

iVRI Interfaces Ivera-App and Ivera- TLC

IRS IDD Ivera 4.0-APP version 2.1, IRS IDD
Ivera 4.0-TLC version 2.1



Over deze publicatie

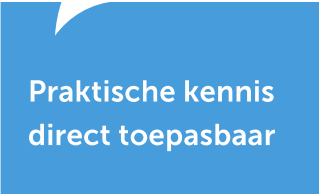
De internationale ontwikkeling van Smart Mobility zorgt voor flinke vernieuwingen in verkeer, vervoer en mobiliteit. Dit raakt direct ook de verkeersregelinstallaties in de Nederlandse steden en provincies en op rijkswegen. Als verkeersregelinstallaties kunnen communiceren met voertuigen en weggebruikers kunnen weggebruikers worden geïnformeerd over actuele fasewisselingen van verkeersregelinstallaties en hierop hun rijgedrag vroegtijdig aanpassen, kunnen doelgroepen als openbaar vervoer, nood- en hulpdiensten en vrachtwagens conform beleidswensen van overheden worden geprioriteerd en kan data van voertuigen zelf worden gebruikt voor betere netwerkregelingen. Dit bevordert doorstroming, bereikbaarheid, verkeersveiligheid en duurzaamheid, legt de basis voor connected en automated driving en speelt in op een digitale samenleving waarin data en connectiviteit bijdragen aan economisch aantrekkelijke en duurzame steden.

Voor het effectief, veilig en leveranciers- en overheidsonafhankelijk communiceren van intelligente verkeersregelinstallaties (iVRI's) met voertuigen en weggebruikers hebben bedrijven en overheden in het Innovatiepartnership Talking Traffic binnen internationale standaarden gezamenlijk specificaties en koppelvlakken voor iVRI's vastgelegd. Eenduidig gebruik door alle overheden en betrokken bedrijven van deze uniforme afspraken binnen internationale standaarden is noodzakelijk voor interoperabiliteit en een goede en betrouwbare werking. Deze standaarden zijn daarom vastgesteld door de landelijke publiek-private Strategic Committee 'Borgen en beheren iVRI standaarden en producten'. Na vaststelling gelden deze standaarden voor alle bedrijven en overheden die in Nederland (willen gaan) werken aan iVRI's t.b.v. intelligente mobiliteit. Vanuit de rol van onafhankelijk en landelijk kennisinstituut verzamelt CROW deze landelijk vastgestelde standaarden en stelt deze transparant ter beschikking aan overheden, adviesbureaus en leveranciers.

About this publication

The international developments in Smart Mobility technology are boosting innovations for traffic, transportation and mobility. This has a direct effect on traffic control systems in Dutch cities and provinces, as well as national highways. When traffic controllers are able to communicate with vehicles and road users, the latter can be informed about real-time phase changes in traffic lights, enabling them to anticipate and adjust driving behaviour accordingly. Also, special interest groups, such as emergency services, public transport and freight carriers, can be prioritized in line with public policy guidelines. The data provided by vehicles themselves can be utilised to improve network-based traffic control programmes. This has a positive effect on flow, accessibility, traffic safety and sustainability, laying out the fundamentals for connected and automated driving and preparing for a digital society in which data and connectivity contribute to economically viable and sustainable cities.

In order to let intelligent traffic controllers (iVRI) communicate with vehicles and road users in an effective, safe and platform independent way, businesses and governments have created and recorded common specifications and interfaces for iVRI technology. These are compliant to international standards and developed within the framework of the Talking Traffic Innovation partnership. The unambiguous use of these uniform agreements, within international standards, by all governmental bodies and businesses is necessary for interoperability and a good and reliable operation. These standards are adopted by the national public-private Strategic Committee 'Ensuring and maintaining iVRI standards and products'. After adoption, these standards apply to all businesses and governmental bodies in the Netherlands that work, or plan to work, on iVRI technology for intelligent mobility purposes. Being an independent national knowledge institute, CROW collects these national standards and provides them to governments, consultants and suppliers in a transparent way.



