



BSI Standards Publication

Intelligent transport systems — Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV)

Part 5: Generic vehicle information

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National foreword

This British Standard is the UK implementation of ISO 15638-5:2013.

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**Intelligent transport systems —
Framework for collaborative Telematics
Applications for Regulated commercial
freight Vehicles (TARV) —**

**Part 5:
Generic vehicle information**

*Systèmes intelligents de transport — Cadre pour applications
télématiques collaboratives pour véhicules de fret commercial
réglementé (TARV) —*

Partie 5: Informations génériques sur le véhicule





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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*

ISO 15638 consists of the following parts, under the general title *Intelligent transport systems — Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV)*:

- *Part 1 Framework and architecture*
- *Part 2: Common platform parameters using CALM*
- *Part 3: Operating requirements, 'Approval Authority' procedures, and enforcement provisions for the providers of regulated services*
- *Part 5: Generic vehicle information*
- *Part 6: Regulated applications* [Technical Specification]
- *Part 7: Other applications*
- *Part 8: Vehicle access monitoring (VAM)* [Technical Specification]
- *Part 9: Remote electronic tachograph monitoring (RTM)* [Technical Specification]
- *Part 10: Emergency messaging system/eCall (EMS)* [Technical Specification]
- *Part 11: Driver work records (work and rest hours compliance) (DWR)* [Technical Specification]
- *Part 12: Vehicle mass monitoring (VMM)* [Technical Specification]
- *Part 14: Vehicle access control (VAC)* [Technical Specification]
- *Part 15: Vehicle location monitoring (VLM)* [Technical Specification]
- *Part 16: Vehicle speed monitoring (VSM)* [Technical Specification]

- *Part 17: Consignment and location monitoring (CLM)* [Technical Specification]
- *Part 18: ADR (Dangerous Goods) transport monitoring (ADR)* [Technical Specification]
- *Part 19: Vehicle parking facilities (VPF)* [Technical Specification]

The following parts are under preparation:

- *Part 4: System security requirements* [Technical Specification]
- *Part 13: Mass Penalties and Levies (VMC)*

Introduction

Many *ITS* technologies have been embraced by commercial transport operators and freight owners, in the areas of fleet management, safety and security. Telematics applications have also been developed for governmental use. While the regulatory services in use or being considered varies from country to country, these include services such as charging, digital tachograph, hazardous goods tracking and e-call. Additional applications with a regulatory impact being developed include access monitoring, on-board mass monitoring, fatigue management, speed monitoring and heavy vehicle charging based on mass, location, distance and time.

In such an emerging environment of regulatory and commercial applications, it is timely to consider an overall architecture (business and functional) that could support these functions from a single platform within a commercial vehicle that operate within such regulations. Such International Standards will allow for a speedy development and specification of new applications that build upon the functionality of a generic specification platform. This suite of standards deliverables describes and defines the framework and requirements so that the *in-vehicle system* [4.7] can be commercially designed in an open market to meet common requirements.

This suite of standards deliverables will provide the basis for future development of cooperative telematics applications for *regulated commercial freight vehicles* [4.14]. Many elements to accomplish this are already available. Existing relevant standards will be referenced, and the specifications will use existing standards (such as *CALM*) wherever practicable.

This suite of standards deliverables will also allow for a powerful platform for highly cost-effective delivery of a range of telematics applications for *regulated commercial freight vehicles* [4.14].

Finally, a business architecture based on a (multiple) *service provider* [4.15] oriented approach will also require consideration of legal and regulatory aspects for the *approval authority* [4.3] approval and auditing of *service providers* [4.7].

This suite of standards deliverables is timely as many governments (Europe, North America, Asia and Australia/New Zealand) are considering the use of telematics for a range of regulatory purposes. Ensuring that a single in-vehicle platform can deliver a range of services to both government and industry through open standards and competitive markets is a strategic objective.

This suite of standards deliverables addresses and defines the framework for a range of cooperative telematics applications for *regulated commercial freight vehicles* [4.14] (such as access monitoring, driver fatigue management, speed monitoring, on-board mass monitoring and charging). The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative *ITS* service platform. The framework will be based on a (multiple) *service provider* [4.15] oriented approach provisions for the *approval authority* [4.3] approval and auditing of *service providers*.

This part of the ISO 15638 family of standards deliverables provides specifications for generic *basic vehicle data* [4.4] that it is required for all *IVSs* to support and make available to application *service providers* [4.15] using the *IVS* wireless communications link(s), in order to support the provision of regulated and commercial application services for *TARVs*; and provides *basic vehicle data* for cooperative intelligent transport systems.

NOTE The definition of what comprises a 'regulated' vehicle is regarded as an issue for national decision, and may vary from country to country. This suite of standards deliverables does not impose any requirements on nations in respect of how they define a regulated vehicle.

NOTE The definition of what comprises a 'regulated' service is regarded as an issue for national decision, and may vary from country to country. This suite of standards deliverables does not impose any requirements on nations in respect of which services for regulated vehicles countries will require, or support as an option, but will provide standardised sets of requirements descriptions for identified services to enable consistent and cost efficient implementations where implemented.

NOTE Cooperative *ITS* applications, in this context, are defined as the use of an in-vehicle *ITS* platform to meet both commercial and regulatory needs from a (functionally) single on-board platform.

Intelligent transport systems — Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) —

Part 5: Generic vehicle information

1 Scope

This part of ISO 15638 defines generic basic vehicle and *core application data* [4.5] provision to application *service providers* [4.15] to be supported by *in-vehicle system* [4.7] (IVS) for cooperative telematics applications for *regulated commercial freight vehicles* [4.14] (TARV), and to provide *basic vehicle data* [4.4] for cooperative intelligent transport systems.

This part of ISO 15638 provides the specifications for generic *basic vehicle data* [4.4] that it is required for all TARV IVSs to support and make available to application *service providers* [4.15] via a wireless communications link supported by the IVS, in order to support the provision of regulated and commercial application services.

Some further data concepts, while not required in all cases for every TARV in every *jurisdiction* [4.9], may be required generically for all equipment within a particular *jurisdiction* [4.9], or class of TARV within a *jurisdiction* [4.9], in order for the *jurisdiction* to achieve its regulation of TARVs.

Equipped vehicles operating internationally will need to carry all of the additional data concepts required by all of the *jurisdictions* [4.9] within which they operate, in order to determine their *core application data* [4.5]. This part of ISO 15638 provides standard definitions for these commonly expected additional data concepts.

A second set of (largely complementary) 'basic vehicle' data is required to support interoperable cooperative intelligent transport systems and this is also determined and provided within this part of ISO 15638. The framework architecture and many of the protocols are common between both (TARV and C-ITS) sets of requirements, and also with those being adopted by the wider cooperative ITS sector.

2 Conformance

This part of ISO 15638 defines specifications for generic *basic vehicle data* [4.4] that it is required for all IVSs to support and make available to application *service providers* [4.15] using the IVS wireless communications link(s), in order to support the provision of regulated and commercial application services for TARVs; and provides *basic vehicle data* for cooperative intelligent transport systems., and has no specific conformance tests defined herein, however Clause 10 specifies which tests may be required. Some aspects defined within may have conformance tests defined in other parts of ISO 15638.

Conformance to any other International Standard or specification referenced in this part of ISO 15638 shall be ascertained according to the requirements of the referenced deliverable.

Conformance to this part of ISO 15638 is therefore a matter of self-declaration of compliance, or by submission to a test house to ascertain that the provisions of the clauses of this part of ISO 15638 have been adhered to.

The protocols defined in this part of ISO 15638 have been independently tested. Annex C (Informative) provides results of these tests. In any conformance assurance process undertaken by candidate systems, where appropriate the results may be used as part of its process of conformance compliance.

3 Normative references

The following referenced documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3166-1	<i>Codes for the representation of names of countries and their subdivisions — Part 1: Country codes</i>
ISO 3166-2	<i>Codes for the representation of names of countries and their subdivisions — Part 2: Country subdivision codes</i>
ISO 3779	<i>Road vehicles — Vehicle identification number (VIN) -- Content and structure</i>
ISO/IEC 8824-1	<i>Information processing systems — Open Systems Interconnection — Specification of abstract syntax notation one (ASN.1) — Part 1: Specification of the Basic Notation</i>
ISO/IEC 8824-2	<i>Information processing systems — Open Systems Interconnection — Specification of abstract syntax notation one (ASN.1) — Part 2: Information Object Specification</i>
ISO/IEC 8824-3	<i>Information processing systems — Open Systems Interconnection — Specification of abstract syntax notation one (ASN.1) — Part 3: Constraint Specification</i>
ISO/IEC 8824-4	<i>Information processing systems — Open Systems Interconnection — Specification of abstract syntax notation one (ASN.1) — Part 4: Parameterisation of the ASN.1 Specifications</i>
ISO/IEC 8825-2	<i>Information technology — ASN.1 encoding rules: Specification of Packed Encoding Rules (PER)</i>
ISO 10918-1	<i>Information technology — Digital compression and coding of continuous-tone still images: Requirements and guidelines).</i>
ISO 13183	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — Broadcast communications</i>
ISO 14816	<i>Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structure</i>
ISO 15638-1	<i>Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 1: Framework and architecture</i>
ISO 15638 -2	<i>Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Common platform parameters using CALM</i>
ISO 15638 -3	<i>Framework for cooperative telematics applications for regulated commercial freight vehicles TARV — Operating requirements, 'Approval authority' procedures, and enforcement provisions for the providers of regulated services</i>
ISO 15638 -4	<i>Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — System security requirements</i>
ISO 17262	<i>Intelligent transport systems — Automatic vehicle and equipment identification — Numbering and data structures</i>
ISO 21210	<i>Intelligent transport systems — Communications access for land mobiles — IPv6 Networking</i>

