Intelligente Verkeers Regel Installatie

(iVRI) – Fase 1

Deliverable G3: IRSIDD IVERA4.00

Interface Requirements Specification IVERA4.0

Interface Definition Design IVERA4.0









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**VOORWOORD**

In juni 2015 is opdracht verstrekt door het Ministerie van Infrastructuur en Milieu via het Beter Benutten Vervolg (BBV) programma aan vier VRA leveranciers om te komen tot een gezamenlijke definitie van VRA standaarden ten behoeve van connected en coöperatieve functionaliteit.

Dit document vormt Deliverable G3 van de afgesproken leverdelen in de opdrachtverstrekking, omschreven als “IRSIDD IVERA”.

Deze deliverable beschrijft in het Engels de wijzigingen van het koppelvlak IVERA tussen een iTLC en een beheercentrale.

Dit document is tot stand gekomen door samenwerking van de vijf leveranciers in de werkgroep bestaande uit:

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*NB. De rest van dit document is geschreven in het Engels om internationale uitwisseling te ondersteunen.*

The rest of this deliverable has been written in English to facilitate international exchange.

Document control sheet

Document versions:

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| 1.0 | 2015-12-14 | WG3 | Initial Draft |
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|  |  |  |  |
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# Introduction

## System Overview

This section describes the high-level view of the functional blocks of the iTLC with IVERA interfaces.



Figure 1 Functional model

In Figure 1 the IVERA-APP and IVERA-TLC connections enable the Traffic Management System (TMS) to manage the ITS Applications and the TLC Facilities.

The TLC Facilities act as an IVERA slave and each ITS Application may act as an IVERA slave. Each of these IVERA slaves provides an IVERA interface with their own set of IVERA objects.

*Example: Two ITS Control applications both will have an object with max green time (TMG). They belong to different entities so have independent values.*

The IVERA protocol describes a single mechanism to communicate with any IVERA slave.

## Document overview

### Purpose and scope

This document describes proposed changes of the IVERA interface of an Intelligent TLC (iTLC). Only the changes with respect to the IVERA version 3.01 are described and will result in IVERA version 4.

This document contains the IRS and IDD of the interfaces IVERA-APP and IVERA-TLC.

### Document structure

Chapter 1 contains introduction

Chapter 2 contains references to normative and informative documents

Chapter 3 explains acronyms and concepts

Chapter 4 contains interface requirements specification

Chapter 5 describes the interface design

## Reader advise

Knowledge of the following documents is assumed:

* IVERA Functionele specificatie (versie 3.01)
* IVERA Objectdefinitie Verkeersregelinstallaties (versie 3.01)
* IVERA Technische specificatie (versie 3.01)
* Beter Benutten Vervolg, project iVRI, Deliverable F, iTLC Architecture (V1.2)

# References

## Normative

**ID Reference**

1. Beter Benutten Vervolg, project iVRI, Deliverable F, iTLC Architecture (V1.2)
2. Bijlage 1 Plan van Aanpak.pdf, 18 mei 2015, definitief t.b.v. DO BBV 26/5/2015
3. IVERA Functionele specificatie (versie 3.01)
4. IVERA Objectdefinitie Verkeersregelinstallaties (versie 3.01)
5. IVERA Technische specificatie (versie 3.01)
6. IVRI2 Deliverable 1d – IRS Security, version 1.1, October 2016
7. Uniform Resource Identifier (URI): Generic Syntax, RFC 3986 <https://www.ietf.org/rfc/rfc3986.txt>

## Informative

**ID Reference**

1. Uniform resource identifier (URI) <https://nl.wikipedia.org/wiki/Uniform_resource_identifier>

# Acronyms, abbreviations and concepts

**Acronyms and abbreviations**

|  |  |
| --- | --- |
| IRS | Interface Requirements Specification |
| IDD | Interface Design Description |
| ITS | Intelligent Transport Systems |
| IVERA | Management protocol for traffic light controllers in the Netherlands |
| TLC | Traffic Light Controller |
| TLC-FI | TLC Facilities Interface |
| iTLC | Intelligent TLC performing traffic light controller functions and allowing for ITS applications |
| TMS | Traffic Management System |
| ITS-A | ITS Application |
| ITS-CLA | ITS Control Application |
| BNF | Backus-Naur form |

**Concepts**

|  |  |
| --- | --- |
| TLC middleware | The internal software of an iTLC delivered by the manufacturer. Amongst others responsible for translating requested signal group states to actual hardware outputs. Access to TLC-Middleware is provided by the TLC Facilities. |
| Traffic control application | The software using the TLC-Facilities that implements the traffic flow regulation. Based on traffic detection information it sends to the TLC middleware the desired signal group states. |
| Signal group | Traffic signs for one driving direction. |
| ITS Application | An application which implements one or more ITS use-cases. Range of possible ITS Applications include a “traffic control application”. |
| IVERA slave | Provides an interface which can be used by IVERA masters to obtain or change IVERA objects.An IVERA slave reports event notifications automatically to an IVERA master. |
| IVERA master | Uses IVERA slaves to read or change IVERA objects.May provide also an interface which IVERA slaves can use to report event-notifications. |

# Requirements

## Introduction

This chapter contains requirements of the IVERA-APP and IVERA-TLC interfaces.

### Requirement notation format

The following format is used to define a requirement:

|  |  |
| --- | --- |
| Req-ID | IRS-xx-yyyy |
| Title |  |
| Description |  |
| Source |  |
| Comment |  |

* Req-ID: unique identification of the requirement according to the following format: ’IRS-xx-yyyy”, where xx is an identifier for the interface, yyyy is a number of the requirement
* Title: a short description of the requirement
* Description: formal and detailed description of the requirement.
* Source: reference to a source document used as input for the requirement.
* Comment: clarification of the requirement.

## General requirements

The following are general requirements are applicable to the IVERA interface of an iTLC.

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-01 |
| Title | Compatibility |
| Description | The IVERA4.0 protocol uses the same syntax as previous versions. It is however NOT backwards compatible. Older TMS instances will not be able to connect to IVERA4.0 slaves. |
| Source | [Ref 3] chapter 4 |
| Comment | Due to a changed login message, older TMS versions cannot connect.By keeping the same syntax, development can extend on the existing codebase. |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-02 |
| Title | Compatibility |
| Description | Changes needed to existing IVERA masters should be as minimal as possible. |
| Source |  |
| Comment | Existing IVERA masters should be able to communicate with iTLC’s by using IVERA with minimal change. Security measures require changes to existing IVERA3.01 (and earlier versions) masters. |

## Management Interface ITS Application

This section describes requirements of the management interface of ITS Applications, known as IVERA-APP.

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-03 |
| Title | Accessibility |
| Description | An ITS Application using the TLC as part of an iTLC may provide an IVERA-APP interface. |
| Source | [Ref 1] Chapter 6.1 |
| Comment |  |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-08 |
| Title | ITS Control Application - accessibility |
| Description | An ITS Control Application must provide an IVERA-APP interface |
| Source | iVRI2 project steering group decision |
| Comment | Implementation of IVERA-APP objects is optional as each ITS-CLA has different needs for management. |

Not all objects from the table in section 4.5 are mandatory for the IVERA-APP. Objects are related to the type and/or implementation of an ITS Application. For example, CCOL and RWS-C have different usage of IVERA objects. Because other types of ITS applications may also implement the IVERA-APP, objects are only applicable if they are relevant for the used ITS application.

It is not mandatory to have an IVERA-APP interface, it can be replaced by another management interface.

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-04 |
| Title | Available objects |
| Description | The IVERA-APP interface provides access to at least all mandatory IVERA Objects as listed in section 4.5, column “IVERA-APP”. |
| Source | [Ref 1] Chapter 6.1 |
| Comment | Mandatory objects are only defined for CCOL and RWS-C, this means that for other types of ITS Applications only the protocol objects (marked with P) are mandatory. |

## Management Interface TLC Facilities

This section describes requirements of the management interface of the TLC, known as IVERA-TLC.

