SSM PROFILE

Colophon

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| --- | --- |
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1. Introduction
   1. Purpose of this Document

This document provides the Dutch Profile for the SSM message. It offers an interpretation of data elements and describes the use of them as extension to the standards.

* 1. SSM Message

The Signal Status Message (SSM) is a message sent by a RoadSide Unit (RSU) in a signalized intersection. It is used to relate the current status of the signal and the collection of pending or active preemption or priority requests acknowledged by the controller. It is also used to send information about preemption or priority requests which were denied. This in turn allows a dialog acknowledgment mechanism between any requester and the signal controller. The data contained in this message allows other users to determine their "ranking" for any request they have made as well as to see the currently active events. When there have been no recently received requests for service messages, this message may not be sent. While the outcome of all pending requests to a signal can be found in the Signal Status Message, the current active event (if any) will be reflected in the SignalPhaseAndTiming (SPAT) message contents.

* 1. Assumptions

The following standards have been used to prepare this profile.

* SAE J2735, Dedicated Short Range Communications (DSRC) Message Set Dictionary, March 2016
* ISO TS19091, Intelligent transport systems — Cooperative ITS — Using V2I and I2V communications for applications related to signalized intersections, 2016(E)
* ETSI 103 301, Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Facilities layer protocols and communication requirements for infrastructure services, V1.1.1 (2016-11)
* ETSI TS102 894-2, Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary, V1.2.1 (2014-09)
  1. Legend

Chapter 2 contains the actual profile describing how the data frames (DFs) and data elements (DEs) shall be used for the implementation of the SRM message.

The description of the DFs and DEs can be found in aforementioned standards. The description of the DEs and DFs in this document build upon the descriptions in these standards.

The font style of the name of DEs and DFs indicates the status as defined in the standards:

* **Bold**: required by the standard;
* *Italic*: these are optional in the standard;
* Underlined: one of these can be chosen (OR);

The status in the profile is indicated in a separate column by means of one of the following labels:

* Mandatory. This DF or DE is mandatory in the standard and is thus always provided.
* Profiled. This DF or DE is mandatory in the profile although optional in the standard. It is therefore assumed that this DF or DE will always be provided.
* Conditional. This DF or DE is mandatory in specific conditions and not used in other conditions. The conditions are provided in the profile.
* Optional. This DF or DE is optional in the standard as well as in the profile.
* Used. This DF or DE is a choice in the standard and used in the profile. It is therefore assumed that this DF or DE can be provided.
* Not used. This DF or DE is optional or a choice in the standard but not used in the profile. The response to the use of this DF or DE is therefore not guaranteed.
* Future use. This DF or DE is not relevant for use cases currently in scope and therefore not profiled in the current version of the profile.
* Bold. Applies to attributes in an enumeration or bitstring and indicates the attribute shall be assigned if applicable. All non-bold attributes are optional.
  1. Document history

|  |  |  |
| --- | --- | --- |
| **Version** | **Date** | **Changes** |
| 0.1 | 12-04-2017 | First draft version |
| 0.2 | 12-05-2017 | Version with new comments for subWG meeting 12th of May |
| 1.0 | 02-06-2017 | Final draft for approval |
| 1.1 | 15-06-2017 | Minor revisions which are tracked in Annex B + summary of SSM profile added in Annex A. |
| 1.2 | 29-06-2017 | Final revised version for approval |