ISO 21212	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — 2G Cellular systems</i>
ISO 21213	<i>(CALM) — 3G Cellular systems</i>
ISO 21214	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — Infra-red systems</i>
ISO 21215	<i>Intelligent transport systems — Communications access for land mobiles (CALM) -- M5</i>
ISO 21216	<i>Intelligent transport systems — Wireless communications — CALM using millimetre communications — Air interface</i>
ISO 21217	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture</i>
ISO 21218	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — Medium service access points</i>
ISO 25111	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — General requirements for using public networks</i>
ISO 25112	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — Mobile wireless broadband using IEEE 802.16</i>
ISO 25113	<i>(CALM) — Mobile wireless broadband using HC-SDMA</i>
ISO TS 26683-2	<i>Intelligent transport systems — Freight land conveyance content identification and communication — Part 2: Application interface profiles</i>
ISO 29281	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — Non-IP networking</i>
ISO 29282	<i>Intelligent transport systems — Communications access for land mobiles (CALM) — Applications using satellite networks</i>
ISO 29283	<i>ITS CALM Mobile Wireless Broadband applications using Communications in accordance with IEEE 802.20</i>
ETSI TS 102 894	<i>Intelligent Transport System (ITS);Users & Applications requirements;Facility layer structure, functional requirements and specifications;Facility layer structure, functional requirements and specifications</i>
ETSI TS 102 890-1	<i>Intelligent Transport Systems (ITS);Facilities layer function;Communication Management specification Facilities Communication Management</i>
ETSI TS 102 890-2	<i>Intelligent Transport Systems (ITS);Facilities layer function;Services announcement specification-Facilities Service Announcement</i>
EN 302 895	<i>Intelligent Transport Systems (ITS);Vehicular Communications;Basic Set of Applications; Local Dynamic Map (LDM) Specification</i>

4 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15638-1 and the following apply.

4.1

A/D voltage

analogue to digital converter voltage

4.2
application service
service provided by a *service provider* [4.15] accessing data from the *IVS* of a *regulated commercial freight vehicle* [4.14] via a wireless communications network

4.3
approval authority
organization (usually independent) which conducts 'Approval Authority' approval and ongoing audit for *service providers* [4.15]

4.4
basic vehicle data
data maintained/provided by all *IVS*

4.5
core application data
basic vehicle data [4.4] plus any additional data required to provide an implemented *regulated application services* [4.13]

4.6
G's
gravitational force
object's acceleration relative to free-fall

4.7
in-vehicle system (IVS)
equipment on-board a vehicle that can provide the specified telematics functionality

NOTE This equipment may comprise a single physical *on-board unit* [4.11], or a telematics functionality within one or multiple equipments on-board a vehicle

4.8
Java™
object oriented open source operating language developed by 'SUN Microsystems'™

4.9
jurisdiction
government, road or traffic authority which owns the '*regulatory applications*' [4.12]

EXAMPLE Country, state, city council, road authority, government department (customs, treasury, transport), etc.

4.10
local data tree
LDT
frequently updated data concept stored in the on-board data pantry containing a collection of data values deemed essential for either a) *TARV regulated applications* [4.12], or b) cooperative intelligent transport systems

4.11
on-board unit
OBU
integrated telematics unit installed on-board which provides the specified telematics functionality required for the *IVS*

4.12
regulated/regulatory application
approval arrangement utilized by *jurisdictions* [4.9] for granting certain categories of commercial vehicles rights to operate in regulated circumstances subject to certain conditions

NOTE Each *jurisdiction* may use their own terminology including, but not limited to, permit, application, scheme, concession, exemption, gazettal and notice

4.13

regulated application service

TARV application service [4.2] that is mandated by a regulation imposed by a *jurisdiction* [4.9], or is an option supported by a *jurisdiction*

4.14

regulated commercial freight vehicle

vehicle designed to haul commercial freight that is subject to regulations determined by the *jurisdiction* [4.9] as to the use of the road system of the *jurisdiction* and the compliance with specific regulations for that class of *regulated commercial freight vehicle*, often through the provision of information via *TARV*

4.15

service provider

party which is approved by a *approval authority* [4.3] as suitable to provide regulated or commercial *ITS* services

4.16

unique vehicle identification

unambiguous identification of the vehicle

5 Symbols (and abbreviated terms)

ACK

acknowledgement

API

application program interface

app

application programme

AS

application service

CALM

communications access for land mobiles

C-ITS

cooperative intelligent transport systems

CVIS

'Cooperative Vehicle-Infrastructure Systems' (EC Project)

DDS

distributed directory service

FOAM

framework for open applications (standards deliverable within CVIS)

G

gravitational force

GNSS

global navigation satellite system

HMC

host management centre

ITS
intelligent transport systems

IVS
in-vehicle system [4.7]

LDM
local dynamic map

LDT
local data tree [4.10]

JAVA
JAVA™ [4.8]

OBU
on-board unit [4.11]

OEM
original equipment manufacturer

OMA
open mobile alliance

OSGi™
open services gateway initiative

PSP
prime service provider

RAM
random access memory

SI
Système international d'unité

ROAM
regime for open application management

TARV
telematics applications for *regulated commercial freight vehicles* [4.14]

URI
uniform resource identifier

UTC
universal time coordinated

6 General overview and framework

6.1 General overview

6.1.1 Context

6.1.1.1 Framework and architecture

ISO 15638-1 provides a framework and architecture for *TARV*. It provided a general description of the roles of the actors in *TARV* and their relationships.

Figure 1 shows the role model conceptual architecture showing the key actors and their relationships.

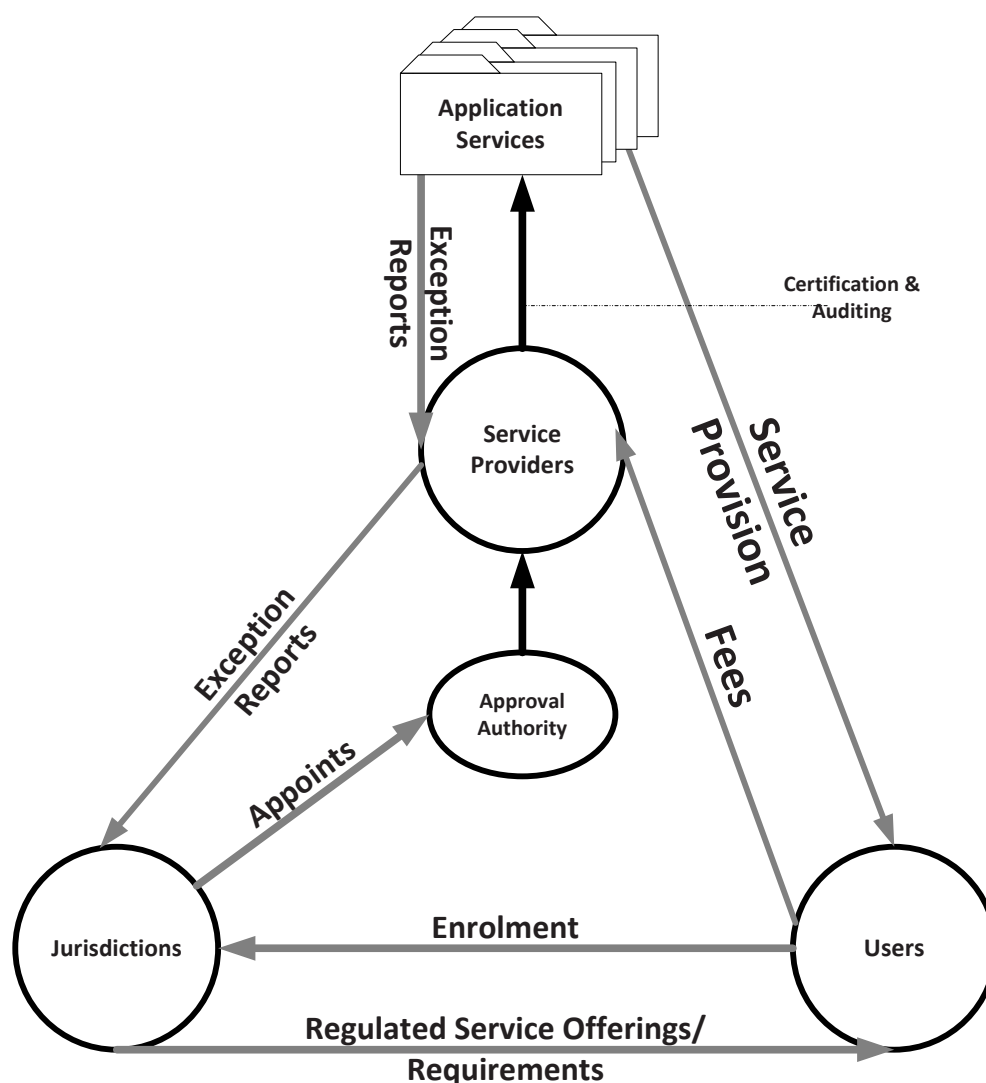


Figure 1 — Role model conceptual architecture
(Source: ISO 15638-1)

To understand more clearly the *TARV* framework in detail the reader is referred to ISO 15638-1.