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-05 |
| Title | Accessibility |
| Description | The TLC-Facilities always provide an IVERA-TLC interface. |
| Source | [Ref 1] Chapter 6.1 |
| Comment |  |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-06 |
| Title | Mandatory objects |
| Description | The IVERA-TLC interface provides access to at least all mandatory IVERA Objects as listed in section 4.5, column “IVERA-TLC”. |
| Source | [Ref 1] Chapter 6.1 |
| Comment |  |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-07 |
| Title | ITS Application identification and location |
| Description | The IVERA-TLC interface must provide information (via IVERA TLC objects) of the ITS Applications that may interact with the iTLC. This information must at least contain the following: * ITS Application id
* ITS Application role when using the TLC Facilities Interface (TLC-FI)
* IP address at which the ITS Application can be accessed
* TCP port number at which the ITS Application provides the IVERA-APP interface (if supported by the application)
 |
| Source | [Ref 1] Chapter 6.1 |
| Comment | With this information, a TMS can determine where it can access the IVERA-APP interfaces of ITS Applications connected to the TLC.  |

## IVERA objects

The IVERA-protocol describes access to IVERA objects. Some objects are related to a traffic control application and other objects are related to the TLC: this is depicted per Object type in the table below.

Some objects are relevant for both TLC as well as ITS Applications and should be implemented for both.

To support the iTLC-architecture, new objects are introduced or objects are changed. These are marked in *italic.*

X = object is expected in this interface.

P = object is protocol related. Object is part of the IVERA protocol itself or needed to implement IVERA and has no direct relation with the slave content.

