it properly reflects the evolution of ITS and services travellers expect to be available, is made more user friendly and includes aspects related to business issues. (E.4.1; K.3.3; K.4.1.1)
Withdrawn for further consideration	Rc_MI10	OESO/OEC Other action : To develop several of the most useful profiles based on NeTEx. (G.4.1) (May be incorporated into SM13)
Withdrawn for further consideration	Rc_MI18	New standard development : To develop a standard data exchange format for each of the New Modes real-time data (availability, booking etc.), coherent with SIRI, in combination with DATEX II.). (G.4.9) (May be incorporated into MI14)
Withdrawn for further consideration	Rc_MI19	New standard development: To develop a standard interface between on-board equipment and mobile devices for dynamic car-pooling. (G.4.10)
Withdrawn for further consideration	Rc_PI03	PT1701 recommends that CEN considers adopting a process where once a work item is created, the first approved deliverable can be published as a TS, and the same approved work item can enable the subsequent development as a full Standard. (This is already the case in ISO, but after publication of a TS, CEN currently requires the creation and approval of a new work item to develop the TS into a full Standard, which incurs delays).
Withdrawn for further consideration	Rc_UL05	Delivery vehicle realtime mapping/route optimisation A project team is probably required in order to develop a delivery vehicle realtime mapping/route optimisation matrix in order that it could apply across EUPriority: Medium (in relation to other Urban Logistics recommendations). (I.5.2)
Withdrawn for further consideration	Rc_UL06	There are already adequate standards available to enable a fully interoperable UCC operation (and one that could co-exist interoperability with the international postal sector). However, guidelines on the operation of such UCCs (probably in the form of a Technical Specification, could be beneficial in finding and interpreting such available standards. (I.2.1.10; I.2.3.2.13)
Withdrawn for further consideration	Rc_SM11	an EC funded Project is proposed to define the way in which multimodal travel data can be made freely available from an urban data access portal to European MIS service providers.
Withdrawn for further consideration	Rc_TM09	Common agreed certification standards to support EC-type examination in the TM domain. (H.4)

Withdrawn for further consideration	Rc_UL08	(this item has been combined into UL01. But have not transferred negative vote because UL01 combines several issues
Withdrawn for further consideration.	Rc_PI07	ITS meta-data/Urban-ITS meta-data concepts defined in standards or metadata registries should be defined in ASN.1. (Note: this does not preclude that the data itself may additionally also be defined in other formats if local practices require this). (D.2.3.2) NOTE: This is in any event an existing requirement for TC204/TC278 Standards

Annex Q Definitions

Q.1 Terms

abstraction
essential characteristics of an entity that distinguish it from all other kinds of entities; an abstraction defines a boundary relative to the perspective of the viewer (ISO 19501)

action
specification of an executable statement that forms an abstraction of a computational procedure (ISO 19501)

NOTE An action typically results in a change in the state of the system, and can be realized by sending a message to an object or modifying a link or a value of an attribute

actor
entity that actively participates in the Use Cases that describe how services are to be delivered (ISO14817)

aggregation
special form of association that specifies a whole-part relationship between the aggregate (whole) and a component part (ISO 19501)

analysis
part of the software development process whose primary purpose is to formulate a model of the problem domain (analysis focuses what to do, design focuses on how to do it) (ISO 19501)

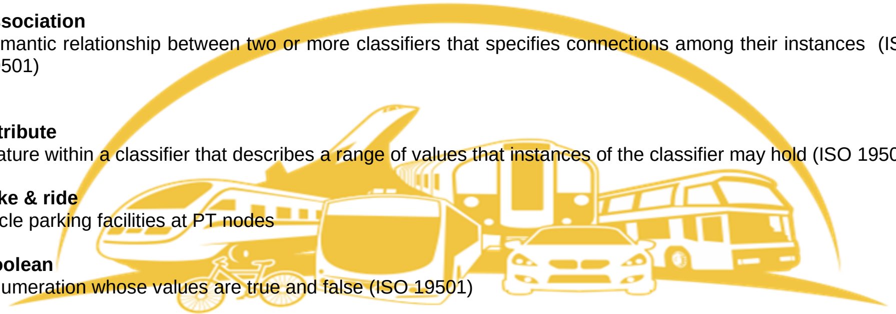
architecture
organizational structure and associated behavior of a system.
An architecture can be recursively decomposed into parts that interact through interfaces, relationships that connect parts, and constraints for assembling parts. Parts that interact through interfaces include classes, components and subsystems (ISO 19501)