ISO 15638 provides a suite of standards deliverables addresses and defines the framework for a range of cooperative telematics applications for regulated commercial freight vehicles (such as access monitoring, driver fatigue management, speed monitoring, on-board mass monitoring and charging). The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative *ITS* service platform. The framework is based on a (multiple) *service provider* [4.15] oriented approach provisions for the *approval authority* [4.3] approval and auditing of *service providers*.

ISO 15638 is comprised of seven framework parts and twelve application specific parts. The framework parts are:

- Part 1: Framework and architecture
- Part 2: Common platform parameters using CALM
- Part 3: Operating requirements, 'Approval Authority' procedures, and enforcement provisions for the providers of regulated services

- Part 4: System security requirements
- Part 5: Generic vehicle information
- Part 6: Regulated applications [Technical Specification]
- Part 7: Other applications

While specific *application services* [4.2], both regulated and commercial, will have their own application specific requirements for data provided by the *IVS* or harvested by the *IVS* from connected equipment and instruments, some generic data is required by many, if not most, and in some cases all, application services for regulated commercial vehicles.

It is therefore required that, while not designing the functionality or physical form of any *IVS* (which is considered a function of the marketplace or *jurisdictions* [4.9] who are regulating in order to implement), that the generic information known within the ISO 15638 suite of standards deliverables as *basic vehicle data* [4.4], shall be supported by all *IVSs*.

(for example, shall have a unique identifier, collect time and location data, etc.)

Some further data concepts, while not required in all cases for every *TARV* in every *jurisdiction* [4.9], may be required generically for all equipment within a particular *jurisdiction*, or class of *TARV* within a *jurisdiction*, in order for the *jurisdiction* to achieve its regulation of *TARVs*. A number of these data concepts, which are expected to frequently be required are, for reasons of interoperability, defined within this part of ISO 15638.

The combination of *basic vehicle data* [4.4] and those additional data concepts required within a particular *jurisdiction* [4.9] (or class of *TARVs*) are known as *core application data* [4.5] for that *jurisdiction*. *Basic vehicle data* [4.4] will therefore be found in all equipped *TARVs*, while *core application data* [4.5] will be found in all equipped *TARVs* (or class of *TARVs*) within a particular *jurisdiction*.

Equipped vehicles operating internationally will need to carry all of the additional data concepts required by all of the *jurisdictions* [4.9] within which they operate, in order to determine their *core application data* [4.5]. By providing standard definitions for these commonly expected additional data concepts, this will be easy to achieve and provide international interoperability.

This part (15638-5) provides definition for generic vehicle information, and simple means for authorised actors to download that information. This information comprises:

- *basic vehicle data* [4.4] provided by the *TARV LDT* [4.10]* for *TARV* applications (*local data tree* [4.10]);
- *basic vehicle data* [4.4] provided by the *C-ITS LDT* [4.10]* for cooperative intelligent transport systems (particularly cooperative safety related systems);
- *core application data* [4.5] which comprises *basic vehicle data* [4.4] (from the *TARV LDT* [4.10]) together with additional data requirements in a particular *jurisdiction* [4.9];
- Archive data, which enables the prime *service provider* [4.15] to maintain a complete record of data calculated and recorded on-board.

NOTE **LDT (local data tree* [4.10]) is a data concept stored in the on on-board data pantry containing a collection of data values deemed essential for either a) *TARV regulated applications* [4.12], or b) cooperative intelligent transport systems.

ISO 15638-1 (*TARV Framework and architecture*) recognises that different *jurisdictions* [4.9] will have different requirements and that they may require in addition to the *basic vehicle data* [4.4]. This additional data together with the *basic vehicle data* is known as *core application data* [4.5] or 'CoreData' within ISO 15638.

But within the global *TARV* context, for a transcontinental journey (examples UK to Russia via France, Belgium, Holland, Germany, Poland, Belarus; Hungary to France via Austria and Germany; China to Malaysia via Laos and Thailand etc.) it is impracticable to just rely on the user or *application service* [4.2] provider to both know and be able to technically provide the additional data to meet the requirements of all of the *jurisdictions* [4.9] of all of the transit countries, particularly as such requirements may also vary over time and from freight type to freight type.

Some of the data on-board the vehicle will also be commercially sensitive and measures need to be taken to prevent it being useful by, or accessed by, the wrong hands.

Further, and most importantly, in a 'co-operative *ITS*' environment, much of this data could be used by, or obtained from, other '*Apps*' on-board, and so it is not efficient just to simply define it as a constituent element of a single data concept *core application data* [4.5] or *basic vehicle data* [4.4] . There is nothing wrong with grouping data elements into data concepts such as *basic vehicle data* or *core application data*, but it is not efficient to have these elements only available within these defined major data concepts.

Finally, the security requirements are such that a common and secure provision for security needs to be provided on all cooperative *ITS* systems in order to both maintain security and offer interoperability, common use and reuse of data.

This data is calculated by *apps* in the on-board data library, and stored as discrete data concept values in the on-board 'data pantry'. The frequency of such updates is determined by the app. This part of ISO 15638 defines that additional *apps* in the library collate the data into two data concepts containing collated data element values:

- a) *TARV LDT* [4.10] values
- b) *C-ITS LDT* [4.10] values

A further app creates an archive of the history and values of data, stored in a file called 'RecentArchive'.

6.1.1.2 Data creation process and architecture

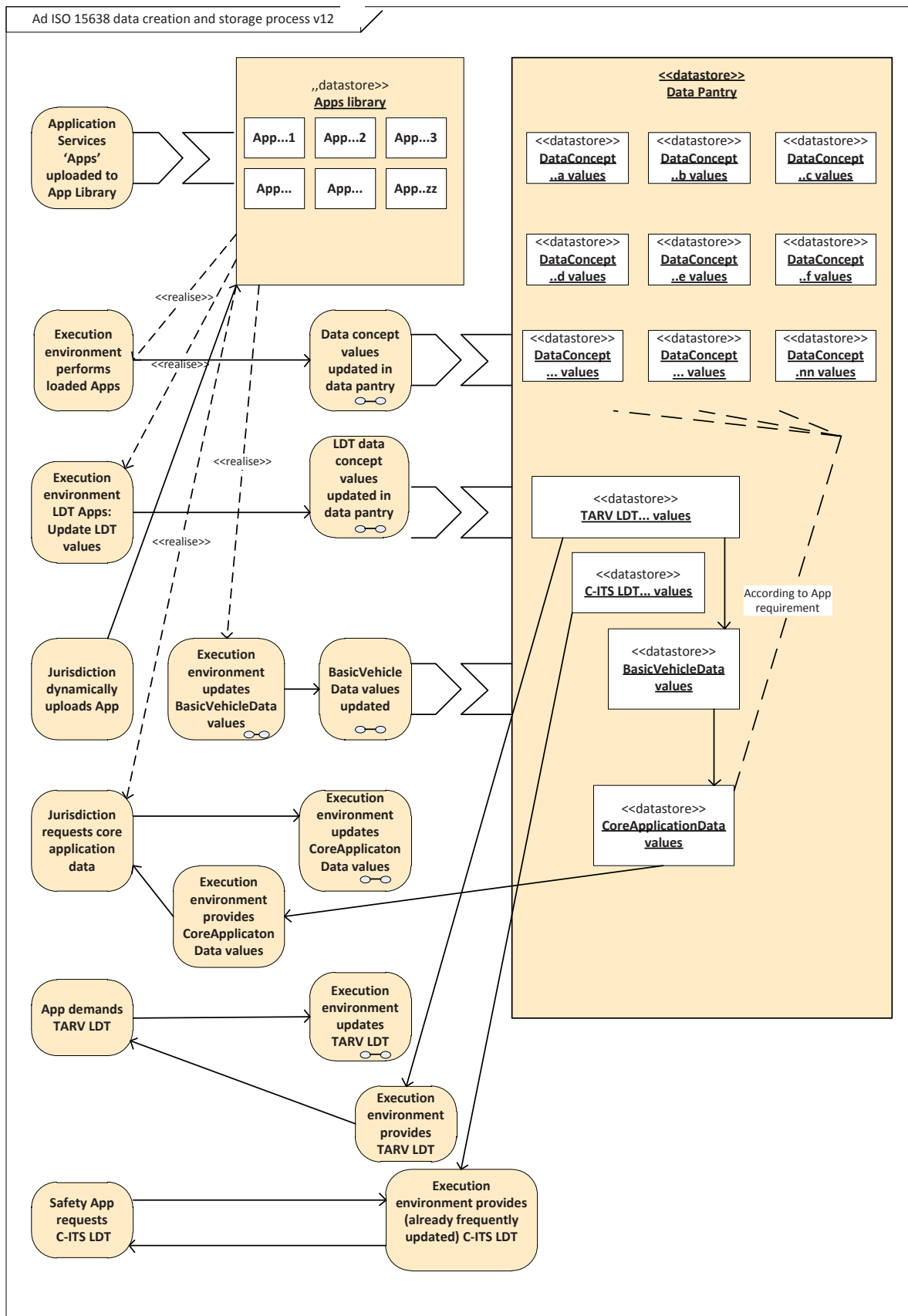


Figure 2 — The ISO 15638 data creation and storage process

Figure 2 shows *apps* being uploaded into the app library, and the execution environment running the *apps* and updating the data concept values in the data pantry. It shows the *LDT* [4.10] values being updated to the instructions of the appropriate *app*. It then shows a *jurisdiction* [4.9] uploading an app for its *core application data* [4.5], which then demands that the *core application data* concept values be updated. This is done. The *jurisdiction* then requests the *core application data* values which are supplied.