| **Name** | **Description[[1]](#footnote-1)** | **IVERA-APP** | **IVERA-TLC** | **Mandatory** |
| --- | --- | --- | --- | --- |
| KTIJD | Kalendertijd |  | X |  |
| *TIJD*  | *Actuele systeemtijd* | *X* | *X* |  |
| *DATUM* | *Actuele systeemdatum* | *X* | *X* |  |
| JAAR | Actueel jaar |  | X |  |
| WEEK | Weeknummer |  | X |  |
| DAG | Nummer van dag van de week |  | X |  |
| DAG.I | Index dag van de week |  | X |  |
| BIJZDAG | Bijzondere dag |  | X |  |
| WKZB | Weeknummer begin zomertijd |  | X |  |
| WKZE | Weeknummer einde zomertijd |  | X |  |
| VRIID | Automaatidentificatie |  | X |  |
| VRIID.I | Index automaatidentificatie |  | X |  |
| VRIVER | Versienummers |  | X |  |
| VRIVER.I | Index versienummers |  | X |  |
| VRISTAT | Automaat toestand |  | X |  |
| VRISTAT.I | Index statusbronnen |  | X |  |
| VRIPROG | Automaat programma |  | X |  |
| VRISUBPROG | Automaat subprogramma |  | X |  |
| VRIPROG.I | Index programmabronnen |  | X |  |
| VRIPROGLYST | Programmalijst. |  | X |  |
| VRIPROGLYSTEXT | Uitgebreide programmalijst |  | X |  |
| BEDRIJF | Bedrijfstoestand m.b.t. de centrale. |  | X |  |
| BEDRIJF.I | Index object BEDRIJF |  | X |  |
| FTPUSER.I | FTP-gebruikersnamen | X | X |  |
| FTPPASS | FTP-passwords | X | X |  |
| FTPLOCATION | FTP-locatie | X | X |  |
| VRIFOUT | Actuele foutcode |  | X |  |
| VRIFOUT.I | Index foutcodes |  | X |  |
| VRIFSUB | Fout status van subsystemen. |  | X |  |
| VRIFSUB.I | Index subsystemen. |  | X |  |
| KLA1 | Inschakelen regelen periode 1 |  | X |  |
| KLU1 | Uitschakelen regelen periode 1 |  | X |  |
| KLA2 | Inschakelen regelen periode 2 |  | X |  |
| KLU2 | Uitschakelen regelen periode 2 |  | X |  |
| KLA3 | Inschakelen regelen periode 3 |  | X |  |
| KLU3 | Uitschakelen regelen periode 3 |  | X |  |
| KLA4 | Inschakelen regelen periode 4 |  | X |  |
| KLU4 | Uitschakelen regelen periode 4 |  | X |  |
| KLA5 | Inschakelen regelen periode 5 |  | X |  |
| KLU5 | Uitschakelen regelen periode 5 |  | X |  |
| KLOKPER | Hulpelement klokperiode |  | X |  |
| KLOKPER.A | Stand klokperiode |  | X |  |
| KLOKPER.I | Index object KLOKPER |  | X |  |
| KLOKPROG | Klokperiode programmakeuze |  | X |  |
| KLOKPROG.A | Stand klokperiode programmakeuze |  | X |  |
| KLOKPROG.I | Index object KLOKPROG  |  | X |  |
| KLA\_AKOEST | Inschakelen akoestische signalen |  | X |  |
| KLU\_AKOEST | Uitschakelen akoestische signalen |  | X |  |
| KLA\_HARD | Inschakelen hoog geluidsvolume |  | X |  |
| KLU\_HARD | Uitschakelen hoog geluidsvolume |  | X |  |
| CIFGUS | CIF gewenste uitgangssturing | X |  |  |
| CIFWUS | CIF werkelijk uitgangssturing | X |  |  |
| CIFIS | CIF ingangsstatus | X |  |  |
| CIFWPS | CIF werkelijke programmastatus | X |  |  |
| CIFGPS | CIF gewenste programmastatus | X |  |  |
| CIFKLOK | CIF kalendertijd | X |  |  |
| CIFPARM1 | CIF parameter tabel 1 | X |  |  |
| CIFPARM2 | CIF parameter tabel 2 | X |  |  |
| TGOR | Garantieontruimingstijd (appl) | X |  |  |
| TGOR1 | Garantieontruimingstijd (proces) |  | X |  |
| TOR | Ontruimingstijd (appl) | X |  |  |
| TGG | Garantiegroentijd (appl) | X |  |  |
| TGG1 | Garantiegroentijd (proces) |  | X |  |
| TGGL | Garantiegeeltijd (appl) | X |  |  |
| TGGL1 | Garantiegeeltijd (proces) |  | X |  |
| TMGL | Maximum geeltijd (appl) | X |  |  |
| TMGL1 | Maximum geeltijd (proces) |  | X |  |
| TGR | Garantieroodtijd (appl) | X |  |  |
| TGR1 | Garantieroodtijd (proces) |  | X |  |
| TVG | Vastgroentijd | X |  |  |
| TVAG | Voertuigafhankelijk verlenggroen | X |  |  |
| TGL | Geeltijd | X |  |  |
| TMG | Actuele maximumgroentijd | X |  |  |
| TMG1 | Maximumgroentijd 1 | X |  |  |
| TMG2 | Maximumgroentijd 2 | X |  |  |
| TMG3 | Maximumgroentijd 3 | X |  |  |
| TMG4 | Maximumgroentijd 4 | X |  |  |
| TMG5 | Maximumgroentijd 5 | X |  |  |
| TMG6 | Maximumgroentijd 6 | X |  |  |
| TDH1 | Actuele 1e hiaattijd | X |  |  |
| TDH11 | 1e hiaattijd periode 1 | X |  |  |
| TDH12 | 1e hiaattijd periode 2 | X |  |  |
| TDH2 | Actuele 2e hiaattijd | X |  |  |
| TDH21 | 2e hiaattijd periode 1 | X |  |  |
| TDH22 | 2e hiaattijd periode 2 | X |  |  |
| TDH | Hiaattijd | X |  |  |
| TDB | Bezettijd voor aanvraag | X |  |  |
| TDOG | Bewakingstijd ondergedrag |  | X |  |
| TDBG | Bewakingstijd bovengedrag |  | X |  |
| TDFL | Meettijd fluttergedrag |  | X |  |
| CDFL | Grenswaarde fluttergedrag |  | X |  |
| TDBP1 | Tijd detectiebewaking aan |  | X |  |
| TDBP2 | Tijd detectiebewaking uit |  | X |  |
| T | Tijdinstelling (appl) | X |  |  |
| T.A | Lopende tijd (appl) | X |  |  |
| T.I | Index timers (appl) | X |  |  |
| T.T | Type tijden | X |  |  |
| C | Counterinstelling (appl) | X |  |  |
| C.A | Lopende counter (appl) | X |  |  |
| C.I | Index counters (appl) | X |  |  |
| C.T | Type counters | X |  |  |
| P | Parameterinstelling (appl) | X |  |  |
| P.I | Index parameters (appl) | X |  |  |
| P.T | Type parameters (appl) | X |  |  |
| EGGP | EGG parameterinstelling (appl) | X |  |  |
| EGGP.I | Index EGG parameters (appl) | X |  |  |
| EGGP.T | Type EGG parameters (appl) | X |  |  |
| S | Schakelaar (appl) | X |  |  |
| S.I | Index schakelaars (appl) | X |  |  |
| S.T | Type schakelaars (appl) | X |  |  |
| KLB | Klok parameter 1 | X |  |  |
| KLE | Klok parameter 2 | X |  |  |
| KL.I | Index klokparameters | X |  |  |
| TP | Tijd instelling (proces) |  | X |  |
| TP.A | Lopende tijd (proces) |  | X |  |
| TP.I | Index timers (proces) |  | X |  |
| CP | Counter instelling (proces) | X |  |  |
| CP.A | Lopende counter (proces) | X |  |  |
| CP.I | Index counters (proces) | X |  |  |
| PP | Parameter instelling (proces) | X |  |  |
| PP.I | Index parameters (proces) | X |  |  |
| SP | Schakelaar (proces) |  | X |  |
| SP.I | Index schakelaars (proces) |  | X |  |
| SGE.A | Signaalgroeptoestand (ext) |  | X |  |
| SGI.A | Signaalgroeptoestand (int) | X |  |  |
| TSGE.A | Timer signaalgroeptoestand (ext) |  | X |  |
| TSGI.A | Timer signaalgroeptoestand (int) | X |  |  |
| SGE.LB | Signaalgroeplogboek (ext) |  | X |  |
| SGI.LB | Signaalgroeplogboek (int) | X |  |  |
| SGE.LA | Signaalgroeplogboek (onb/ext) |  | X |  |
| SGI.LA | Signaalgroeplogboek (onb/int) | X |  |  |
| SG.I | Signaalgroepnamen | X | X |  |
| LAMP.I | Index lampnamen |  | X |  |
| LAMP.A | Actuele lampstatus |  | X |  |
| LAMPINFO | Lampconfiguratie |  | X |  |
| D.A | Detectortoestand |  | X |  |
| TD.A | Timer bezet/onbezet |  | X |  |
| SWD | Software detectorschakelaar |  | X |  |
| D.LB | Detectorlogboek |  | X |  |
| D.LA | Detectorlogboek (onb) |  | X |  |
| D.I | Detectornamen | X | X |  |
| DC.A | Classificatiedetectortoestand |  | X |  |
| DC.I | Index object DC |  | X |  |
| U.A | Toestand overige uitgangen | X | X |  |
| TU.A | Timer uitgangstoestand | X | X |  |
| U.LB | Uitgangenlogboek | X | X |  |
| U.LA | Uitgangenlogboek (onb) | X | X |  |
| U.I | Index overige uitgangen | X | X |  |
| I.A | Toestand overige ingangen |  | X |  |
| TI.A | Timer ingangstoestand |  | X |  |
| SWI | Software inputschakelaar |  | X |  |
| I.LB | Ingangenlogboek |  | X |  |
| I.LA | Ingangenlogboek (onb) |  | X |  |
| I.I | Index overige ingangen |  | X |  |
| LSGE | Lijndump SG-toestand (ext) |  | X |  |
| LSGI | Lijndump SG-toestand (int) | X |  |  |
| LD | Lijndump detector toestand |  | X |  |
| LI | Lijndump ingangtoestand |  | X |  |
| LU | Lijndump uitgangtoestand |  | X |  |
| BL.A | Actueel blok/module/stage | X |  |  |
| PL.I | Index signaalplannen | X |  |  |
| PLTXMAX | maximum waarde cyclustijd (\*TX\_max) | X |  |  |
| PLTPLON | inschakeltijd signaalplan (\*TPL\_on) | X |  |  |
| PLTPLOFF | uitschakeltijd signaalplan (\*TPL\_off) | X |  |  |
| PLTXA | parameter vooruitschakelen (\*TXA[]) | X |  |  |
| PLTXB | parameter SG[ ] (\*TXB[ ]) | X |  |  |
| PLTXC | parameter EWG[ ] /SVG[ ] (\*TXC[ ]) | X |  |  |
| PLTXD | parameter EVG[ ] /SMG[ ] (\*TXD[ ]) | X |  |  |
| PLTXE | parameter EMG[ ] (\*TXE[ ]) | X |  |  |
| VRI.LB | VRI-logboek |  | X |  |
| VRI.LA | VRI-logboek (onb) |  | X |  |
| VRI.C | VRI-commando |  | X |  |
| VRI.A | Actieve storingenlijst |  | X |  |
| PAR.LB | Parameterlogboek | X | X |  |
| PAR.LA | Parameterlogboek (onb). | X | X |  |
| TELINST | Instellingen telprogramma |  | X |  |
| TELDATA | Data telprogramma |  | X |  |
| TELMON | Actuele data telprogramma |  | X |  |
| *DATACOM* | *Instelling datacommunicatie* | *X* | *X* |  |
| DATACOM.I | Index object Datacom | X | X |  |
| AUTHOG | Gebruikersnamen |  | X |  |
| AUTHOP | Toegangscodes |  | X |  |
| LOGINNIVEAU | Nummer gebruikersgroep waaronder ingelogd is. | P | P |  |
| OVDEVICE | OV-devices |  | X |  |
| OVFILTER | OV-filter |  | X |  |
| OV.LB | OV-logboek |  | X |  |
| OV.LA | OV-logboek (onb) |  | X |  |
| DIMINST.I | Index diminstellingen. |  | X |  |
| DIMINST | diminstellingen. |  | X |  |
| DIMMEN.I | Index dimstatus. |  | X |  |
| DIMMEN.A | dimstatus. |  | X |  |
| AKOESTISCH.I | Index Status akoestische signalen |  | X |  |
| AKOESTISCH.A | Status akoestische signalen |  | X |  |
| AKOESTISCH.F | Foutstatus akoestische signalen |  | X |  |
| PAKOESTISCH | Parameter akoestische signalen |  | X |  |
| PAKOESTISCH.I | Index Parameter akoestische signalen |  | X |  |
| EXTRAINFO.A | Informatieve actuele extra info string. | X | X |  |
| EXTRAINFOEXT | Informatieve toelichting extra info string. | X | X |  |
| EXTRAINFO.I | Index extra info | X | X |  |
| EVENTLYST.I | Eventnummers als tekststring | X | X |  |
| EVENTLYST.INFO | Detailinformatie over het event | X | X |  |
| ERROR.CODE | Foutcode | P | P |  |
| ERROR.INFO | Gedetaileerde beschrijving | P | P |  |
| ERROR.CMD | Het commando waar de error bij hoort | P | P |  |
| NOODSTROOM | Instellingen voor de noodstroom voorziening |  | X |  |
| NOODSTROOM.A | Actuele toestand noodstroom voorziening |  | X |  |
| NOODSTROOM.I | Index object noodstroom voorziening |  | X |  |
| NOODSTROOM.LA | Logboek (onb.) noodstroom voorziening |  | X |  |
| NOODSTROOM.LB | Logboek (bev.) noodstroom voorziening |  | X |  |
| ABON | Abonnementsverzoek | P | P |  |
| BB0 | Objectlijst type 0 | P | P |  |
| BB1 | Objectlijst type 1 | P | P |  |
| BBA0 | Objectlijst + attributen type 0 | P | P |  |
| BBA1 | Objectlijst + attributen type 1 | P | P |  |
| PING | Ping-commando | P | P |  |
| *LOGIN* | Login-commando | P | P |  |
| TID | Toepassing identificatienummer | X | X |  |
| XID | Automaat identificatienummer |  | X |  |
| YID | Applicatie identificatienummer | X |  |  |
| ZID | Gereserveerd |  |  |  |
| *TLC.I* | *TLC namen* | *X* |  | *X* |
| *TLC* | *TLC instellingen* | *X* |  | *X* |
| *RIS.I* | *RIS namen* | *X* |  |  |
| *RIS* | *RIS instellingen* | *X* |  |  |
| *ITSAPPLOC* | *Applicatie management referentie* |  | *X* | *X* |
| *ITSAPP.I* | *ITS applicatie gebruikersnamen* |  | *X* | *X* |
| *ITSAPP* | *ITS applicatie instellingen* |  | *X* | *X* |
| *ITSSTAT* | *Huidige status van de ITS applicatie* |  | *X* | *X* |
| *USER* | *IVERA gebruikersinstellingen* | *P* | *P* | *P* |
| *APPID.I* | *Index Identificatie van Applicatie* | *X* |  |  |
| *APPID* | *Identificatie van Applicatie* | *X* |  | *X* |
| *APPIFLOC* | *Applicatie interface locaties* | *X* |  | *X* |
| *APPVER* | *Versies van de applicatie* | *X* |  | *X* |
| *APPVER.I* | *Index versienummers* | *X* |  | *X* |
| *APPFOUT* | *fouttoestand* | *X* |  |  |
| *APPFOUT.I* | *Index fouttoestand*  | *X* |  |  |
| *APP.LA* | *Logboek met meldingen van ITS-Applicatie (onb)* | *X* |  |  |
| *APP.LB* | *Logboek met meldingen van ITS-Applicatie*  | *X* |  |  |
| *APP.A* | *Actieve storingenlijst* | *X* |  |  |
| *X\* (X-objecten)* | *TLC Fabrikant specifieke objecten* |  | *X* |  |
| *Y\* (Y-objecten)* | *APP specifieke objecten* | *X* |  |  |