1. Signal Status Message Profile

| Standard | | | | Profile | | |
| --- | --- | --- | --- | --- | --- | --- |
| Level | Field | Meaning | | Status | Content | Value |
| **Header container (ItsPduHeader - ETSI TS 102 894-2 V1.4.1)** | | | | | | |
|  | **protocolVersion** | Version of the protocol. | | Fixed | Current version is 1. | Set to 1 |
|  | **messageID** | Indicates the type of message. | | Fixed | Examples are denm(1), cam(2), spat(4) etc.  SRM messageID is 10. | 10 |
|  | **stationID** | This is the ID of the station broadcasting the message. | | Mandatory | The stationID must be identical to the stationID of the CAM message of the vehicle. The stationID is subject to change at intervals (pseudonym), but may not change while passing an intersection. | Set by application. |
|  | | | | | | |
| **Level 0: SSM** | | | | | | |
| 0.1 | *timeStamp*  *[MinuteOfTheYear]* | The MinuteOfTheYear data element expresses the number of elapsed minutes of the current year in the time system being used (typically UTC time). | | Profiled | Mandatory in profile as opposed to standard. To be used in combination with the following data element second. | Set by application |
| 0.2 | **second [Dsecond]** | The DSRC second expressed in this data element represents the milliseconds within the current UTC minute. | | Mandatory | - | Set by application |
| 0.3 | *sequenceNumber*  *[MsgCount]* | The MsgCount data element is used to provide a sequence number within a stream of messages with the same DSRCmsgID and from the same sender. Depending on the application the sequence number may change with every message or may remain fixed during a stream of messages when the content within each message has not changed from the prior message sent. | | Profiled | Mandatory in profile as opposed to standard. The sequence number will be increased by one when the content of the message has changed from the prior message.  The value of the MsgCount data element is limited to 127. Therefore, MsgCounts must be numbered continuously starting at 1. | Set by application  Start at 1 |
| 0.4 | **status**  **[SignalStatus-List]****(1..32)** | The SignalStatusList data frame consists of a list of SignalStatus entries. | SignalStatus  The SignalStatus data frame is used to provide the status of a single intersection to others, including any active preemption or priority state in effect. | Mandatory | The SignalStatusList entries shall include one SignalStatus for each Intersection. | See level 1 |
| 0.5 | *regional*  *[REGION.Reg-SignalStatus-Message]* | The element is used for additional "regional information”, as defined in ISO/PDTS 19091. | | Not used | - | - |
|  | | | | | | |
| **Level 1: SignalStatusList → SignalStatus** | | | | | | |
| 1.1 | **sequence-Number**  **[MsgCount ]** | The MsgCount data element is used to provide a sequence number within a stream of messages with the same DSRCmsgID and from the same sender. Depending on the application the sequence number may change with every message or may remain fixed during a stream of messages when the content within each message has not changed from the prior message sent. | | Mandatory | The sequence number will be increased by one when the content the SignalStatus has changed from the prior message.  The value of the MsgCount data element is limited to 127. Therefore, MsgCounts must be numbered continuously starting at 1. | Set by application  Start at 1 |
|  |  |  | |  |  |  |
| 1.2 | **id**  **[IntersectionReferenceID]** | The IntersectionReference-ID is a globally unique value set, consisting of an optional RoadRegulatorID and a required IntersectionID assignment, providing an unique mapping to the intersection MAP. |  | Mandatory | The IntersectionReferenceID should reflect the IntersectionReferenceID defined in the SRM message. | Set by application |
| *region*  *[RoadRegulatorID]*  The RoadRegulatorID data element is a globally unique identifier assigned to a regional authority. | Profiled | Mandatory in Dutch profile as opposed to standard. For each road operator a number is provided in: https://www.rijkswaterstaat.nl/apps/geoservices/rwsnl/searchdata.php?wegbeheerder | Set by application |
| **id**  **[IntersectionID ]**  The IntersectionID is used within a region to uniquely define an intersection within that country or region. | Mandatory | The identifier shall be defined by the road operator. | Set by application |
| 1.3 | **sigStatus**  **[SignalStatus-PackageList]** | The SignalStatusPackageList data frame consists of a list of SignalStatusPackage entries. | SignalStatusPackage  The SignalStatusPackage data frame contains all the data needed to describe the preemption or priority state of the signal controller with respect to a given request and to uniquely identify the party who requested that state to occur. | Mandatory | - | See level 2 |
| 1.4 | *regional*  *[ REGION.Reg-SignalStatus]* | The element is used for additional "regional information”, as defined in ISO/PDTS 19091. | | Not used | - | - |