An example of an app demanding the *TARV LDT* [4.10] is then shown, with the app in the execution environment stimulating a refresh of the *TARV LDT* values, then supplying them to the application.

Finally the example of a safety app requesting the *C-ITS LDT* [4.10] is shown. As these safety events are frequently time critical, it is assumed that an app in the data library is ensuring that the data is always current, and so it is provided instantaneously on request.

6.1.1.3 Commands

This part of ISO 15638 defines (see Clause 7) five generic commands for use by any application:

- a) GET TARV LDT data (GETTARVLDT)
- b) GET C-ITS LDT data (GETC-ITSLDT)
- c) CREATE core application data (CREATECoreData)
- d) GET core application data (GETCoreData)
- e) GET Archive (GETArchive)

GET TARV LDT data provides a means for any application to get the current mix of permanent and situation/time dependent data.

GET core application data provides a means for any application to get the current mix of permanent and situation/time dependent data.

GET Archive, provides a means to upload all data collected in the memory of the *OBU* since the last instance of this command, and to transfer the data to the interrogator.

Certification procedures and enforcement provisions for the providers of regulated services shall be found in ISO 15638-3 Clause 12.

Security aspects are dealt with in ISO 15638-4 TARV system security requirements. Specific *application service* [4.2] provision aspects are defined in ISO 15638-6 TARV regulated application services, and ISO 15638-7 TARV other applications.

Basic vehicle data [4.4] and *core application data* [4.5] aspects are specified in Clause 8 of this part of ISO 15638.

6.1.1.4 IVS requirements

IVS requirements shall be as defined in clause 9 of ISO 15638-3 (TARV – Operating requirements, ‘Approval authority’ procedures, and enforcement provisions for the providers of regulated services).

6.1.2 ROAM

6.1.2.1 ROAM framework and architecture

The *ROAM* (Regime for Open Application Management) architecture provides the framework and operational environment for developing and deploying platforms for *TARV* applications within a general framework of cooperative intelligent transport telematics systems and shall be as defined in ISO 15638-1.

ROAM provides an open execution environment in which *TARV* applications can be developed, delivered, implemented and maintained during the life cycle of both service applications and equipment.

TARV applications for regulated commercial vehicles can be implemented according to the regulations of implementing *jurisdictions* [4.9], and at their discretion, via an app provided by the *jurisdiction*.

A number of generic and interoperable *regulated application services* [4.13] are provided as a toolbox to *jurisdictions* [4.9] in ISO 15638-6 (*TARV* Regulated application services). The methodology to support commercial services for *TARVs*, and to cooperate/interoperate with the provision of general safety services for all classes of vehicles is provided in ISO 15638-7).

Within the *TARV* environment, *regulated applications* [4.12] are developed by *jurisdictions* [4.9] and deployed by *application service* [4.2] providers to 'Host Management Centres' (*HMC*). The *HMC* provides a service gateway that supervises the secure provision of software and services for *TARVs*. *HMCs* manage the provisioning of applications to any authorised and subscribed user via its client system. After it is properly provisioned and installed on the client system it can enact the application. Mechanisms for flexible software deployment and management are provided by *JAVA™* [4.7] / *OSGi™* (open services gateway initiative), and the overall framework and architecture is therefore already well proven in use in other domains, such as mobile telephony.

While the requirements for regulated commercial vehicles are very specific to the domain of a *jurisdiction* [4.9], and will vary from one *jurisdiction* to another, equipped *TARVs*, in a world of cooperative *ITS* systems, do not operate in isolation, and the on-board platform designed to support *TARV regulated application services* [4.13] will also provide other commercial services to *TARVs* and interoperate and support general cooperative safety services for all classes of vehicles.

ROAM defines an architecture (based on *CVIS/OSGi™*) that connects *in-vehicle systems* [4.7], roadside infrastructure and back-end infrastructure necessary for co-operative management of transport safety and efficiency. This provides an architecture and specification that is implementation independent, i.e. to allow implementation using various client and back-end server technologies.

TARV-ROAM is therefore a specific instantiation of a common approach for secure data provision in a cooperative *ITS* environment, adapted to the needs of *TARV*.

While the reader is referred to ISO 15638-1 for an explanation of the architecture and functioning of *TARV-ROAM*, the following Figures are reproduced as a reference précis.

Figure 3 illustrates *TARV* service provision with *ROAM* Identified.

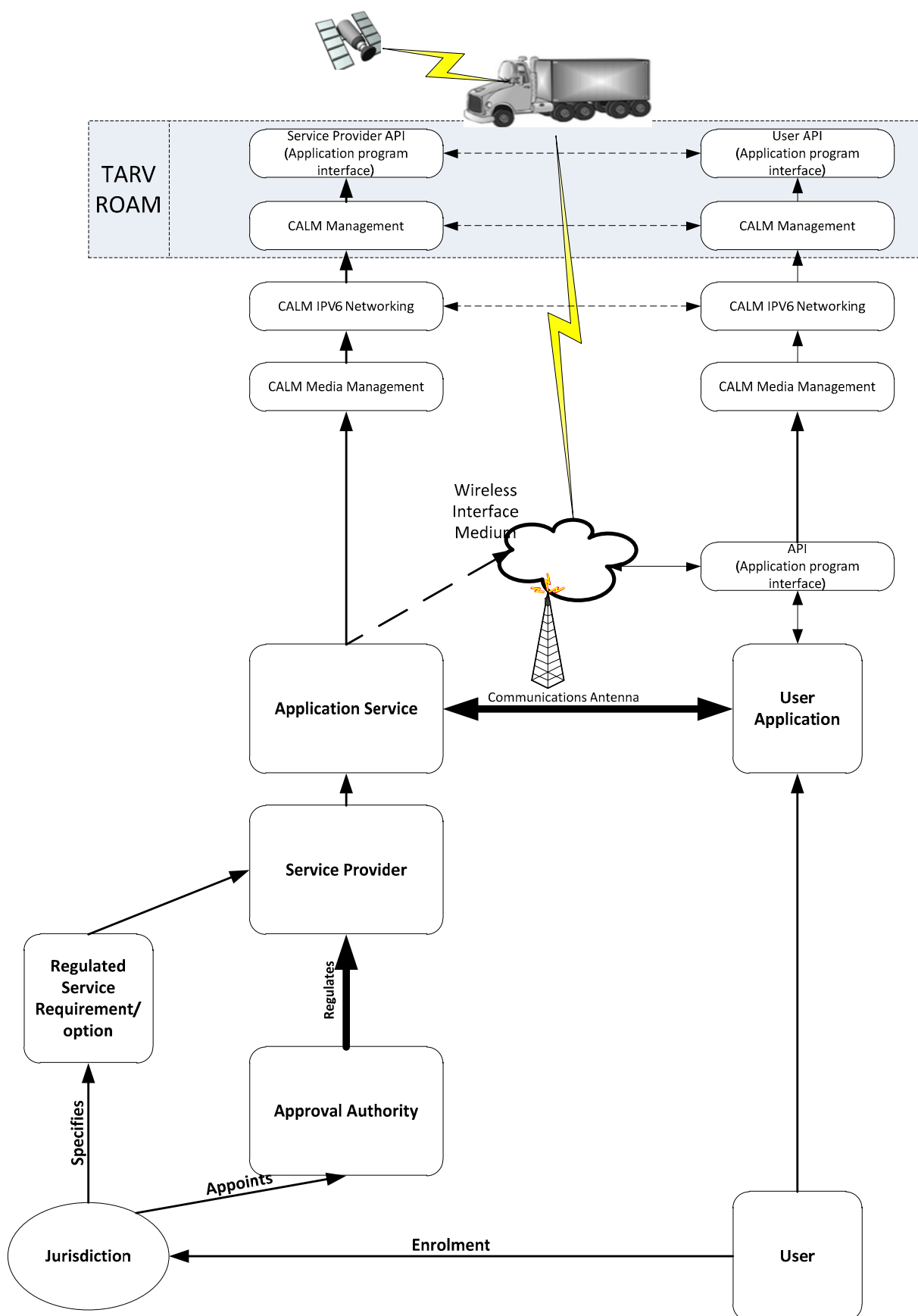


Figure 3 — TARV service provision with ROAM identified
(Source: ISO15638-1, modified)

Figure 4 provides a view of the **IVS** component disposition.