Tabel 1 Object allocation

## IVERA connections

### Master to Slave (object management)

The IVERA interface is defined as a TCP/IP socket connection ([Ref 5] chapters 3-5) with a message syntax [Ref 3] chapter 3.8.

The TCP/IP server port to access the IVERA-TLC interface is 5200 for unsafe connections and 5300 for safe connections.

Access to an IVERA-APP interface (also a TCP/IP server port) is slightly different. To be able to connect to different IVERA-APP interfaces (at the same platform or other platforms), the IVERA-object ITSAPPLOC is defined for the IVERA-TLC interface. The IVERA master can first query this object by using the IVERA-TLC interface, and then determine the right connection properties for an ITS Application.

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-08 |
| Title | IVERA-APP Address and TCP-port |
| Description | The network address and TCP-port at which an IVERA-APP interface is reachable, must be made available for each ITS Application in the IVERA-TLC interface. |
| Source | Accessibility, Compatibility |
| Comment |  |

### Slave to Master (event- and logbook handling)

The IVERA TMS listens on a TCP port for receiving messages sent by IVERA slaves, these messages are called ‘trigger events’. Port 5201 for unsafe connections and 5301 for safe connections.

To be able to support multiple IVERA slaves on different port numbers, a mechanism is required.

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-09 |
| Title | Trigger event with identification |
| Description | IVERA slaves must be able to send a trigger to the trigger port including an identification of the slave  |
| Source | Accessibility, Compatibility |
| Comment | IVERA 3.01 TLC compatibility: The TLC will not send an identification. The TMS will use the default 5000 port to connect to the slave.IVERA 4 Slave compatibility: The slave will send an identification with which the central can determine how to connect to the slave.  |

## TLC-FI User management

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-10 |
| Title | User management TLC-FI |
| Description | It must be possible to add, update and remove users and credentials |
| Source | [Ref 1] Chapter 8.2 |
| Comment | Users are ITS-applications |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-11 |
| Title | Application group |
| Description | It must be possible to add, update and remove group memberships of users |
| Source | [Ref 1] Chapter 8.2 |
| Comment |  |

## ITS Application session state

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-12 |
| Title | Application status |
| Description | It must be possible to request for the session state of ITS applications |
| Source | [Ref 1] Chapter 8.2 |
| Comment | Applicable for TLC and ITS Applications |

## Security

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-13 |
| Title | IVERA Authentication & Authorization |
| Description | A client using IVERA-TLC or IVERA-APP shall be authenticated based on username and password. The client shall be assigned a role. Access to the resources (objects) shall be restricted based on the assigned role. |
| Source | [Ref 6] IRS\_SEC\_TLC\_004 |
| Comment | The current IVERA pin code is deemed insufficient protection, especially since users and passwords are being managed using the IVERA interface. The login using a pin-code should be removed and replaced by a login using username and password, including objects to manage the users and passwords. |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-14 |
| Title | IVERA + TLS |
| Description | The TLC facilities shall support Transport Layer Security (TLS) on the IVERA-TLC interface in accordance with the best practices documented in RFC7525.An ITS application shall support Transport Layer Security (TLS) on the IVERA-APP interface in accordance with the best practices documented in RFC7525. |
| Source | [Ref 6] IRS\_SEC\_TLC\_005 |
| Comment | This is the standard security setup providing the following security:1. Restricted access to the private network
2. User authentication and authorization on the IVERA interface.
3. The client can verify the identity of the TLC (or the ITS application) based on the provided (digital) certificate.
4. The communication between the client and the TLC (or the ITS application) is encrypted.

*Note: Legacy TLC’s may not have the capability to the support encrypted socket communication. To add this facility to legacy TLC’s, a TLS proxy could be considered.* |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-15 |
| Title | User management IVERA users |
| Description | The IVERA-TLC interface shall support the management of the IVERA-TLC users.The IVERA-APP interface shall support the management of the IVERA-APP users. |
| Source | [Ref 6] IRS\_SEC\_TLC\_007b |
| Comment |  |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-16 |
| Title | Security audit log |
| Description | The IVERA datacom events (6xxx) shall be used for the security audit logging. |
| Source | [Ref 6] IRS\_SEC\_TLC\_007c |
| Comment | Applies to IVERA-TLC and IVERA-APP. |

|  |  |
| --- | --- |
| Req-ID | IRS-IVERA-17 |
| Title | File transfer security |
| Description | The file transfer between an IVERA master and an IVERA slave shall use the SSH File Transfer Protocol, SFTP replacing former usage of FTP.  |
| Source |  |
| Comment | Applies to IVERA-TLC and IVERA-APP. |

# Detailed design

## General

See [Ref 3], [Ref 4] and [Ref 5].

## Management Interface TLC Facilities

The figure below describes the way in which an IVERA master can resolve the accesspoint of the management interface of an ITS\_CLA.

Because the IVERA-TLC of the TLC-Facilities is available at a wellknown address/port, this can be used by an IVERA master to query the contents of the IVERA Object ‘ITSAPPLOC’.

This object contains per ITS-CLA one URL, referencing the management interface of the ITS-CLA (the URL is transferred during registering from ITS-CLA to TLC-Facilities).

An IVERA-master can use this URL to connect to the management interface.

If this management interface is IVERA-APP, the master may query the IVERA-object ‘APPIFLOC’. This object contains a list URL referencing all other interfaces of the particular ITS-CLA.

The objects are defined in the next sections.