Praktische kennis
direct toepasbaar

iVRI Interfaces Ivera-App and Ivera-TLC

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:

Version	Date	Author	Comment
0.1	2015-10-01	WG3	Initial version
1.0	2015-12-14	WG3	Initial Draft
1.1	2016-01-20	WG3	Final Draft
1.2	2016-01-28	WG3	Final Draft
1.3	2016-08-30	WG3/WG security	Security requirements and Comments
1.4	2016-08-30	WG3	Rework and comments
1.5	2016-09-01	WG3	Rework WG3 meeting
1.6	2016-09-06	WG3	Comments
1.7	2016-09-08	WG3	Rework WG3 meeting
2.0	2016-09-09	WG3	Final
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1 Introduction

1.1 System Overview

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

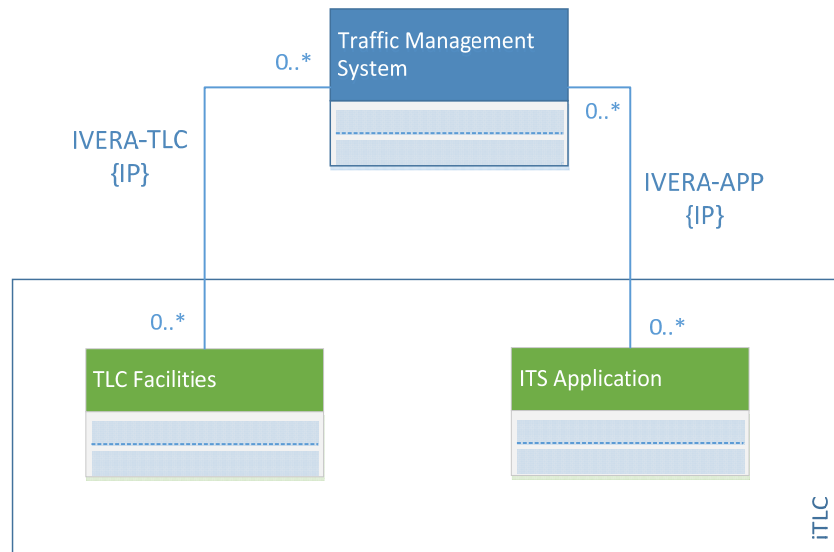


Figure 1 Functional model

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.

1.2 Document overview

1.2.1 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.

1.2.2 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

1.3 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)

2 References

2.1 Normative

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

2.2 Informative

ID	Reference
[Ref 8]	Uniform resource identifier (URI) https://nl.wikipedia.org/wiki/Uniform_resource_identifier

3 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.

4 Requirements

4.1 Introduction

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

4.1.1 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.

4.2 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.

4.3 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 0 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 0, 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.

4.4 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 0, 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: <ul style="list-style-type: none"> - 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.

4.5 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	IVERA-APP	IVERA-TLC	Mandatory
KTIJD	Kalendertijd		X	
<i>TIJD</i>	<i>Actuele systeemtijd</i>	X	X	
<i>DATUM</i>	<i>Actuele systeemdatum</i>	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	
VRID	Automaatidentificatie		X	
VRID.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	Programmalijsjt.		X	
VRIPROGLYSTEXT	Uitgebreide programmalijsjt		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	

¹ The description is in Dutch. It is a copy from the specification which is written in Dutch.

Name	Description ¹	IVERA-APP	IVERA-TLC	Mandatory
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		
CIFPARAM1	CIF parameter tabel 1	X		
CIFPARAM2	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	

Name	Description ¹	IVERA-APP	IVERA-TLC	Mandatory
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	Signaalgroepstoestand (ext)		X	
SGI.A	Signaalgroepstoestand (int)	X		
TSGE.A	Timer signaalgroepstoestand (ext)		X	
TSGI.A	Timer signaalgroepstoestand (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	

Name	Description ¹	IVERA-APP	IVERA-TLC	Mandatory
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 storingslijst		X	
PAR.LB	Parameterlogboek	X	X	
PAR.LA	Parameterlogboek (onb).	X	X	
TELIST	Instellingen telprogramma		X	
TELDATA	Data telprogramma		X	
TELMON	Actuele data telprogramma		X	
DATAKOM	<i>Instelling datacommunicatie</i>	X	X	
DATAKOM.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	

Name	Description ¹	IVERA-APP	IVERA-TLC	Mandatory
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		

Name	Description ¹	IVERA-APP	IVERA-TLC	Mandatory
APP.LB	Logboek met meldingen van ITS-Applicatie	X		
APP.A	Actieve storingslijst	X		
X* (X-objecten)	TLC Fabrikant specifieke objecten		X	
Y* (Y-objecten)	APP specifieke objecten	X		

Tabel 1 Object allocation

4.6 IVERA connections

4.6.1 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	

4.6.2 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.

4.7 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	

4.8 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

4.9 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: <ol style="list-style-type: none"> 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. <p><i>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.</i></p>

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.

5 Detailed design

5.1 General

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

5.2 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.