|  | | | | | | |
| **Level 2: SignalStatusPackageList 🡪 SignalStatusPackage** | | | | | | |
| 2.1 | *Requestor*  *[SignalRequester-Info]* | The SignalRequesterInfo data frame is used to contain information regarding the entity that requested a given signal behaviour. In addition to the VehicleID, the data frame also contains a request reference number used to uniquely refer to the request and some basic type information about the request maker which may be used by other parties.  -- The party that made the initial SRM request |  | Profiled | Mandatory in profile as opposed to standard. | Set by application |
| **id**  **[VehicleID]** The VehicleID is used to uniquely identify a vehicle or other object. | Mandatory | The VehicleID should reflect the VehicleID defined in the SRM message. The data element StationID will be used, see level 3. | See level 3 |
| **request**  **[RequestID ]** The RequestID data element is used to provide a unique ID between two parties for various dialog exchanges. Combined with the sender's VehicleID, this provides a unique string for some mutually defined period of time. | Mandatory | The RequestID should reflect the RequestID defined in the SRM message. | Set by application |
| **sequenceNumber**  **[MsgCount]**  The MsgCount data element is used to provide a sequence number within a stream of messages with the same DSRCmsgID and from the same sender. Depending on the application the sequence number may change with every message or may remain fixed during a stream of messages when the content within each message has not changed from the prior message sent. | Mandatory | The MsgCount should reflect the MsgCount defined in the SRM message. | Set by application |
| *role*  *[BasicVehicleRole]* The BasicVehicleRole data element provides a means to indicate the current role that a DSRC device is playing. | Not used | - | - |
| *typeData*  *[RequestorType]*  The RequestorType data frame is ssed when addition data besides the role is needed, at which point the role entry above is not sent. It holds information regarding all type and class data about the requesting vehicle. | Mandatory | Mandatory in profile as opposed to standard. The RequestorType should reflect the RequestorType defined in the SRM message. | See level 4 |
| 2.2 | **inboundOn**  **[Intersection-AccessPoint]** | The IntersectionAccess-Point data frame is used to specify the index of either a single approach or a single lane at which a service is needed. This is used to indicate the inbound points by which the requestor can traverse an intersection. |  | Mandatory | The IntersectionAccessPoint data frame should reflect the IntersectionAccessPoint data frame defined in the SRM message. | Set by application |
| lane  [LaneID]  The LaneID data element conveys an assigned index that is unique within an intersection. It is used to refer to that lane by other objects in the intersection map data structure. Lanes may be ingress (inbound traffic) or egress (outbound traffic) in nature, as well as barriers and other types of specialty lanes. | Not used | - | - |
| approach  [ApproachID ]  The ApproachID data element is used to relate the index of an approach, either ingress or egress within the subject lane. | Choice | The ApproachID should reflect the ApproachID defined in the SRM message (if provided). | Set by application |
| connection  [LaneConnectionID ]  The LaneConnectionID data entry is used to state a connection index for a lane to lane connection. It is used to relate this connection and any dynamic clearance data sent in the SPAT. | Choice | The LaneConnectionID should reflect the LaneConnectionID defined in the SRM message (if provided). | Set by application |
| 2.3 | *outboundOn*  *[Intersection-AccessPoint]* | The IntersectionAccess-Point data frame is used to specify the index of either a single approach or a single lane at which a service is needed. This is used to indicate the outbound points by which the requestor can traverse an intersection. |  | Not used | LaneConnectionID implies the outbound. Moreover, outBoundOn is not used in the SRM profile. | - |
| lane  [LaneID] | Not used | - | - |
| approach  [ApproachID ] | Not used | - | - |
| connection  [LaneConnectionID ] | Not used | - | - |
| 2.4 | *minute*  *[MinuteOfTheYear]* | The MinuteOfTheYear data element expresses the number of elapsed minutes of the current year in the time system being used (typically UTC time). | | Mandatory | Mandatory in profile as opposed to standard. | - |
| 2.5 | *second [Dsecond]* | The DSRC second expressed in this data element represents the milliseconds within the current UTC minute. | | Mandatory | Mandatory in profile as opposed to standard. | - |