Figure 2 resolving connection points of ITS-A

### Object ITSAPPLOC

The object ITSAPPLOC contains the URI identifying where the ITS Application management interface is reachable.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | ITSAPPLOC | Naam |
| O | 1 | URI of an ITS-Application as provided during ITS-A Registration with the TLC-Facilities | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| L | 0 |  | Logboek |
| W | 0 |  | Wijzigingsteller |
| E | 0 | NUMITSAPP | aantal data-elementen |
| I | 1 | ITSAPP.I | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| IMIN | 1 |  | Index data-element minimumwaarde |
| IMAX | 1 |  | Index data-element maximumwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 401 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |
| A | 1 |  | Overzicht alle attributen |

Tabel 2 Object attributen ITSAPPLOC

This object contains accessibility data for the ITS applications that have active access to this TLC. An ITS Application is identified by “programmanummer” and is listed one time.

**Format: Resource identifier (401) [[2]](#footnote-2), type 1**

ResourceIdentifier = uri + “,” + [omschrijving]

uri = AsciiString conform [Ref 7]

omschrijving = AsciiString

**Usage: Read an element**

ITSAPPLOC/<element>=”<uri>,[omschrijving]”

<element> : objectelement (index nummer)

<uri> : uniform resource identification (het is aanbevolen het poortnummer in de uri op te nemen)

<omschrijving> : bevat additionele informatie

In addition to standardized schemes (such as http, https), the following URI schemes are defined for IVERA:

|  |  |
| --- | --- |
| URI scheme | Description |
| ivera-app | Identifies ivera-app protocol |
| ivera-apps | Identifies ivera-app protocol using TLS |
| ivera-tlc | Identifies ivera-tlc protocol |
| ivera-tlcs | Identifies ivera-tlc protocol using TLS |
| tlc-fi | Identifies tlc-fi protocol |
| tlc-fis | Identifies tlc-fis protocol using TLS |
| ris-fi | Identifies ris-fi protocol |
| ris-fis | Identifies ris-fis protocol using TLS |
| vlog | Identifies v-log protocol |
| vlogs | Identifies v-log protocol using TLS |
| ccol | Identifies ccol parser protocol |
| ccols | Identifies ccol parser protocol using TLS |

Example resource identifier elements:

ivera-apps://10.10.39.40:5100,Regelapplicatie spits

http://10.10.40.10,OV prioriteitsappl

https://10.10.41.19,Snelheidsadviesapplicatie

Examples:

Reading an element:

ITSAPPLOC/#1

ITSAPPLOC/#1=”ivera-apps://10.10.39.40:5100,Regelapplicatie spits”

Reading multiple elements:

ITSAPPLOC

ITSAPPLOC=”ivera-apps://10.10.39.40:5100,Regelapplicatie spits”,” http://10.10.40.10,OV prioriteitsappl”

Reading an empty element:

ITSAPPLOC/#3

ITSAPPLOC/#3=””

## Management Interface ITS Application

### Object APPID.I

The object APPID.I depicts the index names of application identification:

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APPID.I | Naam |
| O | 1 | Index applicatie identificatie | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | NUMAPPID | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 2 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 3 Object attributen

The object APPID.I contains a number of elements to characterize the application.

|  |  |
| --- | --- |
| APPID.I | APP identificatie |
| 0 | LEVERANCIER | Partij die applicatie levert |
| 1 | ONTWERPER | Gegeven over ontwerper en of programmeur |
| 2 | KRP\_NR | Kruispuntnummer |
| 3 | KRP\_NAAM | Kruispuntnaam |
| 4 | PAK\_TYPE | Naam van basispakket |
| 5 | APP\_NAAM | Applicatienaam |
| 6 | OMSCHRIJVING | Omschrijving van de applicatie |
| 7 | LEV7 | Vrij in te vullen |
| 8 | LEV8 | Vrij in te vullen |
| 9 | LEV9 | Vrij in te vullen |

Tabel 4 applicatie identificatie

### Object APPID

The object APPID depicts the application identification:

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APPID | Naam |
| O | 1 | Applicatie identificatie | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | NUMAPPID | aantal data-elementen |
| I | 1 | APPID.I | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 1, ruwe tekst | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 5 Object attributen

Example:

Reading all elements:

APPID

APPID=”LeverancierX”,”Klaas”,”KRP55”,” Dorpstraat/Kerkstraat”,”CCOL”,”Applicatie”,””,””,””,””

### Object APPVER.I

The object APPVER.I depicts the index names of application versions:

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APPVER.I | Naam |
| O | 1 | Index versienummers | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | NUMAPPVER | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 2 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 6 Object attributen

|  |  |
| --- | --- |
| APPVER.I | Omschrijving |
| 0 | VERSIE | Versie nummer van de applicatie |
| 1 | DATUM | De datum waarop de applicatie is gemaakt |
| 2 | LEV1 | Leverancierspecifiek (indexnaam en waarde) |
| 3 | LEV2 | Leverancierspecifiek (indexnaam en waarde) |
| 4 | LEV3 | Leverancierspecifiek (indexnaam en waarde) |

Tabel 7 Versie nummers

### Object APPVER

The object APPVER depicts the application versions:

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APPVER | Naam |
| O | 1 | Versienummers | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | NUMAPPVER | aantal data-elementen |
| I | 1 | APPVER.I | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 1, ruwe tekst | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 8 Object attributen

Example:

Reading all elements:

APPVER

APPVER=”Applicatie V1.0.0”,”2017-04-27”,””,””,””

### Object APPFOUT.I

The object APPFOUT.I depicts the index names of errorcode (‘foutcode’):

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APPFOUT.I | Naam |
| O | 1 | index foutcode | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | 2 | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 2 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 9 Object attributen

The object APPFOUT contains two Error codes. The used numbers are the event codes from object APP.LB:

|  |  |
| --- | --- |
| APPFOUT.I |  |
| 0 | FATAAL | Eerste fatale fout |
| 1 | MELDING | Laatste niet fatale fout |

Tabel 10 Foutcode

### Object APPFOUT

The object APPFOUT depicts the actual error code:

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APPFOUT | Naam |
| O | 1 | actuele foutcode | Omschrijving |
| T | 1 | 0 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | 2 | aantal data-elementen |
| I | 1 | APPFOUT.I | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 1, getal met eenheid 1 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 11 Object attributen

Example:

Reading all elements:

APPFOUT

APPFOUT=0,2500

### Object APP.LA

The object APP.LA depicts the APP-log (not confirmed):

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APP.LA | Naam |
| O | 1 | APP-logboek (onbevestigd) | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 6666 | User Identificatie Control |
| E | 0 | 0 .. 1000 | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 100 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 12 Object attributen

### Object APP.LB

The object APP.LB depicts the APP-log:

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APP.LB | Naam |
| O | 1 | APP-logboek | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | 0 .. 1000 | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 100 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 13 Object attributen

### Object APP.A

The object APP.A contains the list with actual application errors:

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APP.A | Naam |
| O | 1 | Actieve storingslijst | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | 0 .. 150 | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 100 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 14 Object attributen

Example:

Reading an element:

APP.A/#0

APP.A/#0=”20170426:175437,0,2500,”

### Object APPIFLOC

This object is used to query the available protocols of the ITS Application using a URI. See also Figure 2 resolving connection points of ITS-A

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | APPIFLOC | Naam |
| O | 1 | Applicatie interface adressen (uri) | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| L | 0 |  | Logboek |
| W | 0 |  | Wijzigingsteller |
| E | 0 | NUMAPPIFLOC | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| IMIN | 1 |  | Index data-element minimumwaarde |
| IMAX | 1 |  | Index data-element maximumwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 401 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |
| A | 1 |  | Overzicht alle attributen |

Tabel 15 Object attributen APPIFLOC

The ResourceIdentifier format (401) used for this object is defined in 5.2.1.

