
**Intelligent transport systems —
Framework for cooperative telematics
applications for regulated commercial
freight vehicles (TARV) —**

**Part 21:
Monitoring of regulated vehicles using
roadside sensors and data collected
from the vehicle for enforcement and
other purposes**

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

*Partie 21: Surveillance des véhicules réglementés à l'aide de capteurs
routiers et de données collectées dans les véhicules pour l'application
des lois et à d'autres fins*



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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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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 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligence transport systems*.

A list of all parts in the ISO 15638 series can be found on the ISO website.

Introduction

The ISO 15638 series TARV application standards are based on a triumvirate of vehicle operators with in-vehicle systems, on-board application service providers (3.39) and jurisdictions (3.28). The basic TARV standards focus on the transactions between these parties via ITS-stations (3.25), and do not have measures to detect/avoid tampering/incorrect setting of on-board equipment, and are limited to using data collected from the vehicle for purposes such as control, management and enforcement. In many countries road side sensors (3.37) are already widely used for jurisdiction enforcement and other enhancement purposes. These road side sensors can be used in combination with the TARV framework (3.21) to enhance functionality by eliminating/reducing problems of incorrect setting/tampering etc. and/or complementing/corroborating data obtained from on-board systems. This provides increased capability for jurisdictions and other entities to use existing parts of the ISO 15638 series of standards (which are focussed only on the transaction of data collected from on-board systems), thus potentially providing validation of, or removing weakness in, the accuracy of the data transmitted from the vehicle to an application service provider (3.39), or to provide new management and control measures for regulated commercial freight vehicles. In some cases, new means of management and enforcement may be enabled by using this document.

It, therefore, seems appropriate to include this part of ISO 15638 to the 15638 series of standards to provide the means to use roadside/in-road sensors to validate the accuracy of on-board equipment, and/or complement the data available to application service providers (3.39) and jurisdictions and other entities.

NOTE ISO 15638-9¹⁾ already covers provisions consistent with EC165/2014. This document is complementary to and not competitive to ISO 15638-9, and therefore consistent with EC 165/2014.

1) To be published. Stage at publication: ISO/DIS 15638-9.

Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) —

Part 21:

Monitoring of regulated vehicles using roadside sensors and data collected from the vehicle for enforcement and other purposes

1 Scope

The ISO 15638 series of standards defines the framework (3.21) for online fleet management of regulated commercial freight vehicles utilizing data communication between in-vehicle systems and an application service provider (3.39) via on-board communication unit interfacing with road monitoring infrastructure. This document defines an extension to the existing role model conceptual architecture (3.7) by adding roadside sensors (3.37) to the model for additional data collection path for enhancement of the system.

The objective of this document is to reinforce vehicle monitoring for enforcement and other management purposes of regulated commercial freight vehicle movements. The scope of this document is to

- a) Reinforce vehicle monitoring for enforcement and other purposes,
- b) Provide additional data security by using roadside sensor data links,
- c) Detect/avoid tampering/incorrect setting of onboard sensor equipment,
- d) Provide means of using roadside sensors to validate the accuracy of on-board equipment, and
- e) Enable the combined use of data obtained from the regulated commercial freight vehicle and roadside/in-road sensors to monitor, manage and control the movement of regulated commercial freight vehicles.

In this extended role model architecture (3.7), roadside sensor (including buried in-road sensors) functionality is added to the existing TARV role model. In this extended role model, jurisdictions (3.28) and other entities can reinforce monitoring or other management purpose applications by using a combination of information from both in-vehicle systems and roadside/in-road sensors.

In this document, the framework (3.21) for this modified and improved reinforcement of vehicle monitoring for enforcement and other management purpose applications is defined.

This document is complementary to, and does not replace, any other parts of the ISO 15638 series of standards. This document is beneficial to jurisdiction enforcement and other vehicle monitoring management purpose entities and it provides a means for using roadside sensors to validate the accuracy of on-board equipment and provides additional use cases for TARV service applications.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 15638 (all parts), *Intelligent transport systems — Framework (3.21) for cooperative telematics (3.43) applications for regulated commercial freight vehicles (TARV)*

ISO/TR 12859:2009, *System architecture — Privacy aspects in ITS standards and systems*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org>

3.1 access methods

procedures and protocols to provision and retrieve data

3.2 app

small (usually) applets, organised as software bundles, that support *application services* (3.3) by keeping the *data pantry* provisioned with up to date data

3.3 application service

service provided by a *service provider* (3.39) enabled by accessing data from the *IVS* (3.23) of a *regulated vehicle* (3.35) via a wireless communications network

3.4 application service provider ASP

party that provides an *application service* (3.3)