| 2.6 | *duration [Dsecond]* | The duration value is used to provide a short interval that extends the ETA so that the requesting vehicle can arrive at the point of service with uncertainty or with some desired duration of service. This concept can be used to avoid needing to frequently update the request. The requester must update the ETA and duration values if the period of services extends beyond the duration time. It should be assumed that if the vehicle does not clear the intersection when the duration is reached, the request will be cancelled and the intersection will revert to normal operation. | | Mandatory | Mandatory in profile as opposed to standard. | - |
| 2.7 | **status**  **[Prioritization-ResponseStatus]** | The PrioritizationResponseStatus data element is used to indicate the general status of a prior prioritization request. | | Mandatory | Output from the ITS application.  Types (see SAE J2735 for details):   * unknown (0) * requested (1) * processing (2) * watchOtherTraffic (3) * granted (4) * rejected (5) * maxPresence (6) * reserviceLocked (7) | Set by application |
| 2.8 | *Regional*  *[REGION.Reg-SignalStatus-Package ]* | The element is used for additional "regional information”, as defined in ISO/PDTS 19091. | | Not used | Desired extension not yet defined in the standard, therefore not used in this version of the profile:  rejectedReason [rejectedReason] – enumeration with types:   * unknown (0) * emergencyVehiclePriority (1) * maxWaitingTimeExceeded (2) * ptPriorityDisabled (3) * higherPTPriorityGranted (4) * vehicleTrackingUnknown (5)   emergencyPassage [EmergencyPassage] – enumeration with types:   * unknown (0) -- indicates the priority request is processed in the normal way * allRed (1) -- indicates that wrong way driving is possible * passOnLeft (2) -- indicates that the left turning lane will be cleared * passOnRight (3) -- indicates that the right turning lane will be cleared | - |
|  | | | | | | |
| **Level 3: VehicleID** | | | | | | |
| 3.1 | entityID  [TemporaryID] | This is the random device identifier, called the TemporaryID. When used for a mobile OBU device, this value will change periodically to ensure the overall anonymity of the vehicle. Other devices, such as infrastructure (RSUs), may have a fixed value for the temporary ID value. | | Not used | The data element StationID will be used instead. | - |
| 3.2 | stationID  [StationID] | This is the ID of the station broadcasting the message. | | Mandatory | The StationID should reflect the StationID defined in the SRM message. | Set by application |
|  | | | | | | |
| **Level 4: RequestorType** | | | | | | |
| 4.1 | **role**  **[BasicVehicle-Role]** | The BasicVehicleRole data element provides a means to indicate the current role that a DSRC device is playing. | | Mandatory | EU Types:   * basicVehicle (0), * publicTransport (1), * specialTransport (2), * dangerousGoods (3), * roadWork (4), * roadRescue (5), * emergency (6), * safetyCar (7), | Set by application |
| 4.2 | *subrole*  *[RequestSubRole]* | The RequestSubRole data element is used to further define the details of the role which any DSRC device might play when making a request to a signal controller.  Meanings based on regional needs to refine and expand the basic roles which are defined elsewhere. | | Profiled | Mandatory in profile as opposed to standard, if provided in SRM. To be used to enrich information provided by the BasicVehicleRole data element.  Types:   * requestSubRoleUnKnown (0), * requestSubRole1 (1), -- bus * requestSubRole2 (2), -- tram * requestSubRole3 (3), -- metro * requestSubRole4 (4), -- train * requestSubRole5 (5), -- blue light and sirene * requestSubRole6 (6), -- ‘glijdend transport’ * requestSubRole7 (7), -- ‘dienstregelingsrit’ * requestSubRole8 (8), -- ‘regelmaatdienstrit’ * requestSubRole9 (9), --   ‘HOV-lijn’   * requestSubRole10 (10), -- ‘materiaalrit’ * requestSubRole11 (11), * requestSubRole12 (12), * requestSubRole13 (13), * requestSubRole14 (14), * requestSubRoleReserved (15) | Set by application |
| 4.3 | *request*  *[Request-ImportanceLevel]* | The RequestImportance-Level data element is used to state what type of signal request is being made to a signal controller by a DSRC device in a defined role.  The levels of the request typically convey a sense of urgency or importance with respect to other demands to allow the controller to use predefined business rules to determine how to respond. | | Not used | - | - |
| 4.4 | *Iso3833*  *[Iso3833Vehicle-Type]* | The Iso3833VehicleType data element represents the value domain provided by ISO 3833 for general vehicle types. It is a European list similar to the list used for the Highway Performance Monitoring System (HPMS) in the US region. In this standard, the HPMS list is used in the data concept named VehicleType. | | Not used | - | - |
| 4.5 | *hpmsType*  *[VehicleType]* | The VehicleType data element is a type list (i.e., a classification list) of the vehicle in terms of overall size | | Not used | - | - |
| 4.6 | *regional*  *[REGION.Reg-RequestorType]* | The element is used for additional "regional information”, as defined in ISO/PDTS 19091. | | Not used | - | - |