Examples:

Reading an element:

APPIFLOC/#1

APPIFLOC/#1=”ivera-app://10.10.39.40:5100,management interface”

Reading multiple elements:

APPIFLOC

APPIFLOC=”ivera-app://10.10.39.40:5100,management interface”,”http://10.10.40.10,web interface

ccol://10.10.41.19:7000,command parser”,”vlog://10.10.41.19:7001,verkeerslogging”,””,””,””

Reading an empty element:

APPIFLOC/#3

APPIFLOC/#3=””

## IVERA connections

### Master to Slave (object management)

Master to slave management principle is not changed.

### Slave to Master (event- and logbook handling)

An IVERA slave sends trigger events to notify the TMS (IVERA master) about new occurred events. The IVERA master may then take appropriate action (like querying logbooks at the IVERA slave).Trigger events are sent to a trigger port at the TMS.

For IVERA 4, new trigger-ports are defined:



Figure 3 Trigger ports on TMS

In IVERA-versions prior to 4.0, the TMS was able to identify the IVERA-slave by using the source IP-address which reported the trigger event.

Because multiple IVERA slaves may be deployed within one system as defined in [Ref 1] (therefore sharing the network stack and IP-address), the IVERA trigger message is extended with a trigger source identification which is used by IVERA master to determine the network location of the corresponding IVERA slave.

The data sent by the IVERA-slave to report the trigger events is extended with the contents the corresponding ID object:

1. APPID for triggers from IVERA-APP
2. VRIID for triggers from IVERA-TLC

The trigger events are sent as a sequence of messages, please refer to the [Ref 3] IVERA Functionele specificatie (versie 3.01) section 3.8 for the Backus-Naur form (BNF) definitions:

BerichtSlaveAckHand CarriageReturn

BerichtSlaveTrigger CarriageReturn

{ BerichtSlaveTrigger CarriageReturn }

Example:

VRIID=”V10002”,”KRP55”,”Dorpstraat/Kerkstraat”,”FAB X Type Y”,”iTLC”,”1997-01-17”,””,””,””,””

:T=2001

:T=1010

The sequence is:

* Slave connects to the trigger port on the master.
* Slave sends messageBerichtSlaveAckHand with contents of the ID object
* The following message(s) contain(s) one or more BerichtSlaveTrigger
* The slave disconnects.
* Master takes appropriate actions to follow up on the trigger message(s) taking the received ID into account. (e.g. requesting logbook objects)

## Application and User management

### User groups

The definition of the user groups is changed. A user group Administrator (Admin) for user account management is needed for which group 4 will be used. In IVERA version 3.01 and earlier this group was assigned to Technical maintenance.

The user groups in IVERA 4.00 are:

1. The world (De wereld)
2. Road mender (Kantonnier)
3. Traffic engineer and technical maintenance (Verkeerskundige en Technisch onderhoud)
4. User and access administration (Gebruiker en toegangsbeheer)

The UIC of object DATACOM will therefore be changed from “6444” to “6644”

In Figure 4 Object relations and users, the relation between IVERA-Objects and user-management is depicted.

The following user-configurations can be distinguished:

* ‘IVERA users’ are users allowed to use IVERA-TLC
* The ’TLC-FI users’ are users that may register at TLC- Facilities.
* The ’RIS-FI users’ are users that may register at RIS-Facilities.
* ‘IVERA APP users’ are users allowed to login at the IVERA-APP interface.
* ‘user/password’ are credentials as used by an application to login at X-Facilities

All user-configurations are managed by IVERA Objects (depicted green) which are defined in the next sections.



Figure 4 Object relations and users

### Object ITSAPP.I

IVERA Object ITSAPP.I returns the user names for the configured ITS applications. The user names can be changed by writing to ITSAPP.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | ITSAPP.I | Naam |
| O | 1 | ITS applicatie user management | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | NUMITSAPP | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 2 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 16 Object attributen ITSAPP

### Object ITSAPP

IVERA Object ITSAPP can be used to manage the ITS applications.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | ITSAPP | Naam |
| O | 1 | ITS applicatie user management | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 6644 | User Identificatie Control |
| E | 0 | NUMITSAPP | aantal data-elementen |
| I | 1 | ITSAPP.I | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 402 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 17 Object attributen ITSAPP

**Format: ITSAPP Gebruiker (402), type 1**

ITSAPPGebruiker = [ GebruikersnaamITSA + “,” [ + Type ] + “,” [ + Programma ] + “,”
[ + Wachtwoord ] + “,” [ + Kruispunt ] ]

Letter = “A” .. “Z” | “a” .. “z”

Digit = “0” .. “9”

Digit1to9 = “1” .. “9”

UnderScore = “\_”

Hyphen = “-“

GebruikersnaamITSA = Letter { Letter | Digit | UnderScore | Hyphen }

Type = “CONTROL” | “PROVIDER” | “CONSUMER”

Programma = Digit1to9 [ Digit ]

Wachtwoord = AsciiString

Kruispunt = AsciiString

Only an IVERA administrator can change the settings for user management (username, password and type.). To change the settings for a user the next format will be used:

**Usage: write an element**

ITSAPP/<element>="[<gebruikersnaam>,[<type>],[<programma>],[<wachtwoord>],[<kruispunt>]]"

waarbij:

<element> : objectelement (index nummer of indexnaam)

<gebruikersnaam> : gebruikersnaam van de ITS applicatie (Alleen door ADMIN te wijzigen)

<type> : het type ITS applicatie (CONTROL|PROVIDER|CONSUMER) (Alleen door ADMIN te wijzigen)

<programma> : het programma nummer (1..99). (Vanaf gebruikers niveau 3 te wijzigen.) Alleen van toepassing voor een ITS-CLA application (CONTROL)

<wachtwoord> : het wachtwoord voor de ITS applicatie. (Alleen door ADMIN to wijzigen)

<kruispunt> : Identificatie (naam) van het kruispunt dat de ITS-CLA mag regelen
Alleen van toepassing voor een ITS-CLA application (CONTROL)

A user can be removed by writing an empty string by the administrator.

Reading the object ITSAPP will return a string in the full format without the password

**Usage: reading an element**

ITSAPP/<element>=”<gebruikersnaam>,<type>,<programma>,<kruispuntId>”

Examples:

Writing an element:

ITSAPP/#1=”Control1,CONTROL,96,Password,KRP55”

Reading an element:

ITSAPP/#1

ITSAPP/#1=”Control1,CONTROL,96,KRP55”

Removing a user:

ITSAPP/#1=””

### Object ITSSTAT

The object ITSSTAT contains the ITS application state:

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | ITSSTAT | Naam |
| O | 1 | ITS applicatie status | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | NUMITSAPP | aantal data-elementen |
| I | 1 | ITSAPP.I | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 1 ruwe tekst | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 18 Object attributen ITSSTAT

This object depicts the current state of the ITS applications. The possible values depends on the type of the ITS application (see IDD TLC-FI)

* Disconnected
* Connected
* NotConfigured
* Offline
* ReadyToControl
* StartControl
* InControl
* EndControl
* Error

Example:

Reading an element:

ITSSTAT/#2

ITSSTAT/#3="InControl"

### Object TLC.I

IVERA Object TLC.I returns the names of the intersections supported by this control applications.

The name is configured in the ITS application and cannot be modified using the IVERA protocol. The intersection name must match the intersection name configured in the TLC.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | TLC.I | Naam |
| O | 1 | Kruispuntnamen | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | NUMTLC | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 2 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 19 Object attributen TLC.I

### Object TLC

IVERA Object TLC can be used to manage the settings for the connection to the TLC Facilities using the TLC-FI interface.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | TLC | Naam |
| O | 1 | TLC management | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 6444 | User Identificatie Control |
| E | 0 | NUMTLC | aantal data-elementen |
| I | 1 | TLC.I | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 401 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 20 Object attributen TLC

The ResourceIdentifier format (401) used for this object is defined in 5.2.1.

Note that the username:password part of the URI authority component is used in this object. The password is only used when writing the URI. Reading the object RIS will return a URI where the password is not included.