association
semantic relationship between two or more classifiers that specifies connections among their instances (ISO 19501)

attribute
feature within a classifier that describes a range of values that instances of the classifier may hold (ISO 19501)

bike & ride
cycle parking facilities at PT nodes

boolean
enumeration whose values are true and false (ISO 19501)



car sharing
several persons share a car (not necessarily at the same time), includes commercial short period car-rental services

car-pooling
also known as ride-sharing, lift-sharing, (or confusingly car-sharing in UK), is simply the sharing of car journeys so that more than one person travels in a car

class
description of a set of objects that share the same attributes, operations, methods, relationships, and semantics. A class may use a set of interfaces to specify collections of operations it provides to its environment (ISO 19501)

classification scheme
scheme for the arrangement or division of objects into groups by functional area (ISO 14817)

collaboration diagram
representation that shows interactions organized around the structure of a model, using either classifiers and associations or instances and links. Unlike a sequence diagram, a collaboration diagram shows the relationships among the instances. Sequence diagrams and collaboration diagrams express similar information, but show it in different ways. See: sequence diagram. (ISO 19501)

Commission Implementing Decision (CID)
Article 291 of the Treaty on the Functioning of the European Union allows the Commission to adopt implementing measures for a legal act when uniform conditions of implementation are necessary. The basic legal act must explicitly confer on the Commission the power to adopt implementing acts. The end result of this process is a “Commission Implementing Decision”

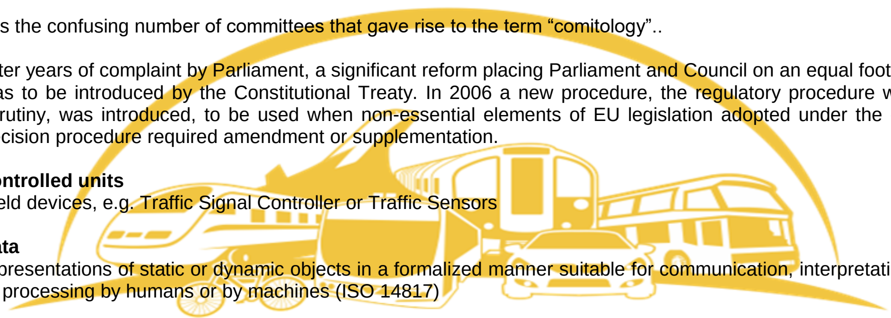
comitology
EU process by which EU law is modified or adjusted and takes place within "comitology committees" chaired by the European Commission. The official term for the process is committee procedure. Comitology committees are part of the EU's broader system of committees that assist in the making, adoption, and implementation of EU laws. The comitology system was reconfigured by the Lisbon Treaty which introduced the current Articles 290 and 291 TFEU. Whereas Article 291 TFEU provides for a continuation of implementation of EU law through comitology, Article 290 TFEU introduced the delegated act which is now used to amend or supplement EU legislation, whereas beforehand this was also done through comitology.
Council of the European Union can confer such powers on the Commission. However, the Commission must act in conjunction with committees of representatives of member states who often have the power to block the Commission and refer the matter to the Council.

It is the confusing number of committees that gave rise to the term “comitology”..