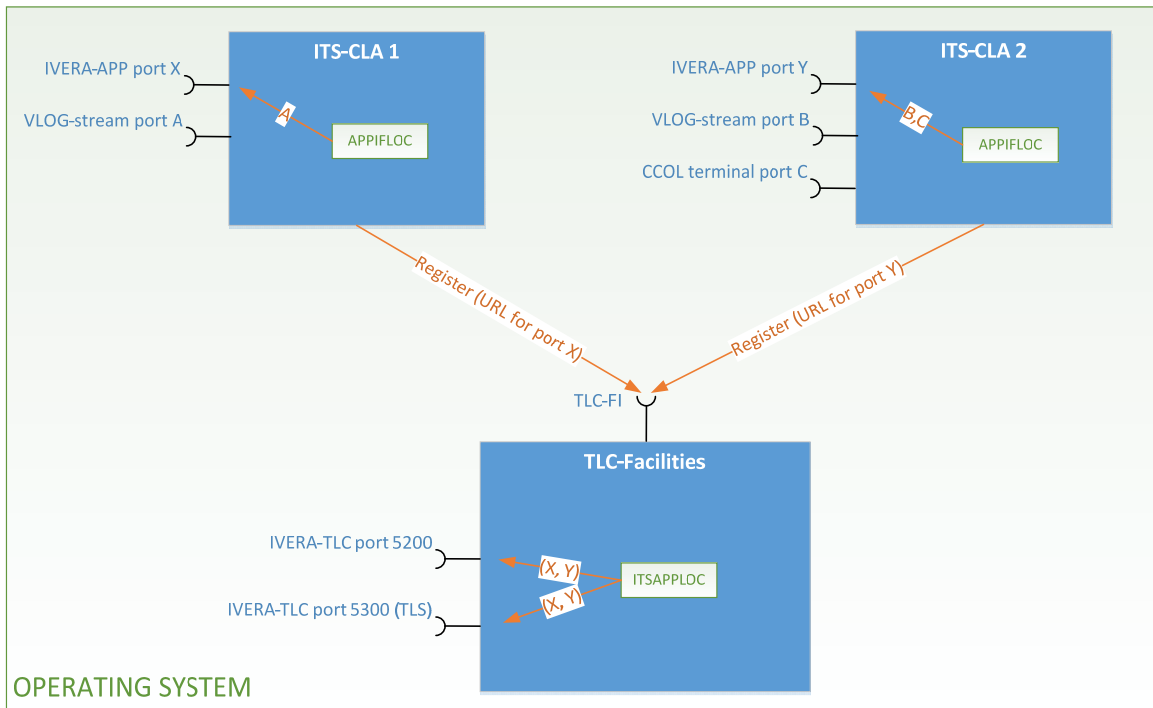


Figure 2 resolving connection points of ITS-A

5.2.1 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, 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=""

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.

5.3 Management Interface ITS Application

5.3.1 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	Applicatiennaam
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

5.3.2 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","","",""

5.3.3 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

5.3.4 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","",""

5.3.5 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

5.3.6 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

5.3.7 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

5.3.8 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

5.3.9 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,"

5.3.10 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=""

5.4 IVERA connections

5.4.1 Master to Slave (object management)

Master to slave management principle is not changed.

5.4.2 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:

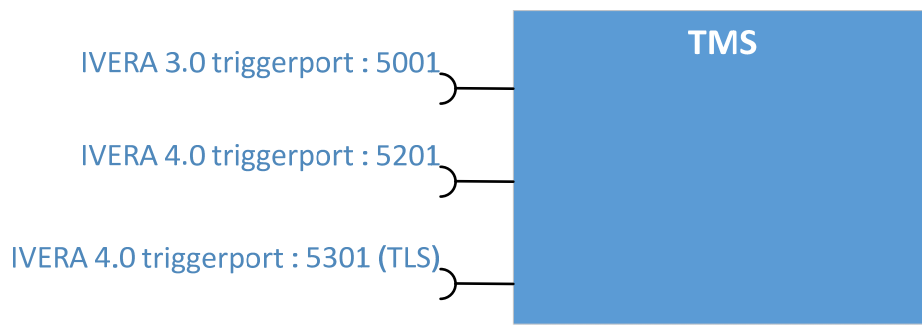


Figure 3 Trigger ports on TMS

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 message BerichtSlaveAckHand 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)

5.5 Application and User management

5.5.1 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.