3.5 app library

separately secure area of memory in *IVS* (3.23) where apps are stored (with different access controls to *data pantry*)

3.6 application service data file ASD file

file held in the *data pantry* of the *IVS* (3.23) containing data specific to an *application service* (3.3)

3.7 architecture

formalised description of the design of the structure of *TARV* and its *framework* (3.21)

3.8 audit auditing

review of a party's capacity to meet, or continue to meet, the initial and ongoing *certification agreements* as a *service provider* (3.39)

3.9 authentication

function intended to establish and verify a claimed identity

3.10 basic vehicle data

data that shall be maintained/provided by all *IVS* (3.23) (regardless of jurisdiction)

3.11**certification**

formal affirmation that an applicant has satisfied all the requirements for appointment as an *application service provider* (3.39) or that an *application service* (3.3) delivers the required service levels.

3.12**certification authority**

<digital> organization which issues digital certificates for use by other parties (specifically in the context of communications security)

3.13**certification authority**

<regulatory> organisation (usually independent) which conducts *certification* (3.11) and ongoing *audit* (3.8) for *service providers* (3.39) on behalf of a jurisdiction

3.14**commercial application(s)**

ITS applications in *regulated vehicles* (3.35) for commercial (non-regulated) purposes

EXAMPLE Asset tracking, vehicle and engine monitoring, cargo security, driver management etc.

3.15**consignment**

shipment of goods/cargo to a destination

3.16**conveyance**

vehicle or trailer used to transport from one place to another

3.17**cooperative ITS****C-ITS**

ITS applications for both regulatory and commercial purposes that require the exchange of data between uncontracted parties using multiple *ITS-stations* (3.25) communicating with each other and sharing data with other parties with whom they have no direct contractual relationship to provide one or more *ITS services* (3.24)

3.18**data pantry**

secure area of memory in *IVS* (3.23) where data values are stored [with different access controls to *app library* (3.5)]

3.19**driver**

person driving the *regulated vehicle* (3.35) at any specific point in time

3.20**facilities**

layer that sits on top of the communication stack and helps to provide data interoperability and reuse, and to manage applications and enable dynamic real time loading of new applications

3.21**framework**

particular set of beliefs and ideas referred to in order to describe a scenario or solve a problem

3.22**global navigation satellite system****GNSS**

system that comprises several networks of satellites that transmit radio signals containing time and distance data that can be picked up by a receiver, allowing the *user* (3.45) to identify the location of its receiver anywhere around the globe

3.23
in-vehicle system
IVS

ITS-station (3.25) and connected equipment on board a vehicle

3.24
ITS service
communication functionality offered by an *ITS-station* (3.25) to an *ITS-station* (3.25) application

3.25
ITS-station
ITS-s
entity in a communication network, comprised of application, *facilities* (3.20), networking and access layer components specified in ISO 21217 that operate within a bounded secure management domain

3.26
IVS installer
actor who installs *IVS* (3.23) on behalf of the vehicle manufacturer or the initial prime service provider (3.32)

3.27
IVS maintainer
actor who maintains *IVS* (3.23) on behalf of the *prime service provider* (3.32)

3.28
jurisdiction
government, road or traffic authority which owns the *regulatory applications* (3.33)

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

3.29
jurisdiction regulator
regulator
agent of the *jurisdiction* (3.28) appointed to regulate and manage TARV within the domain of the *jurisdiction* (3.28); may or may not be the *certification authority (regulatory)* (3.13)

3.30
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 application service* (3.34), or b) cooperative intelligent transport systems

3.31
operator
fleet manager of a *regulated vehicle* (3.35)

3.32
prime service provider
service provider (3.39) who is the first contractor to provide *regulated application* (3.33) *services* (3.3) to the *regulated vehicle* (3.35), or a nominated successor on termination of that initial contract

Note 1 to entry: The *prime service provider* (3.32) is also responsible to maintain the installed *IVS* (3.23), if the *IVS* (3.23) was not installed during the manufacture of the vehicle the prime service provider is also responsible to install and commission the *IVS* (3.23)

3.33**regulated application**
regulatory application

application arrangement using TARV utilised by *jurisdictions* (3.28) for granting certain categories of commercial vehicles rights to operate in regulated circumstances subject to certain conditions, or to permit a vehicle to operate within the *jurisdiction* (3.28)

Note 1 to entry: It may be mandatory or voluntary at the discretion of the *jurisdiction* (3.28).