After years of complaint by Parliament, a significant reform placing Parliament and Council on an equal footing was to be introduced by the Constitutional Treaty. In 2006 a new procedure, the regulatory procedure with scrutiny, was introduced, to be used when non-essential elements of EU legislation adopted under the co-decision procedure required amendment or supplementation.

controlled units
Field devices, e.g. Traffic Signal Controller or Traffic Sensors

data
representations of static or dynamic objects in a formalized manner suitable for communication, interpretation, or processing by humans or by machines (ISO 14817)



data concept

any of a group of data dictionary structures defined in this International Standard (i.e., object class, property, value domain, data element concept, data element, data frame, message, interface dialogue, association) referring to abstractions or things in the natural world that can be identified with explicit boundaries and meaning and whose properties and behaviour all follow the same rules (ISO 14817)

data concept instance

individual occurrence of a data concept (ISO 14817)

data dictionary

an organized and constructed (electronic data base) compilation of descriptions of data concepts that provides a consistent means for documenting, storing and retrieving the syntactical form (i.e., representational form) and the meaning and connotation of each data concept (ISO 14817)

data element

data concept; some single unit of information of interest (such as a fact, proposition, observation, etc.) about some (entity) class of interest (e.g., a person, place, process, property, concept, association, state, event) considered to be indivisible in a particular context. (ISO 14817)

NOTE A data element is represented by an object class, a property of the represented object class and a value domain.

data element concept

data concept; an expression of the inherent concept embodied in a data element without regard to the value domain(s) by which it can be physically represented. (ISO 14817)

NOTE A data element concept is represented by an object class and a property of that object class.

data frame

data concept; grouping of data elements primarily for the purpose of referring to the group with a single name, and thereby efficiently reusing groups of data elements that commonly appear together (e.g. ASN.1 SEQUENCE, SEQUENCE OF, SET, SET OF or CHOICE) in a message specification (ISO 14817)

NOTE This data concept type may be used to specify groups of data elements for other purposes as well.

data model

description of the organization of data in a manner that reflects an information structure (ISO 14817)

NOTE See also information model.

meta-data registry

store of data, characterized in a consistent manner, as determined according to the provisions of this International Standard, used for a specific purpose (in this case ITS) data concept (ISO 14817)

NOTE The data registration process provides a determination of the ITS data dictionary items accepted into the 'ITS Meta-data registry'. The meta-data registry contains not only data about data concepts in terms of their names and representational forms but also substantial data about the semantics or meaning associated with the data concepts. A meta-data registry may contain data that assists information interchange and re-use, both from the perspective of human users and for machine-interpretation of data concepts. The 'ITS Meta-data registry' is comprised of items only from ITS data dictionaries, showing their source; however, not all ITS data dictionary items shall necessarily be submitted for inclusion, or accepted, into the meta-data registry, or is comprised of directly submitted data concepts.

data registrar

organizational element or an individual appointed by ISO TC204 to undertake the day-to-day management of the meta-data registry process (ISO 14817)

data registration process
process by which data is formally described and provided to an approved location in the meta-data registry (ISO 14817)

NOTE This process is effected under the control of a 'ITS Data Registrar', in accordance with the requirements of ISO 14817

data type
classification of the collection of letters, digits, and/or symbols used to encode values of a data element based upon the operations that can be performed on the data element (ISO 14817)

datatype
descriptor of a set of values that lack identity and whose operations do not have side effects. Datatypes include primitive pre-defined types and user-definable types. Pre-defined types include numbers, string and time. User-definable types include enumerations (ISO 19501)

destination
end point of a journey

domain
area of activity or knowledge characterized by a set of concepts and terminology understood by practitioners in that area (ISO 19501)

driver
person/control system who drives (is in direct physical control of) a vehicle

event
specification of a significant occurrence that has a location in time and space (ISO 19501)
NOTE: an event is an occurrence that can trigger a transition.

fare
amount paid for conveyance in a vehicle, usually predetermined

framework
stereotyped package that contains model elements which specify a reusable architecture for all or part of a system. Frameworks typically include classes, patterns or templates (ISO 19501)

generalization
specialization/generalization relationship in which an object class of a specialized element (child) is substituted for a generalized element (parent). (ISO 14817)

identifier
means of designating or referring to a specific data concept instance (ISO 14817)

information
that which informs; viz. the meaningful interpretation of data (values attributed to parameters, and knowledge) which signifies understanding of real things or abstract concepts; information is conveyed either as the content of a message or through direct or indirect observation of some thing; commonly. data that has been processed so that it is human readable or meaningful to a receiving system

NOTE: Information can be encoded into various forms for transmission and interpretation (for example, information may be encoded into a sequence of signs, or transmitted via a sequence of signals). It can also be encrypted for safe storage and communication.

information model
graphical representation that logically organizes various data concepts by depicting key relationships among the data concepts (ISO 14817)

EXAMPLE An information model might specify that a Vehicle may be described by a variety of properties, such as: Make, Model, Year, and Vehicle Identification Number. Likewise a collision might be described by properties such as Time of Occurrence, Severity, and Number of Vehicles Involved. Finally, the model might depict that a collision has a many-to-many relationship to a vehicle.