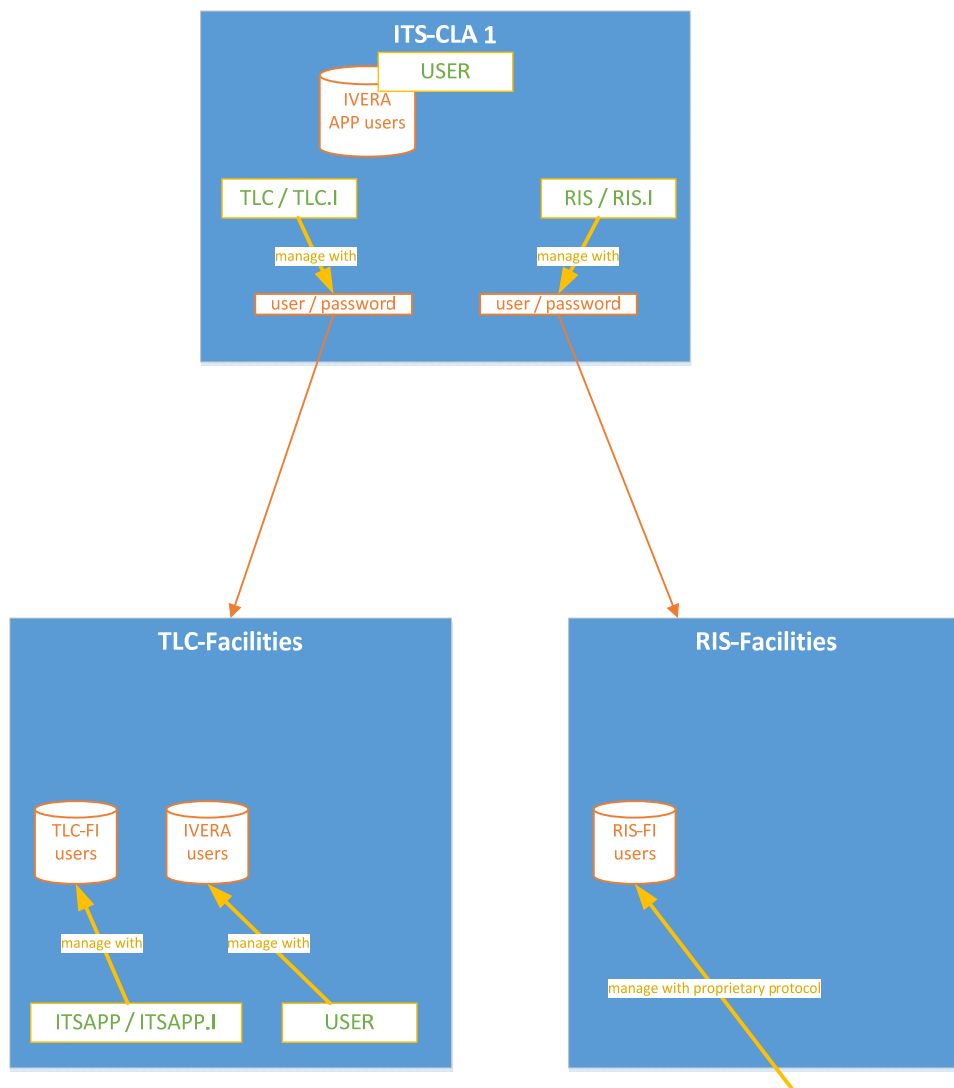


Figure 4 Object relations and users

5.5.2 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

5.5.3 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=""
```

5.5.4 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"
```

5.5.5 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

5.5.6 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"
```

5.6 RIS-FI User management

5.6.1 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

5.6.2 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"
```

5.7 IVERA User Management

5.7.1 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:

- USER/#0 is always an administrator.
- 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"
```

5.7.2 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=""
```

5.8 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 Verkeersregelinstantaties (versie 3.01) will apply to the SFTP users.

5.9 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

5.10 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 Verkeersregelininstallaties (versie 3.01), [Ref 4].

5.10.1 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

5.10.2 I/O events

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

5.10.3 Program events

Code	Omschrijving	Detailinfo	APP.A VRI.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	<i>APP.LA Logboek 90% vol grens bereikt</i>			A
2600	Seriële koppeling - ontbreken levenssignaal.			A/T
2601	Seriële koppeling - geen communicatie.			A/T
2700	Onderspanningsmelding			T
2701	Bovenspanningsmelding			T
2702³	Telefoonnummer centrale kwijt			

³ This event is obsolete, the iTLC is expected to communicate using broadband technology

5.10.4 Supervisor events

Code	Omschrijving	Detailinfo	APP.A VRI.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

5.10.5 Reset events

Code	Omschrijving	Detailinfo	APP.A VRI.A	Interface (A/T)
4000	Algemeen resetevent			A/T
4001	Reset van alle storingen			A/T
4002	Reset van detectiealarmeren			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 uitsterbericht			T
4011	Opstartbericht			T
4012	Deur open politie paneel			T
4013	Deur open wegbeheerder			T
4014	Deur open energie compartiment			T
4015	Testbericht nooddrekmelder			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

5.10.6 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

5.10.7 Data communication events

Code	Omschrijving	Detailinfo	APP.A VRI.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

Colophon

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