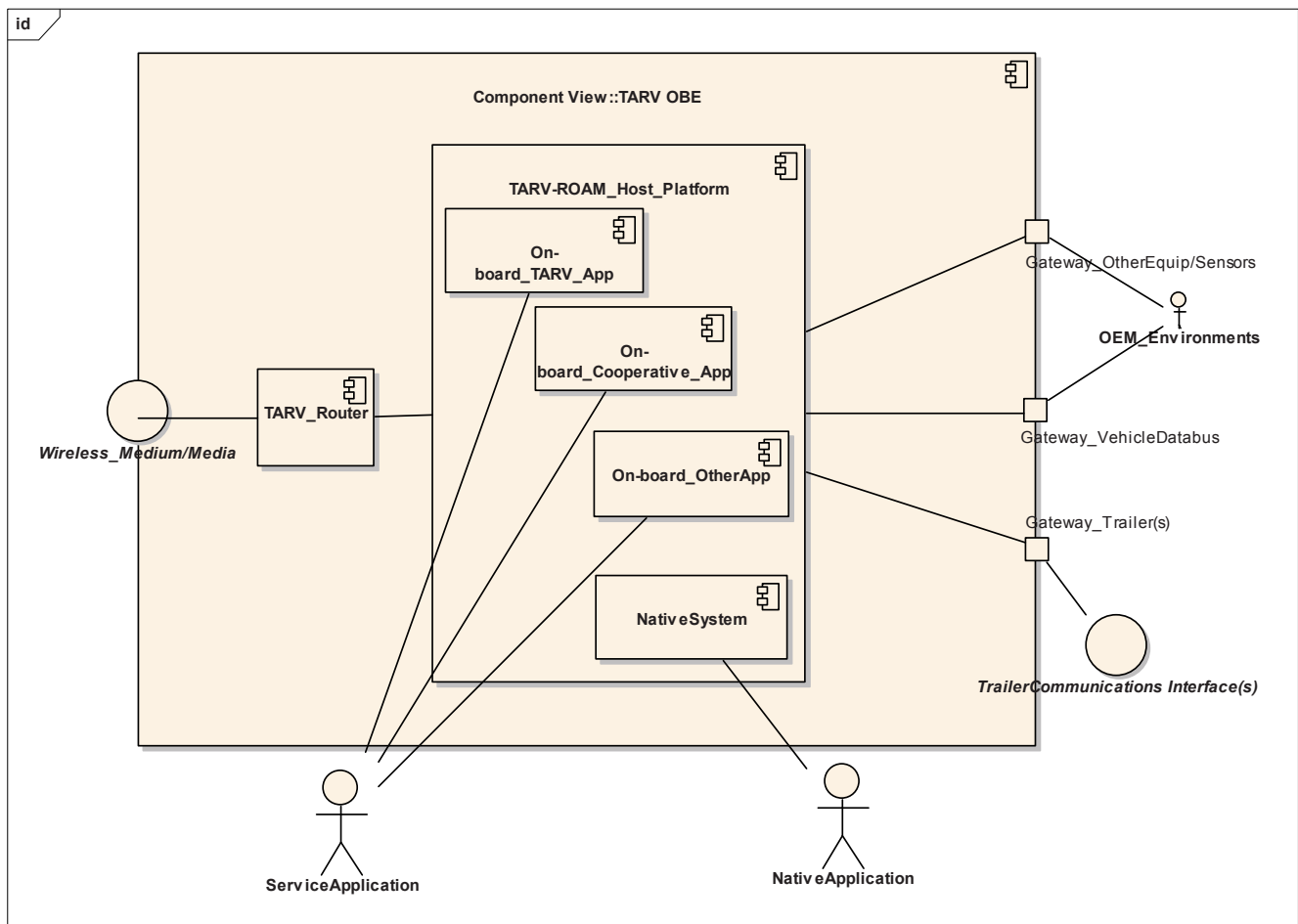


Figure 4 — TARV IVS component decomposition

Figure 5 provides a view of the communications.

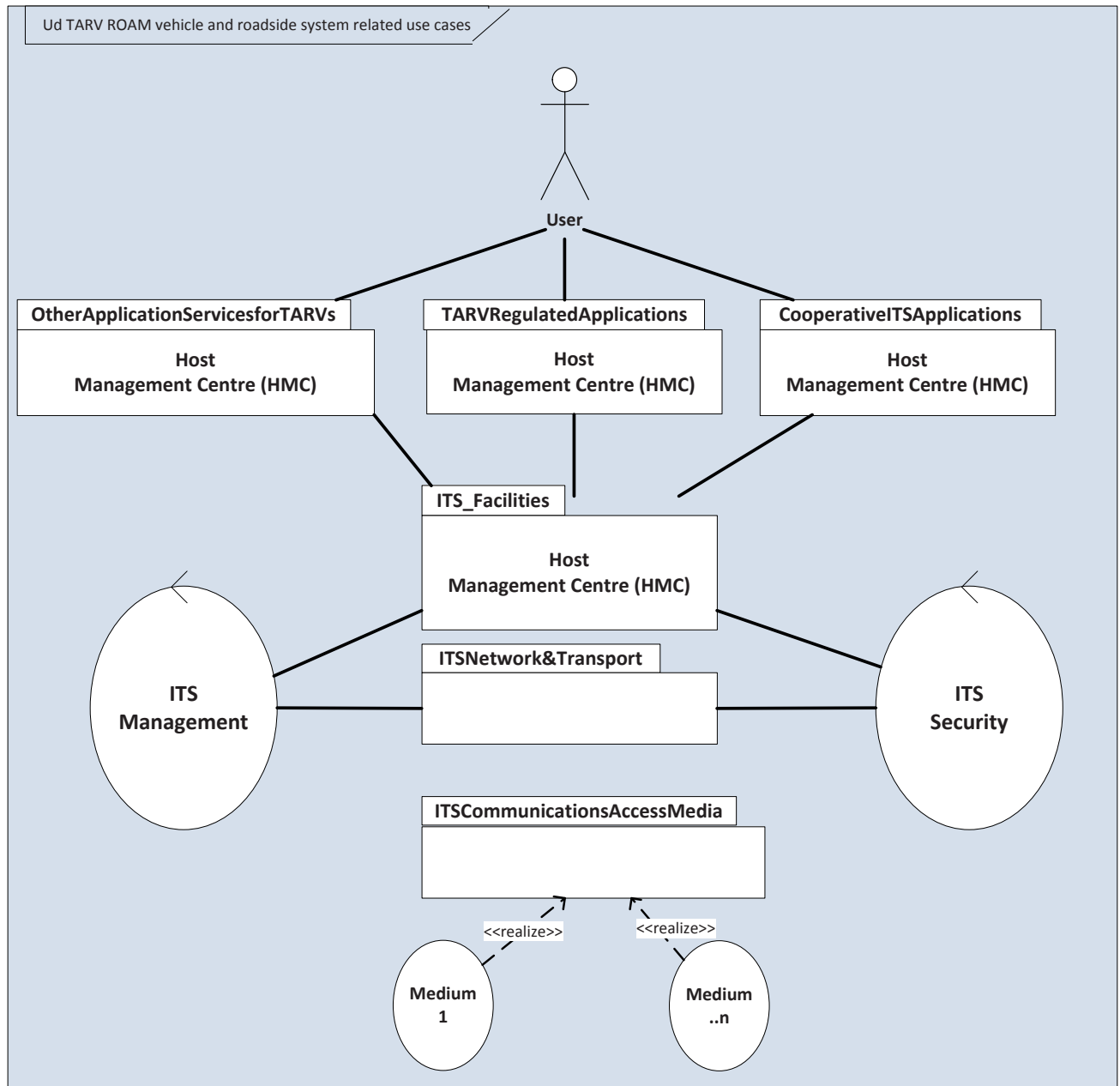


Figure 5 — UML representation of TARV-ROAM communication diagram

Figure 6 shows a UML view of TARV–ROAM service platform components.