NOTE 2 This document uses the term information model in order to reflect the fact that relationships give the data a context and thereby transforms data into information. Some groups use the term data model. See also data model.

instation
back office or central computing system responsible for sending/receiving data from outstations and processing said data

Intelligent Transport System(s)
ITS
transport systems in which advanced information, communication, sensor and control technologies, including the Internet, are applied to increase safety, sustainability, efficiency, and comfort

interchangeability
capability to exchange devices of the same type on the same communications channel and have those devices interact with others devices of the same type using the same (usually) standards-based functions; or, having a choice of the mode of transport means,

intermodal(ity)
sequential change of transport means in order to achieve a journey

interoperabile/interopeability
property of a product or system, whose (communication-) interfaces are completely understood, to work with other products or systems, present or future, without any restricted access, nor complex additional implementation requirements

JAVA
general-purpose computer programming language that is concurrent, class-based, object-oriented,[12] and specifically designed to have as few implementation dependencies as possible.

journey
movement from a ‘start point’ to a ‘destination’ using one or modes of transport

message
data concept; grouping of data elements and/or data frames, as well as associated message metadata, that is used to convey a complete unit of information (ISO 14817)

NOTE For the purposes of this document, a message is an abstract description; it is not a specific instance.

message
specification of the conveyance of information from one instance to another (ISO 19501)

message instance
occurrence of a message containing the actual values for the data elements and, in some cases, data about the message (ISO 14817)

meta

word denoting a description that is one level of abstraction above the concept being described (ISO 14817)

meta attribute
any documenting characteristic of a data concept (ISO 14817)

metaclass
class whose instances are classes (ISO 19501)

meta-data
data that defines and describes other data (ISO 14817)

metamodel
model that defines the language for expressing a model (ISO 19501)

multimodal(ity)
ability to make a journey by more than one transport means

multimodal information services (MIS)
provision of information to assist travellers to make journeys using a choice or and/or multiple modes of transport to achieve a journey in an efficient and pleasant manner

name
indexical term used by humans as a means of identifying data elements and other data concepts (ISO 14817)

object
entity with a well-defined boundary and identity that encapsulates state and behavior. State is represented by attributes and relationships, u is represented by operations, methods, and state machines. An object is an instance of a class (ISO 19501)

object class
data concept; construct used to represent any kind of object (also referred to as an entity) within a ITS information environment (ISO 14817)

outstation
Communications device, normally installed in the field, designed to manage the data transmission from the controlled units to the *Instation*

parameter
any defined and constant factor in the operation of a system, or definition of an object

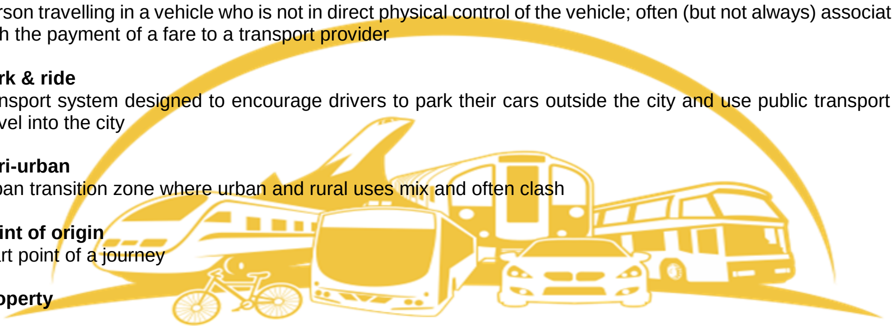
passenger
person travelling in a vehicle who is not in direct physical control of the vehicle; often (but not always) associated with the payment of a fare to a transport provider