Examples:

* applicationX is the username
* secret is the password
* 10.10.39.40 is the hostname
* 11001 is the port number

Writing an element

TLC/#1=”tlc-fis://applicationX:secret@10.10.39.40:11001”

Reading an element:

TLC/#1

TLC/#1=”tlc-fis://applicationX@10.10.39.40:11001”

## RIS-FI User management

### Object RIS.I

IVERA Object RIS.I returns the functional name of the RIS.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | RIS.I | Naam |
| O | 1 | RIS namen | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | NUMRIS | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 2 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 21 Object attributen RIS.I

### Object RIS

IVERA Object RIS can be used to manage the settings for the connection to the RIS Facilities using the RIS-FI interface..

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | RIS | Naam |
| O | 1 | RIS management | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 6444 | User Identificatie Control |
| E | 0 | NUMRIS | aantal data-elementen |
| I | 1 | RIS.I | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 401 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 22 Object attributen RIS

The ResourceIdentifier format (401) used for this object is defined in 5.2.1.

Note that the username:password part of the URI authority component is used in this object. The password is only used when writing the URI. Reading the object RIS will return a URI where the password is not included.

Examples:

Writing an element

RIS/#1=”ris-fis://applicationX:secret@10.10.39.40:12001”

Reading an element:

RIS /#1

RIS /#1=”tlc-fis://applicationX@10.10.39.40:12001”

## IVERA User Management

### Object USER

IVERA Object USER will be used in IVERA 4.0 to define the users that can use the IVERA interface. (Both interfaces IVERA-TLC and IVERA-APP)

An administrator has special rights in the IVERA protocol. Only an administrator can change the username and user group. The password can be changed by an administrator or the user itself. There may be more than one administrator user in the list of users.

Special notes about the first user, USER/#0:

* The user group of USER/#0 cannot be changed
* USER/#0 may never be removed from the list of users
* Any admin user may change the username and/or password of USER/#0

Reading this object will result in username and user group.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | USER | Naam |
| O | 1 | IVERA gebruiker management | Omschrijving |
| T | 1 | 1 | Type |
| U | 0 | 6666 | User Identificatie Control |
| E | 0 | NUMUSERS | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 | MAX\_FLEN | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 404 | Data-element formaat |
| S | 0 |  | Data-element stapgrootte |

Tabel 23 Object attributen USER

**Format: IveraGebruiker (404), type 1**

IveraGebruiker =
Gebruikersnaam + “,” + Gebruikersgroep [ + “,” + Wachtwoord + “,” + Nieuw1 + “,” + Nieuw2 ]

Gebruikersnaam = AsciiString

Gebruikersgroep = “1” | “2” | “3” | “4”

Wachtwoord = AsciiString

Nieuw1 = AsciiString

Nieuw2 = AsciiString

**Usage: write an element**

USER/<element>=”<gebruikersnaam>,<gebruikersgroep>[,<wachtwoord>,<nieuw1>,<nieuw2>]”

waarbij:

<element> : objectelement (index nummer)

<gebruikersnaam> : gebruikersnaam van de gebruiker (alleen te wijzigen door Admin)

<gebruikersgroep> : de IVERA gebruikersgroep (1..4). Admin=4. (alleen te wijzigen door Admin)

<wachtwoord> : het wachtwoord van de gebruiker of de huidige ingelogde Admin gebruiker

<nieuw1> : nieuw wachtwoord voor deze gebruiker

<nieuw2> : nieuw wachtwoord voor deze gebruiker (moet overeenkomen met nieuw1)

Examples:

Writing an element

USER/#2="admin2,4,secret1,newSecret,newSecret"

Reading an element:

USER/#2

USER/#2="admin2,4"

### Object LOGIN

The behavior of the login object will be changed. In IVERA 4.0 the user needs to login using username and password. The login using a 4 digit pin code is deprecated.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | LOGIN | Naam |
| O | 1 | Login-commando | Omschrijving |
| T | 1 | *1* | Type |
| U | 0 | 6666 | User Identificatie Control |
| E | 0 | 1 | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 | 0 | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 405 | Data-element formaat |
| S | 0 | 1 | Data-element stapgrootte |

Tabel 24 Object attributen LOGIN

**Format: Login (405), type 1**

LoginCommand = Gebruikersnaam + “,” + Wachtwoord

Gebruikersnaam = AsciiString

Wachtwoord = AsciiString

**Usage: login**

LOGIN/#0=”<gebruikersnaam>,<wachtwoord>”

waarbij:

<gebruikersnaam> : gebruikersnaam van de IVERA gebruiker.

<wachtwoord> : het wachtwoord voor de IVERA gebruiker.

Reading the login object is not defined.

Writing an empty string will logout the current user.

Examples:

Logging in:

LOGIN/#0=”admin,secret”

Logging out:

LOGIN/#0=””

## IVERA FTP User Management

The SSH File transfer Protocol (SFTP) will be used by peers to exchange files.

For this purpose, the functionality of the FTPPASS, FTPUSER.I and FTPLOCATION objects as defined in [Ref 4], IVERA Objectdefinitie Verkeersregelinstallaties (versie 3.01) will apply to the SFTP users.

## DATUM/TIJD

The iTLC Architecture defines each platform to be synchronized using NTP, therefore the objects DATUM and TIJD are changed to be read-only.

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | TIJD | Naam |
| O | 1 | Actuele systeemtijd | Omschrijving |
| T | 1 | 0 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | 1 | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 | 0 | Minimum data-elementwaarde |
| MAX | 0 | 235959 | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 21 | Data-element formaat |
| S | 0 | 1 | Data-element stapgrootte |

Tabel 25 Object attributen TIJD

|  |  |  |  |
| --- | --- | --- | --- |
| Attribuut | Type  | Object | Omschrijving |
| N | 1 | DATUM | Naam |
| O | 1 | Actuele systeemdatum | Omschrijving |
| T | 1 | 0 | Type |
| U | 0 | 4444 | User Identificatie Control |
| E | 0 | 1 | aantal data-elementen |
| I | 1 |  | Index verwijzing per dimensie |
| MIN | 0 |  | Minimum data-elementwaarde |
| MAX | 0 |  | Maximum data-elementwaarde |
| ITYPE | 1 |  | Index data-element type |
| F | 0 | 22 | Data-element formaat |
| S | 0 | 1 | Data-element stapgrootte |

Tabel 26 Object attributen DATUM

## Events

The objects VRI.LA and VRI.LB contains all relevant events that can occur in a TLC and made available over the IVERA-TLC interface. The APP.LA and APP.LB objects contains all relevant events that can occur in an application and made available over the IVERA-APP interface.

Since there is a split in functionality between IVERA-APP and IVERA-TLC, some events will be expected on only one of the interfaces, while other events may be expected on both interfaces.

This section contains definition of new events, changed events and for each event a definition for which interface it may be expected.

New or changed events are marked in *italic*.

The expected interface is marked with (T) for IVERA-TLC and/or (A) for IVERA-APP.

Detail info and presence in APP.A or VRI.A is omitted for all events that have not been changed (marked with shaded cells). For further details of these events please refer to IVERA Objectdefinitie Verkeersregelinstallaties (versie 3.01), [Ref 4].