Annex A: Summary of SSM profile

**bold** = mandatory/used

***bold-italic*** = conditional

*italic* = optional

~~strikethrough~~ = not used

red = desired extensions

**timestamp [MinuteOfTheYear]**

**second [Dsecond]**

**sequenceNumber [MsgCount]**

**status [SignalStatusList]**

**SignalStatus**

**sequenceNumber [MsgCount]**

**id [IntersectionReferenceID]**

**region [RoadRegulatorID]**

**Id [IntersectionID]**

**sigStatus [SignalStatusPackageList]**

**SignalStatusPackage**

**Requestor [SignalRequesterInfo]**

**Id [VehicleID]**

~~entityID [TemporaryID]~~

**stationID [StationID]**

**Request [RequestID]**

**sequenceNumber [MsgCount]**

~~role [BasicVehicleRole]~~

**typeData [RequestorType]**

**role [BasicVehicleRole]**

**subrole [RequestSub-Role]**

~~request [RequestImportanceLevel]~~

~~Iso3833 [Iso3833VehicleType]~~

~~hpmsType [VehicleType]~~

~~regional [REGION.Reg-RequestorType]~~

**inboundOn [IntersectionAccessPoint]**

~~lane [LaneID]~~

*approach [ApproachID]*

*connection [LaneConnectionID]*

~~outboundOn [IntersectionAccessPoint]~~

~~lane [LaneID]~~

~~approach [ApproachID]~~

~~connection [LaneConnectionID]~~

**minute [MinuteOfTheYear]**

**second [Dsecond]**

**duration [Dsecond]**

**status [PrioritizationResponseStatus]**

~~regional [REGION.Reg-SignalStatusPackage]~~

~~addGrpC [SignalStatus-addGrpC]~~

~~rejectedReason [rejectedReason]~~

~~emergencyPassage [EmergencyPassage]~~

~~regional [REGION.Reg-SignalStatus]~~

~~regional [REGION.Reg-SignalStatusMessage]~~

Annex B: Revision log and wish list

Revision log – changes compared to v1.0

|  |  |
| --- | --- |
| **Row**  **DF/DE** | **Revision** |
| messageID | Changed to 8 instead of 9 according to ETSI TS 102 894-2 V1.4.1. |
| 2.8 | Added rejectedReason as desired extension plus a definition of the type. |
| 2.8 | Added emergencyPassage as desired extension plus a definition of the type. |
| 2.7 | Remove ‘all-red’ as this is not part of emergencyPassage in 2.8. |
| 4.2 | Types 8 and 9 were duplicates, therefore 9 was removed and 10 and 11 moved up. |

Wishlist – changes considered for v2.0

|  |  |
| --- | --- |
| **Row**  **DF/DE** | **Revision** |
| 2.8 | Change regional extension for rejectedReason and emergencyPassage to conditional (i.e. mandatory when applicable). Requires change to ASN1. |

Annex C: Members subWG NL profile

Jaap Vreeswijk - MAPtm

Martin Barto – Vialis

Eric Koenders – Dynniq

Peter Luns – Siemens

Eddy Verhoeven – Siemens

Peter Smit – Swarco

Jaap Zee – Swarco

Kartik Mundaragi Shivakumar – RHDHV

Klaas-Jan op den Kelder – RHDHV

Wannes de Smet – BeMobile

Arie Schreuders – Sweco

Bram Schiltmans – RWS