park & ride
transport system designed to encourage drivers to park their cars outside the city and use public transport to travel into the city

peri-urban
urban transition zone where urban and rural uses mix and often clash

point of origin
start point of a journey

property



data concept; documenting characteristic of an object class used to group and differentiate individual objects (ISO 14817)

public bike sharing

repository
facility for storing object models, interfaces, and implementations (ISO 19501)

reuse
use of a pre-existing artifact (ISO 19501)

scenario
specific sequence of actions that illustrates behaviors. A scenario may be used to illustrate an interaction or the execution of a Use Case instance. (ISO 19501) See: *interaction.*

semantics
meaning, including concept(s), associated with a given data concept (ISO 14817)

sequence diagram
diagram that shows object interactions arranged in time sequence. In particular, it shows the objects participating in the interaction and the sequence of messages exchanged. Unlike a collaboration diagram, a sequence diagram includes time sequences but does not include object relationships (ISO 19501)

specification
declarative definition of what something is or does (ISO 19501. Amended)

state machine
behaviour that specifies the sequences of states that an object or an interaction goes through during its life in response to events, together with its responses and actions (ISO 19501)

start point
origination point of a journey

sustainable/sustainability
capacity to endure; it is how biological systems remain diverse and productive indefinitely; within the context of Urban-ITS it is to achieve successful achievement of a journey with minimum impact on the environment; or, in terms of the provider of the transport means, to provide transport means that have minimum adverse effect on the environment

syntax
structure of expressions in a language and the rules governing the structure of a language
(ISO 14817)

TEN-T
transport infrastructure policy that connects the continent between East and West, North and South. This policy aims to close the gaps between Member States' transport networks, remove bottlenecks that still hamper the smooth functioning of the internal market and overcome technical barriers such as incompatible standards for railway traffic.

Transmodel
European reference data model for public transport which constitutes an offer to public transport companies and other providers of services related to the process of passenger transportation (planning, operation and information), to suppliers of software products supporting these processes, to consultants and other experts

acting in the field of public transport in the widest sense; the reference data model, developed at conceptual level, can support the development of software applications, their interaction or combination in an integrated information system, the system's organisation and information management which rules the utilisation of the existing telematics environment in a company (or group of companies) running computer applications supporting the different functional areas of public transport.

transport means
any single transport mode or combination of transport modes used to achieve completion of a journey

transport mode
method or way of transport or travelling (vehicle class or type; walking, swimming etc.); All modes of transportation have 6 subsystems: Propulsion, Suspension, Control, Guidance, Structural, and Support.

traveller
person or object who undertakes a 'journey' from a 'start point' to a 'destination' using one or modes of transport

trip
outward and return journey, usually pre-planned, from a 'start point' to a 'destination' using one or modes of transport, and usually with the intention of returning to the start point of the journey at some point in time

type
stereotyped class that specifies a domain of objects together with the operations applicable to the objects, without defining the physical implementation of those objects. A type may not contain any methods, maintain its own thread of control, or be nested. However, it may have attributes and associations (ISO 19501)

Urban-ITS
use of ITS to enable and support efficient and sustainable transport systems in the urban environment; including services such as multimodal information systems, multimodal transport systems, environmental management control systems for transport and traffic, traffic management, and supporting new modes of transport designed especially for the urban context

Use Case
specification of a sequence of actions, including variants, that a system (or other entity) can perform, interacting with actors of the system to achieve an objective (ISO 19501)

Use Case diagram
diagram that shows the relationships among actors and Use Cases within a system (ISO 19501)

vehicle
any conveyance in or by which people or objects are transported

value domain
data concept; expression of a specific and explicit representation of some information about something of interest within the ITS domain (ISO 14817)

view
projection of a model, which is seen from a given perspective or vantage point and omits entities that are not relevant to this perspective (i.e. does not necessarily describe the whole system) (ISO 19501)