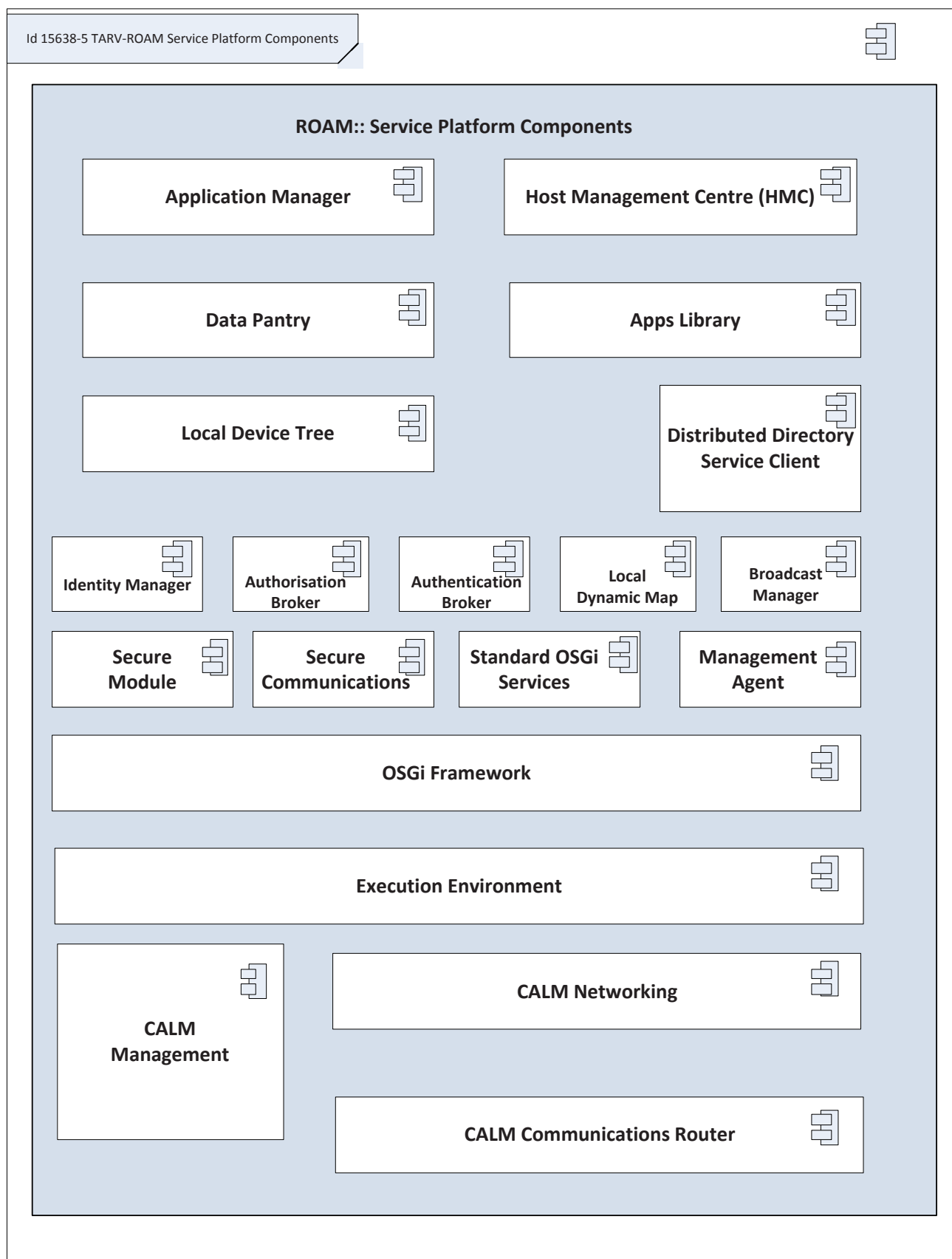


Figure 6 — TARV–ROAM service platform components

6.1.2.2 TARV supported LDTs

This version of *TARV* supports two *LDT* [4.10] *basic vehicle data* [4.4] concepts

- 1) TARV LDT
- 2) C-ITS LDT

The *TARV LDT* [4.10] *basic vehicle data* [4.4] is focussed to the specific requirements for regulated commercial vehicles.

The *C-ITS* (co-operative intelligent transport systems) *LDT* [4.10] *basic vehicle data* [4.4] is focussed to the requirements for cooperative intelligent transport systems for all classes of vehicle, and is safety application centric.

Figure 7 provides a representation of the *C-ITS local data tree* [4.10].

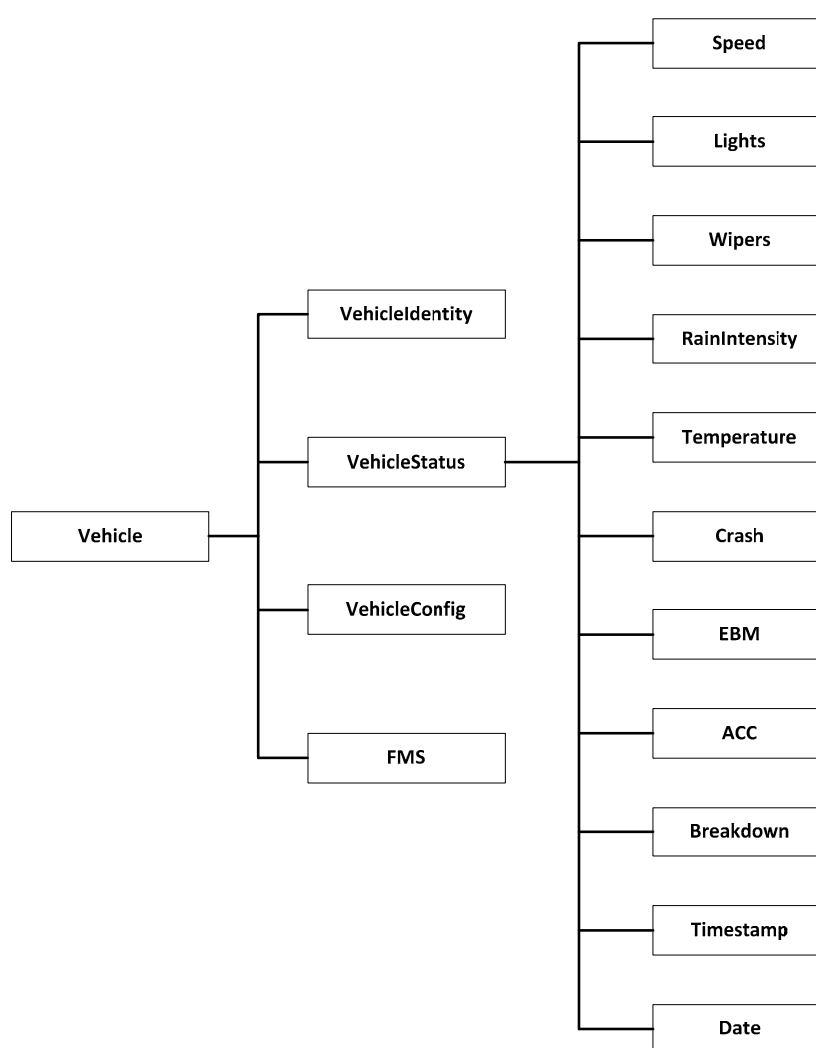


Figure 7 — C-ITS local data tree
(From project CVIS)

Figure 8 shows the TARV *local data tree* [4.10].

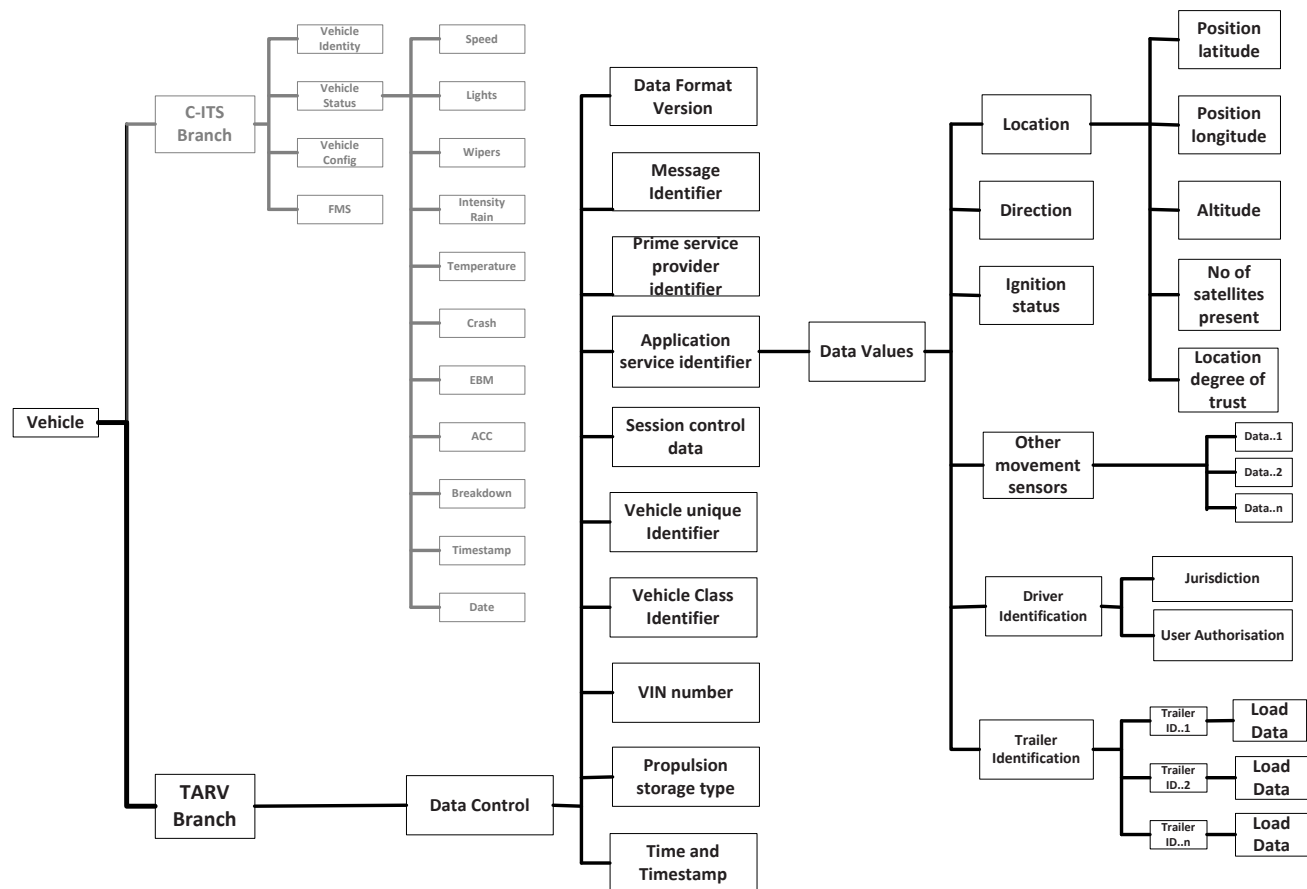


Figure 8 — TARV local data tree

7 System requirements

7.1 Communications requirements

TARV-ROAM communications layers shall conform to ISO 15638-2.

7.2 TARV-ROAM Security requirements

TARV-ROAM security aspects shall conform to ISO 15638-4.

7.3 TARV-ROAM facilities layer requirements

TARV-ROAM facilities layer functions shall conform to:

- ETSI TS 102 894 Intelligent Transport System (ITS); Users & Applications requirements; Facility layer structure, functional requirements and specifications.
- ETSI TS 102 890-1 Intelligent Transport Systems (ITS); Facilities layer function; Communication management specification.
- ETSI TS 102 890-2 Intelligent Transport Systems (ITS); Facilities layer function; Services announcement specification.