3.34**regulated application service**

TARV application service (3.3) that meets the requirements of a regulated application (3.33) that is mandated by a regulation imposed by a *jurisdiction* (3.28), or is an option supported by a *jurisdiction* (3.28)

3.35**regulated vehicle**

vehicle that is subject to regulations determined by the *jurisdiction* (3.28) as to its use on the road system of the *jurisdiction* in regulated circumstances, subject to certain conditions, and in compliance with specific regulations for that class of regulated vehicle

3.36**regime for open application management****ROAM**

facilities layer for TARV, within the ISO 15638 series of standards, providing an open access, yet secure runtime environment for *TARV* and other applications, including cooperative vehicle applications, on top of the *CALM* communications environment

3.37**roadside sensor**

device installed at or near the roadside or above the road or embedded into the road that either:

- a) collects data concerning the vehicle (e.g. licence plate, vehicle speed, vehicle emission data, etc.) and passes that data to the vehicle *IVS* (3.23),
- b) provides other dynamic data to the vehicle *IVS* (3.23) (e.g. temporary or permanent speed limits or other restrictions or informative data), and
- c) Requests the *IVS* (3.23) to take some action as a result of sensed information

for use in support or execution of a *TARV* application

3.38**sensor**

device that receives a signal or stimulus and responds to it

3.39**service provider**

party which is certified by a *certification authority (regulatory)* (3.13) as suitable to provide regulated or commercial *ITS application services* (3.3)

3.40**session**

wireless communication exchange between the *ITS-station* (3.25) of an *IVS* (3.23) and the *ITS-station* (3.25) of its *application service provider* (3.39) to achieve data update, data provision, upload *apps* (3.2), or otherwise manage the provision of the *application service* (3.3), or a wireless communication provision of data to the *ITS-station* (3.25) of an *IVS* (3.23) from any other *ITS-station* (3.25)

3.41**specification**

explicit and detailed description of the nature and functional requirements and minimum performance of equipment, service or a combination of both

3.42

tampering action

action conducted towards *IVS* (3.23) or a service provider's system which is intended to prevent the *IVS* (3.23) or the *service provider's* (3.39) system from functioning correctly

3.43

telematics

use of wireless media to obtain and transmit (data) from a distant source

3.44

Unified Modeling Language

UML

graphical language for visualizing, specifying, constructing, and documenting the artifacts of a software-intensive system which offers a standard way to write a system's blueprints, including conceptual things such as business processes and system functions as well as concrete things such as programming language statements, database schemas, and reusable software components

Note 1 to entry: UML is standardised as ISO/IEC 19501 [Unified Modeling Language (UML)].

3.45

user

individual or party that enrolls in and operates within a regulated or *commercial application* (3.14) *service* (3.3)

EXAMPLE *Driver* (3.19), *transport operator* (3.31), freight owner, etc.

4 Abbreviated terms

app	applet (JAVA™ application or similar).
ASD file	application service data file (3.6)
ASP	application service provider (3.39)
CALM	communications access for land mobiles
C-ITS	cooperative intelligent transport system
CONOPS	concept of operations
DSRC	dedicated short range communication
GNSS	global navigation satellite system (3.22)
HGV	heavy goods vehicle
HV	heavy vehicle
Hz	Hertz
ID	identity
ITS-S	ITS station (3.25)
IVS	In-vehicle system (3.23)
LDM	local dynamic map
LDT	local data tree (3.30)

RAS	regulated application (3.33) service (3.3)
RHV	regulated heavy vehicle
ROAM	regime for open application management (3.36)
RTM	remote tachograph monitoring
SPaT-MAP	Signal Phase and Timing — Intersection geometry
TARV	telematics (3.43) applications for regulated vehicles (3.35)
UML	Unified Modeling Language (ISO/IEC 19501)
VMS	variable message sign (ISO 14823)
WIM	weigh in motion

5 Conformance

Requirements to demonstrate conformance to any of the general provisions or specific application services ([3.3](#)) described in this document shall be within the regulations imposed by the jurisdiction ([3.28](#)) where they are instantiated. Conformance requirements to meet the provisions of this document are therefore deemed to be under the control of, and to the specification ([3.41](#)) of, the jurisdiction where the application service(s) ([3.3](#)) is/are instantiated.

6 General overview and framework

This document provides a framework ([3.21](#)) and architecture ([3.7](#)) for “extended TARV” which extends the capabilities of TARV to include interaction with/data collection from roadside sensors ([3.37](#)). It provides a general description of the roles of the actors in extended TARV and their relationships.

ISO 15638-1 and ISO 15638-6 shall be consulted to understand clearly the extended TARV framework ([3.21](#)), architecture ([3.7](#)) and detailed specification ([3.41](#)) of the roles of the actors involved.