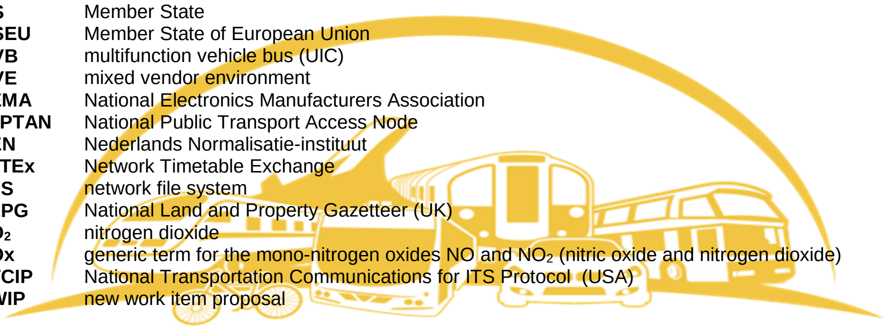
WGS84
Earth-centered, Earth-fixed terrestrial reference system and geodetic datum. WGS84 is based on a consistent set of constants and model parameters that describe the Earth's size, shape, and gravity and geomagnetic fields

Q.2 Symbols and abbreviations

2G	GSM mobile communications networks
3G	UMTS mobile communications networks
4G	E-UTRAN/LTE mobile communications networks
5G	Next generation mobile communications networks
AASHTO	American Association of State Highway and Transportation Officials
ACC	automated cruise control
ADAS	advanced driver assistance services
ADR	Accord européen relatif au transport international des marchandises Dangereuses par Route **/**European Agreement concerning the International Carriage of Dangerous Goods by Road
AID	Application ID
AGORA	Implementation of Global Location Referencing Approach (Name of a European project 2000–2002) (ImplementAtion of Global lOcation Referencing Approach : C stands for “compact”)
Alert-C	Advice and Problem Location for European Road Traffic, Version C.
AMPQ	advanced message queuing protocol
ANPR	Automatic Number-Plate recognition
ANSI	American National Standards Institute
APEC	Asia-Pacific Economic Cooperation (forum)
APS	assisted parking system
ASCII	American standard code for information interchange
API	application program interface
APS	assisted parking systems
ASN.1	Abstract Syntax Notation.1 (ISO 8845,8825)
ASP	application service provider
ATM	asynchronous transfer mode
AVMS	automated vehicle monitoring systems
B2B	business to business
B2C	business to consumer
B2G	business to government
BER	basic encoding rules (ASN.1)
BSA	basic set of applications (C-ITS)
BSMD	bounded secure managed domain
BSS	Binnenstadservice.nl
CA	certification authority
CACC	cooperative adaptive cruise control
CALM	communications access or land mobiles
CAM	Cooperative Awareness Message
CCTV	closed circuit television
CEN	European Committee for Standardisation
CENELEC	European Committee for Electrotechnical Standardisation
Cf.	compare
CID	Commission Implementation Decision (previously called a ‘Mandate’)
C-ITS	Cooperative-ITS (cooperative intelligent transport system(s))
C-ITSS	Central ITS-station
CENELEC	European Committee for Electrotechnical Standardisation
CIDCR	Central ITS Data Concept Registry
COMEAP	Committee on the Medical Effects of Air Pollutants
CONOPS	CONcept of OPerationS
CORBA	common object request broker architecture
CSV	comma separated values
CVRIA	connected vehicle reference implementation architecture (USA)