Any *TARV-ROAM* local dynamic map specifications shall conform to EN 302 895 'Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Local Dynamic Map (LDM) Specification'.

7.4 Host management centre (HMC) requirements

The *HMC* shall operate in compliance with the basic Java bundle that includes a management agent. See <http://www.osgi.org/javadoc/r4v42/org/osgi/service/provisioning/ProvisioningService.html>, together with the process devised by CVIS, to automate and secure this process. These extra additional Java classes are found in:

http://www.itscommunity.eu/cvisproject/download/Deliverables/DEL_CVIS_3.4_Final_Architecture_and_System_Specifications_v1.0.pdf

(Chapter 3.1).- See Annex B.

8 Generic vehicle data requirements

8.1 Data provision

8.1.1 Location of on-board data

On-board data calculated or obtained by the *IVS* shall be stored as individual data concept values in the 'data pantry' defined in ISO 15638-1.

Apps shall be provided by the prime *service provider* [4.15], *application service* [4.2] providers and *jurisdictions* [4.9] to the *IVS* and shall be stored in the non-volatile memory in an 'application library'. This is described as a function and the physical manifestation shall be a function of product design, not standardisation.

The 'Host Management Centre'/execution environment shall host and run the *apps*.

TARV data shall be calculated by *apps* in the on-board data library, and stored as discrete data concept values in the 'data pantry'. The frequency of such updates is determined by the app.

The means by which data is collected shall be at the determination of the prime *service provider* [4.15], but shall be capable to meet the relevant requirements of 8.3.

The specifications shown in this part of ISO 15638 are shown below in semantic representation. Data presentation shall be as determined in ISO 15638-2 (Common platform parameters using CALM).

The real position of the element in the data-stream is defined by the ASN1 definition. Such elaboration should be provided by the *jurisdiction* [4.9] or its agent (in conformance to ISO 15638-2).

Example ASN.1 definitions may be provided in ISO 15638-6 and ISO 15638-7.

It should therefore be noted that data elements therefore do not necessarily start or end on a byte boundary.

8.1.2 Naming of 'Apps'

An '*App*' is created by or to the instruction of a *jurisdiction* [4.9] to obtain data from the vehicle (*CoreData*).

The *App* name shall always be the IPv6 address of the destination that the data creates is to be sent.

As IPv6 addresses are unique, this means that multiple '*Apps*' can be safely sent to the on-board '*Apps*' library by multiple parties (who are unaware of each other) and can be stored in the on-board '*Apps*' library without fear of naming conflicts.

It also provides additional security for *CoreData* over and above that provided by ISO 15638-4.

8.1.3 Local data trees

Additional *apps* in the library shall be provided by the prime *service provider* [4.15] and shall collate the data into two collated data concepts:

- a) TARV LDT values
- b) C-ITS LDT values

8.1.4 C-ITS LDT

See Figure 7 above.

The *C-ITS* (co-operative intelligent transport systems) *LDT* [4.10] *basic vehicle data* [4.4] is focussed to the requirements for cooperative intelligent transport systems for all classes of vehicle, and is safety application centric.

For the interoperability and efficient operation of cooperative safety services (for example collision avoidance; ice, fog and obstacle alerts; incident warnings; etc.), the *basic vehicle data* [4.4] available needs to be the same for all vehicles, of whatever class.

The data content of the *C-ITS LDT* [4.10] shall therefore be as determined in a future standard to be developed by ISO or ETSI.

Apps from the on board *Apps* library shall therefore update the data concepts in the 'data pantry' and the *C-ITS-LDT* [4.10] either at frequencies specified in that Standard, or as determined by the *app*. Where not predetermined by the standard, the means by which, and frequency at which, that data is populated and refreshed shall be determined by the *app* installed in the *app* library by the prime *service provider* [4.15] or *application service* [4.2] provider and is not determined in this part of ISO 15638, but the form of the data stored in the data pantry, and the access rights, shall be as determined in ISO 15638-4, and a future standard to be developed by ISO or ETSI in respect of the final data payload of the *C-ITS LDT* [4.10].

8.1.5 TARV LDT

See Figure 8 above.

The *TARV LDT* [4.10] is focussed on the specific requirements for the provision of application services to regulated commercial vehicles.

TARV LDT [4.10] *basic vehicle data* [4.4] shall consist of at least the data specified in Clauses 8.3 and stored in the 'data pantry' in formats specified in these subClauses.

The scope of this section is to define core generic *basic vehicle data* [4.4] provision to *application service* [4.2] providers to be supported by *in-vehicle system* [4.7] (*IVS*) for cooperative telematics applications for *regulated commercial freight vehicles* [4.14] (*TARV*). This data shall be represented in the *TARV LDT* [4.10]. 8.3 below provides specification of the data concepts. 8.4 provides the organisation within the *TARV LDT*.

While specific application services, both regulated and commercial, will have their own application specific requirements for data provided by the *IVS* or harvested by the *IVS* from connected equipment and instruments, some generic data is required by many, if not most, and in some cases all, *TARV* application services. (*basic vehicle data* [4.4] for all classes of vehicles for safety and other cooperative intelligent transport systems is specified in the *C-ITS-LDT* [4.10] defined in 8.1.4 above).

It is therefore required that, while not designing the functionality or physical form of any *IVS* (which is considered a function of the marketplace or *jurisdictions* [4.9] who are regulating in order to implement), the generic information known within the ISO 15638 suite of standards deliverables as '*TARV basic vehicle data* [4.4]', shall be supported by all *TARV IVSs*:

(for example, shall have a unique identifier, collect time and location data, etc.)

Apps from the on board *apps* library shall update the data concepts in the 'data pantry' and the *TARV-LDT* [4.10] either at frequencies specified in this part of ISO 15638, or as determined by the *app*. Where not predetermined by this part of ISO 15638, the means by which, and frequency at which, that data is populated and refreshed shall be determined by the *app* installed in the app library by the prime *service provider* [4.15] or *application service* [4.2] provider, and is not determined within this part of ISO 15638, but the form of the data stored in the data pantry for these data concepts shall be as determined within this Clause 8 (this Clause), and the access rights, shall be as determined in ISO 15638-4. The *app* shall also predetermine the IPv6 destination address for the prime *service provider* and *application service* provider(s) for the receipt of data and in the case of '*apps*' to create *core application data* [4.5] the *apps* shall be named as the destination address for the *core application data* (see 8.1.2 above).

Where required, the prime *service provider* [4.15], *application service* [4.2] providers and *jurisdictions* [4.9] can provide new *apps* to the app library on board the *IVS* by the methods described in ISO 15638-1, this part of ISO 15638 (ISO 15638-5), and its referenced standards.

This part of ISO 15638 therefore provides the specifications for generic *basic vehicle data* [4.4] that it is required for all *TARV IVSs* to support and make available to *application service* [4.2] providers via a wireless communications link supported by the *IVS*, in order to support the provision of regulated and commercial application services. This is achieved through the *TARV local data tree* [4.10] (*LDT*).

Some further data concepts, while not required in all cases for every *TARV* in every *jurisdiction* [4.9], may be required generically for all equipment within a particular *jurisdiction*, or class of *TARV* within a *jurisdiction*, in order for the *jurisdiction* to achieve its regulation of *TARVs*. A number of these data concepts, which are expected to frequently be required are, for reasons of interoperability, defined within this part of ISO 15638 (Clause 9) to provide the *core application data* [4.5] concept.

8.1.6 Recent data archive

A further *app* shall be provided by the prime *service provider* [4.15] and shall create an archive of the history and values of data, stored in a file called 'RecentArchive'.

8.2 Commands for vehicle data

ISO 15638-3 provides for 5 generic commands for use by any application:

- 1) GET *TARV LDT* data
- 2) GET *C-ITS LDT* data
- 3) CREATE *core application data*
- 4) GET *core application data*
- 5) GET Archive

8.2.1 GET *TARV LDT* data

On receipt of the command 'GETTARVLDT' the system shall provide the values of the *TARV LDT* [4.10] data concept, together with the requested destination address provided by the requestor, to the previously advised destination address of the requesting *application service* [4.2] provider or *jurisdiction* [4.9]. The data shall be sent to no other destination. The *IVS* shall not, under any circumstances, provide data to an address provided at the same time as the request for data, and the *IVS* shall only provide data to previously predetermined addresses. The system shall send an ACK to the requesting address and close the communication with that address immediately.

NOTE By responding to a command by sending the response (data) only to a predetermined IPv6 address, the possible phishing (attempting to acquire information by masquerading as a trustworthy entity) and other unauthorised third party access to the data is significantly reduced.

8.2.2 GET C-ITS LDT data

On receipt of the command 'GETC-ITSLDT' the system shall make the values of the *C-ITS LDT* [4.10] data concept (specified in this part of ISO 15638) available to authorised users and shall provide the values to the previously advised destination address of the requesting *application service* [4.2] provider or *jurisdiction* [4.9]. The data shall be sent to no other destination. It is not allowed to provide a destination address at the time of requesting the data. The *IVS* shall not, under any circumstances, provide data to an address provided at the same time as the request for data, and the *IVS* shall only provide data to previously predetermined addresses.