### Categories

The following table gives an overview of the different event categories.

|  |  |  |
| --- | --- | --- |
| Eventcode | Omschrijving | Interface(A/T) |
| 1000..1999 | I/O-events | T |
| 2000..2999 | Programma-events/fouten | A/T |
| 3000..3999 | Bewakerevents/fouten | T |
| 4000..4999 | Resetevents | A/T |
| 5000..5999 | Commando-events | A/T |
| 6000..6099 | Datacommunicatie-events | A/T |
| 100000..199999 | Automaatspecifieke events. | T |
| 200000..299999 | Applicatiespecifieke events. | A |

### I/O events

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Code | Omschrijving | Detailinfo | APP.AVRI.A | Interface(A/T) |
| 1010 | Lampfout |  |  | T |
| 1020 | Detectiefout |  |  | T |
| 1030 | Akoestischefout |  |  | T |

### Program events

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Code | Omschrijving | Detailinfo | APP.AVRI.A | Interface(A/T) |
| 2000 | Programma event |  |  | A/T |
| 2001 | VRI status wijziging |  |  | T |
| 2002 | Programmaomschakeling |  |  | A/T |
| 2003 | Brugingreep |  |  | A |
| 2004 | Brandweeringreep |  |  | A |
| 2005 | AHOB melding |  |  | A |
| 2500 | Fasebewaking |  |  | A |
| 2501 | GUS-WUS fouten CVN C-interface |  |  | A |
| 2502 | Rekentijdproblemen |  |  | A |
| 2503 | Garantietijdonderschrijding |  |  | A |
| 2504 | Maximumtijdoverschrijding |  |  | A |
| 2505 | Start niet kunnen regelen door storing |  |  | A |
| 2506 | Einde niet kunnen regelen door storing |  |  | A |
| 2510 | Overig Logboek 90% vol grens bereikt. |  |  | A/T |
| 2511 | VRI.LA Logboek 90% vol grens bereikt. |  |  | T |
| 2512 | PAR.LA Logboek 90% vol grens bereikt. |  |  | A/T |
| 2513 | OV.LA Logboek 90% vol grens bereikt. |  |  | A |
| *2514* | *APP.LA Logboek 90% vol grens bereikt* |  |  | *A* |
| 2600 | Seriële koppeling - ontbreken levensignaal. |  |  | A/T |
| 2601 | Seriële koppeling - geen communicatie. |  |  | A/T |
| 2700 | Onderspanningsmelding |  |  | T |
| 2701 | Bovenspanningsmelding |  |  | T |
| ~~2702~~*~~[[3]](#footnote-3)~~* | ~~Telefoonnummer centrale kwijt~~ |  |  |  |

### Supervisor events

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Code | Omschrijving | Detailinfo | APP.AVRI.A | Interface(A/T) |
| 3000 | Algemeen bewakerevent |  |  | T |
| 3001 | Conflict |  |  | T |
| 3002 | Lampfout |  |  | T |
| 3003 | Meer dan 1 kleur |  |  | T |
| 3004 | Geelknipperfout |  |  | T |
| 3005 | Garantietijdonderschrijding |  |  | T |
| 3006 | Maximumtijdoverschrijding |  |  | T |
| 3007 | Fout in eindschakelaar |  |  | T |
| 3008 | Witknipperfout |  |  | T |
| 3009 | Halfconflict OV |  |  | T |
| 3010 | Volgordebewaking |  |  | T |

### Reset events

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Code | Omschrijving | Detailinfo | APP.AVRI.A | Interface(A/T) |
|  |  |  |  |  |
| 4000 | Algemeen resetevent |  |  | A/T |
| 4001 | Reset van alle storingen |  |  | A/T |
| 4002 | Reset van detectiealarmen |  |  | T |
| 4003 | Reset van lampfouten |  |  | T |
| 4004 | Reset van applicatiefouten |  |  | A |
| 4005 | Reset van tellers |  |  | A |
| 4006 | Reset teller applicatiefouten |  |  | A |
| 4007 | Reset teller aantal GUS-WUS fouten |  |  | A |
| 4008 | Reset teller fasebewakingsfouten |  |  | A |
| 4009 | Reset teller executietijdoverschrijdingen |  |  | A |
|  |  |  |  |  |
| 4010 | Netspanning uitsterfbericht |  |  | T |
| 4011 | Opstartbericht |  |  | T |
| 4012 | Deur open politie paneel |  |  | T |
| 4013 | Deur open wegbeheerder |  |  | T |
| 4014 | Deur open energie compartiment |  |  | T |
| 4015 | Testbericht noodkreetmelder |  |  | T |
| 4016 | Noodstroomvoedingbericht |  |  | A/T |
|  |  |  |  |  |
| 4022 | ‘Aanvraag toestemming lokaal’ is gedaan door gebruiker bij VRI. |  |  | T |
| 4023 | ‘Aanvraag toestemming lokaal’ is ingetrokken door gebruiker bij VRI. |  |  | T |
|  |  |  |  |  |

### Command events

These events are used by an IVERA master to send commands to IVERA slaves using the VRI.C object

|  |  |  |
| --- | --- | --- |
| Code | Omschrijving | Interface(A/T) |
|  |  |  |
| 5001 | Test putsarmatuur | T |
|  |  |  |
| 5022 | Geeft de VRI toestemming om naar lokaal bedrijf te gaan. Er wordt niet meer geluisterd naar de programmawens van de centrale maar van de lokale bediening / weekautomaat. | T |
| 5023 | Opheffen toestemming lokaal bedrijf. De VRI luistert alleen naar de wens van de programmawens van de centrale. Deze wens is vastgelegd in elementnr. 2 van resp. VRISTAT en VRIPROG. Afhankelijk van de implementatie in de VRI wordt hier al of niet gehoor aan gegeven. | T |
|  |  |  |
| 5100..5199 | Gewenste VRI-status vanuit centrale | T |
| 5200..5299 | Gewenste programmanummer vanuit centrale | T |
| 5300..5399 | Gewenste subprogrammanummer vanuit centrale | T |
|  |  |  |
| 5990 | Geeft VRI opdracht een warme herstart uit te voeren | A/T |
|  |  |  |
| 9990 | Geeft VRI opdracht een warme herstart uit te voeren (verouderd) | T |
|  |  |  |

### Data communication events

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Code | Omschrijving | Detailinfo | APP.AVRI.A | Interface(A/T) |
| 6000 | Testtrigger |  |  | A/T |
| 6001 | Begin fysieke verbinding  |  |  | A/T |
| 6002 | Einde fysieke verbinding |  |  | A/T |
| 6003 | Poging tot inbreuk IVERA |  |  | A/T |
| 6004 | Uitbellen naar centrale |  |  | A/T |
| *6005* | *Login IVERA* |  |  | *A/T* |
| 6006 | Logout IVERA |  |  | A/T |
| *6012* | *Deur open politie paneel* | *0 = gesloten, 1 = open* |  | *T* |
| *6013* | *Deur open wegbeheerder* | *0 = gesloten, 1 = open* |  | *T* |
| *6014* | *Deur open energie compartiment* | *0 = gesloten, 1 = open* |  | *T* |
| *6023* | *Poging tot inbreuk TLC-FI* |  |  | *T* |
| *6025* | *TLC-FI verbonden* |  |  | *A/T* |
| *6026* | *TLC-FI verbroken* |  |  | *A/T* |
| *6027* | *Configuratiefout TLC-FI* |  |  | *A/T* |
| *6041* | *Ivera gebruiker aangemaakt* |  |  | *A/T* |
| *6042* | *Ivera gebruiker verwijderd* |  |  | *A/T* |
| *6043* | *Ivera gebruiker gewijzigd* | *1 = naam, 2 = wachtwoord, 3 = gebruikersgroep* |  | *A/T* |
| *6051* | *TLC-FI gebruiker aangemaakt* |  |  | *A/T* |
| *6052* | *TLC-FI gebruiker verwijderd* |  |  | *A/T* |
| *6053* | *TLC-FI gebruiker gewijzigd* | *1 = naam, 2 = wachtwoord, 3 = type* |  | *A/T* |
| *6061* | *RIS-FI gebruiker aangemaakt* |  |  | *A/T* |
| *6062* | *RIS-FI gebruiker verwijderd* |  |  | *A/T* |
| *6063* | *RIS-FI gebruiker gewijzigd* | *1 = naam, 2 = wachtwoord, 3 = type* |  | *A/T* |

1. The description is in Dutch. It is a copy from the specification which is written in Dutch. [↑](#footnote-ref-1)
2. Note that the format 401 is used by several IVERA objects that need access to URI’s. It is defined once in this document and referred back to when needed. [↑](#footnote-ref-2)
3. This event is obsolete, the iTLC is expected to communicate using broadband technology [↑](#footnote-ref-3)