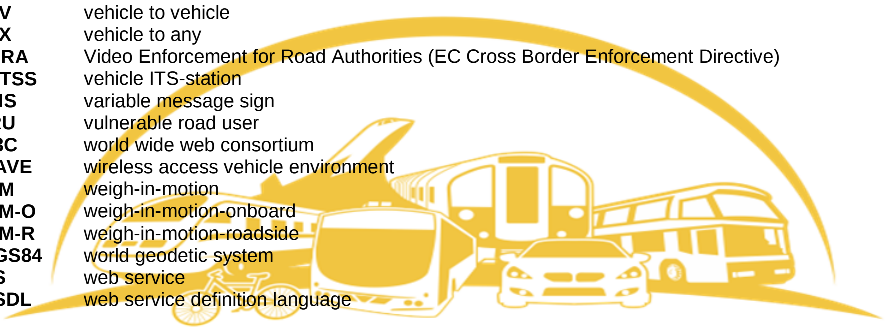
DAB	digital audio broadcasting
DATEX	DAta EXchange
DATEX II	Data Exchange 2
DENM	Decentralised Environmental Notification Message
DG	directorate general
DMB	digital multimedia broadcasting
DRT	demand responsive transport
DTM	dynamic traffic management
DVB	digital video broadcasting
EBSF	European Bus System of the Future (project)
EC	European Commission
ECJ	European Court of Justice
EDI	electronic data interchange
EDIFACT	Electronic Data Interchange For Administration, Commerce and Transport
EDPS	European Data Protection Supervisor
EMS	Express Mail Service
EN	European Norm (Standard)
EPR	endpoint reference
ERA	European Railway Agency
ESO	European Standards Organisation
ESOC	European Standards Organisation/Committee
ETS	emissions trading system
ETSI	European Telecommunications Standards Institute
E-UTRAN	Evolved Universal Terrestrial Access Network
EU	European Union
EU-ICIP	E**U**ropean **I**TS **C**ommunications, **I**nformation and **P**rotocols
F2V	field to vehicle
FCD	floating car data
FDDI	fibre distributed data interface
FLC-CIC	Freight land conveyance - content identification and communication
FRAME	FRamework Architecture Made for Europe
FTP	file transfer protocol
FTS	Flexible transport service
GDF	geographic data file
GDP	gross domestic product
GIS	Geographic information systems (ISO 19101)
GML	geographic mark-up langage
GNSS	global navigation satellite system
GPRS	general packet radio service
GPS	Global Positioning System (US GNSS system)
GS1	Global Standards One
GSM	Global systems mobile
GSMA	GSM Association
GTFS	general transit feed specification
HD	high definition
HDLC	High-level Data Link Control
HMI	human machine interface/interaction
HTG	Harmonisation Task Group
HTTP	hypertext transfer protocol
I2I	infrastructure to infrastructure
I2V	infrastructure to vehicle
I2F	Infrastructure to field
IATA	International Air Transport Association
IBEC	International Benefit Economy Co-operation
ICRW	**intersection collision risk warning**

ICT	information and communications technology
ID	identity
IEC	International Electrotechnical Commission
IEE	Institute of Electrical Engineers
IEEE	Institute of Electrical and Electronic Engineers
IETF	Internet Engineering Task Force
IFOPT	Identification of Fixed Objects in Public Transport
IPITA	Integrated Proactive Intermodal Travel Assistant
IOPTA	Interoperable Public Transport Applications
IP	internet protocol (IPv4, IPv6)
IPITA	integrated proactive intermodal travel assistant
IPX	internetwork packet exchange
IPC	International Post Corporation
IPR	intellectual property rights
IR	implementation rules
IRI	international resource identifiers
IRU	International Road Transport Union
ISO	International Standards Organisation
ITE	Institute of Transportation Engineers (USA)
ITS	Intelligent Transport System(s)
ITU	International Telecommunications Union
IVERA	Initiatiefgroep VERkeersregeltechnici Nederland. Astrin
JWG	joint working group
KAR	Korte Afstand Radio (short distance radio)(Netherlands)
KPI	key performance indicator
LBCC	London Boroughs Consolidation Centre
LCRW	longitudinal collision risk warning
LDM	local dynamic map
LKA	lane keeping assistant
LIDAR	Light Detection And Ranging
LLC	logical link control (OSI)
LoS	level of service
LR	location referencing
LRM	location reference method
LRS	location referencing system
LTE	long term evolution
MAC	media access control (OSI)
MIB	management information base
MIS	Multimodal Information Services
MMTIPS	Multimodal travel information and planning services
MQTT	message queuing telemetry transport
MS	Member State
MSEU	Member State of European Union
MVB	multifunction vehicle bus (UIC)
MVE	mixed vendor environment
NEMA	National Electronics Manufacturers Association
NaPTAN	National Public Transport Access Node
NEN	Nederlands Normalisatie-instituut
NeTEx	Network Timetable Exchange
NFS	network file system
NLPG	National Land and Property Gazetteer (UK)
NO_2	nitrogen dioxide
NOx	generic term for the mono-nitrogen oxides NO and NO_2 (nitric oxide and nitrogen dioxide)
NTCIP	National Transportation Communications for ITS Protocol (USA)
NWIP	new work item proposal