8.2.3 CREATE core application data

In order to obtain *core application data* [4.5] the *IVS* first has to create that data. There is one single command to create *core application data*, but there may be multiple '*apps*' concurrent in the vehicle whose *core application data* [4.5] is different.

The application therefore first provides the *IVS* system with the destination IPv6 for the *core application data* [4.5].

It then provides the command 'CREATECoreData'.

On receipt of the command 'CREATECoreData' the system shall run the previously provided '*app*' which bears the same name as the destination IPv6 address (see 8.1.2 above) which will populate the *core application data* [4.5] data concept with the current values of the *TARV LDT* [4.10] together with any additional data concept values specified in the '*app*',

and on request (GET CoreData See 8.2.4 below) shall provide the values to the previously advised destination address of the requesting *application service* [4.2] provider or *jurisdiction* [4.9], as determined in the previously uploaded '*app*'.

The data shall be sent to no other destination. (i.e. it is not returned to the address of the enquirer conducting the communication session, but is sent via the internet to the previously advised IPv6 address programmed into the previously provided '*app*').

core application data [4.5] comprises the *TARV LDT* data defined in 8.1 above, plus the data for any mandated or supported *regulated application service* [4.13] for *TARV* and the IPv6 address (*app* filename) of the destination address.

Figure 9 shows an example. For explanation of the detail of the content see clauses 8.3, 8.4 and 9 below.

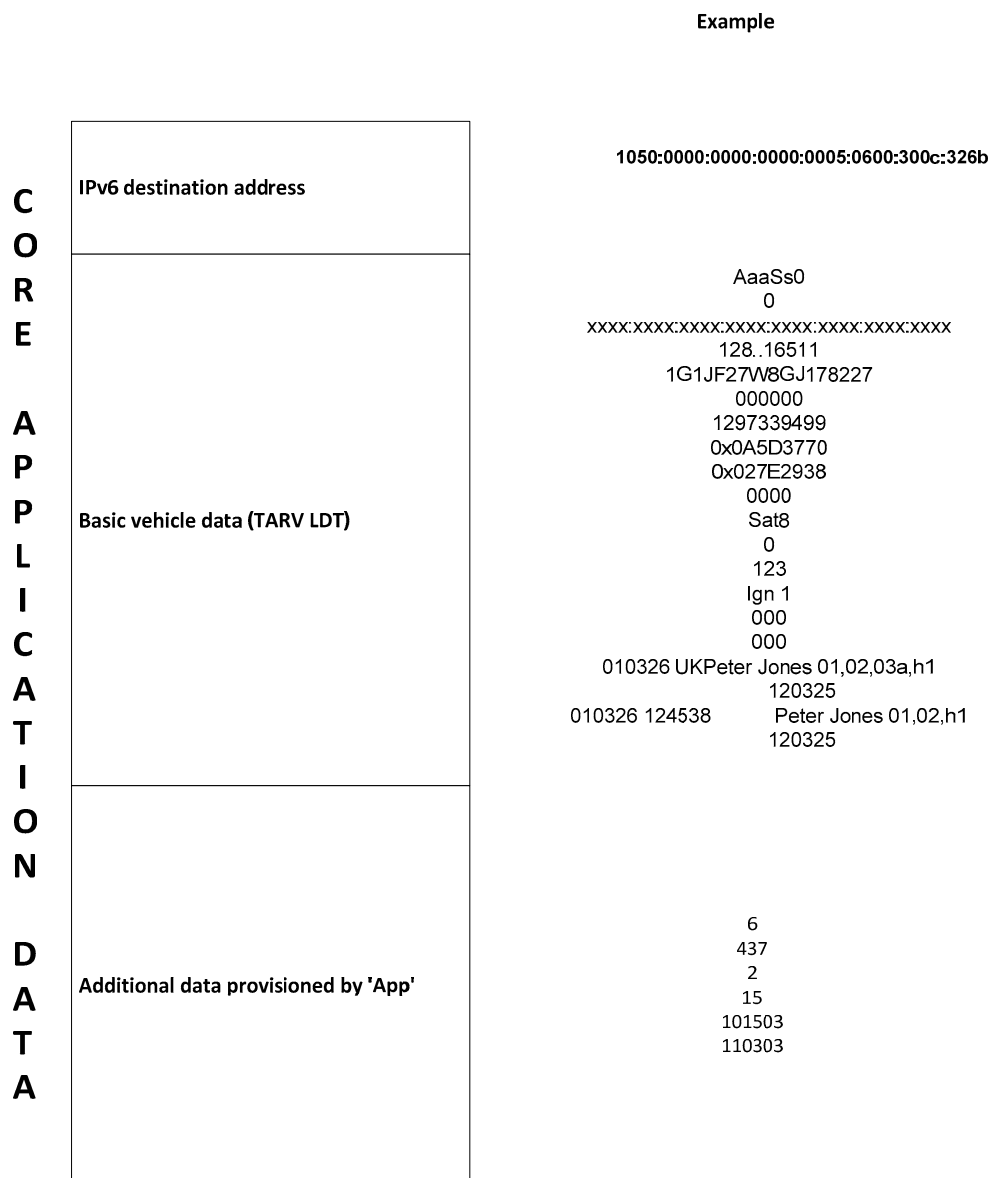


Figure 9 — Core application data

However, whilst 8.3.1 – 8.3.17 determine the *basic vehicle data* [4.4] that shall be supported by all *IVS* for regulated commercial vehicles in all cases and countries, *jurisdictions* [4.9] may impose additional requirements for additional data, regardless of the *regulated application services* [4.13], that it requires or supports at any point in time. This part of ISO 15638 provides some candidates in Clause 9.

The use of all or any of these candidates in addition to the *TARV LDT* [4.10] to form the *core application data* [4.5] is at the election of the *jurisdiction* [4.9].

The purpose of defining these additional data concepts is to provide international interoperability so that where used, they are used consistently.

It is important to understand that the *core application data* [4.5] field is a transient data concept. There is just one data concept *core application data* [4.5] and it is populated according to the most recent use of the 'CREATE Core application data' command. This both keeps the application programming simple and uses the limited memory of the *IVS* efficiently.

8.2.4 GET core application data

On receipt of the command 'GETCoreData' the system shall send the values of the *core application data* [4.5] data concept (see 8.2.3 above) which has just been provisioned into the CoreData by the 'CREATECoreData' command (see 8.2.3 above), together with the requested destination address provided by the requestor to the previously advised destination IPv6 address of the *application service* [4.2] provider or *jurisdiction* [4.9]. The data shall be sent to no other destination. The IVS shall not, under any circumstances, provide data directly to an interrogating party, and the IVS shall only provide data to the previously predetermined IPv6 address provided by the previously provisioned 'app'. The system shall send an ACK to the requesting address and close the communication with that address immediately.

NOTE In this way spoof, 'phishing' or other fraudulent attempts to access vehicle data are avoided. The only way to get *core application data* [4.5] is via the "GETCoreData" command and that command can only send the data via the internet to the previously determined IPv6 address. Other security measures, provided by TARV-ROAM and ISO 15638-4 (TARV system security requirements) prevent the unauthorised loading of 'apps' into the on-board 'app' library. Therefore, even if a spoof *application service* [4.2] provider manages to gain access to the IVS and successfully conducts a communication session, its attempt to get *core application data* [4.5] will only result in that data being sent to its legitimate destination, not back to the enquirer.

8.2.5 GET Archive

On receipt of the command 'GETArchive' the system shall provide the contents of the 'RecentArchive' file stored in the non volatile memory of the IVS to the IPv6 address previously provided by the prime *service provider* [4.15]. The 'RecentArchive' file shall only be accessed by the application or prime *service provider* via the IPv6 address that it has previously provided to the IVS and the 'RecentArchive' file shall be protected against access in any other way or by any other party whatsoever except during an IVS maintenance operation, and then only by the prime *service provider* or his agent. It is not allowed to provide a destination address at the time of requesting the data. The IVS shall not, under any circumstances, provide data to an address provided at the same time as the request for data, and the IVS shall only provide data to previously predetermined addresses.

On successful receipt of the receipt of the 'RecentArchive' data, the prime *service provider* [4.15] shall send an ACK to the IVS acknowledging, in the form prescribed in ISO 15638-3, that it has received the data.

On receipt of the ACK by the IVS, the IVS shall clear the data in the 'RecentArchive' file and shall commence to repopulate that file with a record of the clearance of the file in the format `yyyymmddhhmmss`.

8.3 Presentation of the 'basic vehicle data' concept

The definitions shown in this part of ISO 15638 are shown below in semantic representation. Data presentation shall be as determined in ISO 15638-2 (Common platform parameters using CALM).

The real position of the element in the data-stream is defined by the ASN1 definition. It is recommended that such definition is specified by the *jurisdiction* [4.9] or its agent in its downloaded App. Example ASN.1 definitions may be provided in ISO 15638-6 and ISO 15638-7.

It should therefore be noted that data elements therefore do not necessarily start or end on a byte boundary.

Basic vehicle data [4.4] shall consist of at least the data 8.3.1- 8.3.16 in this clause, together with the data specified in 8.3.17 if available. The data shall be stored in the data pantry, and as required by Apps, shall be used to update the TARV LDT [4.10].

8.3.1 Data format version

The 'data pantry' of the IVS shall:

- carry a data format version identification which shall comprise the three letter country identification code of the *jurisdiction* [4.9] as defined in ISO 3166-1 (Codes for the representation of names of countries and their subdivisions — Part 1: Country codes),