OBE	on-board equipment
OCA	Open Traffic Systems City Association
OCR	optical character recognition
OCIT	Open Communication Interface for Road Traffic Control Systems
OEM	original equipment manufacturer
OICA	Organisation Internationale des Constructeurs d'Automobiles
OMG	object management group
OMMS	onboard multimedia system (UIC)
OMTS	onboard multimedia and telematics subsystems (UIC)
OSEM	open single European market
OSI	open systems interconnection
OTS	object transaction service
P&R	park and ride
PC	personal computer
PDC	personal digital cellular
PDE	portable data collection equipment
PER	packed encoding rules) (ASN.1)
PHS	personal handset system
P-ITSS	Personal ITS-station
PM_{10}	particulate matter up to 10 micrometers
POI	point of interest
POLIS	Promotion of Operational Links with Integrated Services
POM	process oriented methodology
PPP	point-to-point protocol
PSAP	public service answering point
PSF	Physical Storage Format
PSV	public service vehicle
PT	1) project team (2) public transport
PTI	public transport information
Pt-2-Pt	Point-to-point
QoS	quality of service
RDC	radio data communication
RDS	radio data system
RDS-TMC	radio data system - traffic message channel
REST	representational state transfer
RFID	radio frequency identification
RFQ	request for quotations (IETF)
R-ITSS	Roadside ITS-station
RPC	remote procedure call
RTF	rich text format
SA	Service Agreement (EC/CEN)/ Support Action
SAE	Society of Automotive Engineers
SAP	service access protocol
SDO	standards development organisation
SID	service ID
SIRI	speech interpretation and recognition interface
SLA	service level agreement
SLI	service level indicator
SME	small or medium sized enterprise
SPX	sequenced packet exchange
SMTP	simple mail transfer protocol
SNMP	simple network management protocol
SOA	service oriented architecture
SOAP	simple object access protocol
SP	service provider

SPaT	Signal Phase And Timing
SQL	Structured query language
STOMP	streaming text orientated messaging protocol
SVG	scalable vector graphics
TAWG	the TPEG application working group
TCA	Transport Certification Australia
TCC	traffic control centre
TCN	train communication network
TCP	transmission control protocol
TCP/IP	transmission control protocol/internet protocol
TI	traveller information
TIC	traffic information centre
TIS	traveller information systems
TISA	Traveller Information Services Association
TLS	Technischen Lieferbedingungen für Streckenstationen
TLV	type, length, value
TM	traffic management
TMC	traffic management centre
TMP	traffic management plan
TMS	traffic management system
TN-ITS	Transport Network ITS Spatial Data Deployment Platform (INSPIRE)
TPEG	transport protocol experts group
TS	Technical Specification
TSS	traffic signal systems
UA	Urban-ITS architecture
UC	Use Case
UCC	urban consolidation centre
UDP	user datagram protocol
UDDI	universal description discovery and integration (OASIS:XML)
UITP	Union International des Transports Public
UL	urban logistics
ULEZ	urban low emission zone
UML	universal modelling language (ISO 19501)
UMTS	Universal Mobile Telecommunications System
UN/LOCODE	United Nations location code
UNECE	United Nations Economic Commission for Europe
UPU	Universal Postal Union
USDoT	United States Department of Transportation
UTC	urban traffic control
UTMC	Urban Traffic Management Control
V2I	vehicle to infrastructure
V2V	vehicle to vehicle
V2X	vehicle to any
VERA	Video Enforcement for Road Authorities (EC Cross Border Enforcement Directive)
V-ITSS	vehicle ITS-station
VMS	variable message sign
VRU	vulnerable road user
W3C	world wide web consortium
WAVE	wireless access vehicle environment
WIM	weigh-in-motion
WIM-O	weigh-in-motion-onboard
WIM-R	weigh-in-motion-roadside
WGS84	world geodetic system
WS	web service
WSDL	web service definition language



WTB	wire train bus (UIC)
WWW	world wide web
XML	eXtended Mark-up Language
XSD	XML Schema Definition

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