In summary, [Figure 1](#) shows the extended role model conceptual architecture ([3.7](#)) showing the key actors and their relationships.

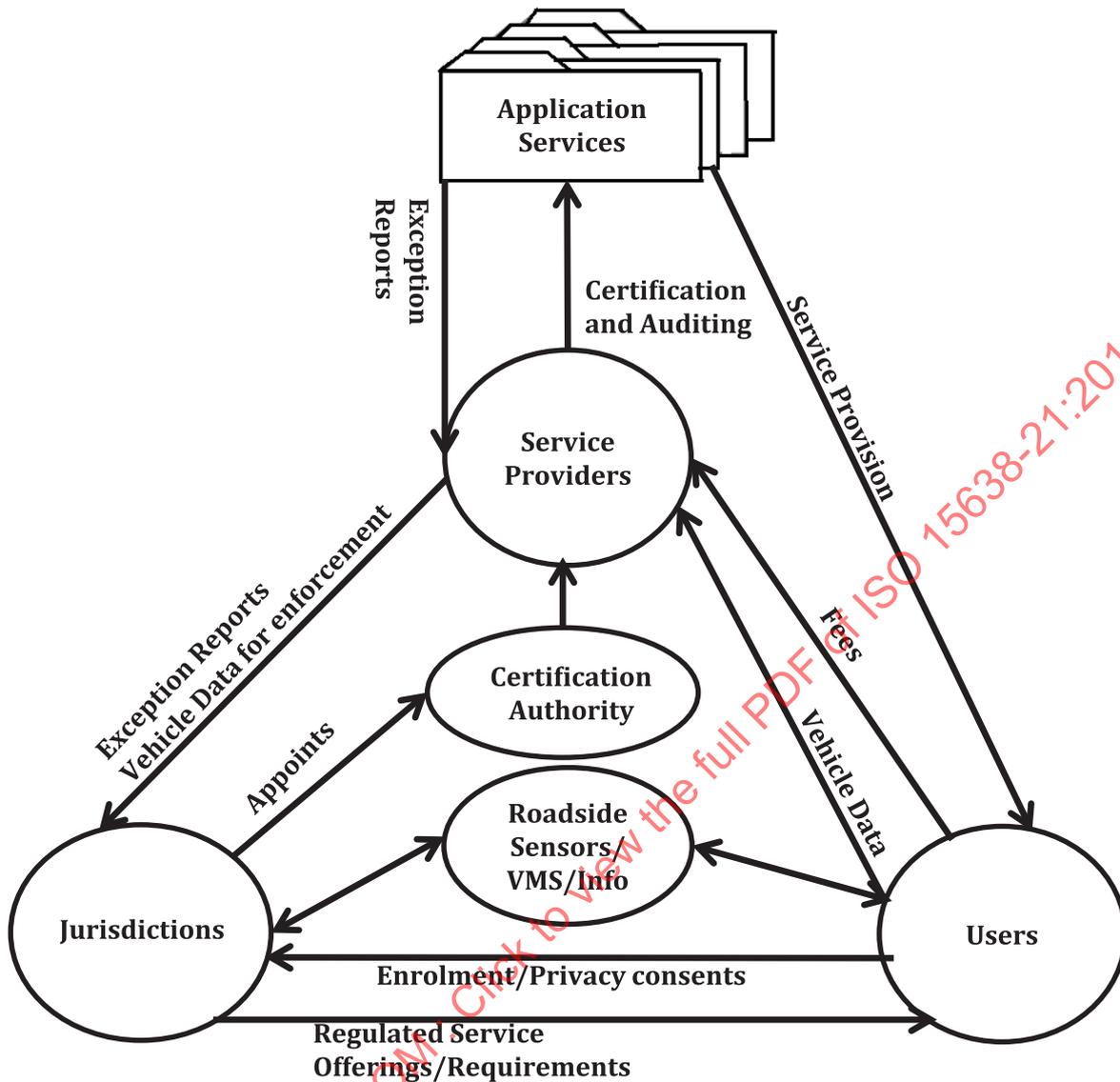


Figure 1 — Extended Role model conceptual architecture (3.7)

The ISO 15638 series of standards provides a suite of standards deliverables addresses and defines the framework (3.21) for a range of cooperative telematics (3.43) applications for regulated vehicles (3.35) [such as electronic tachograph monitoring, Driver (3.19) work records, emergency messaging/eCall, mass monitoring, 'Mass' information for jurisdictional control and enforcement, speed monitoring, access control, access methods (3.1), location monitoring, weigh in motion, etc.]. The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative ITS service (3.24) platform. The framework (3.21) is based on a (multiple) service provider (3.39) oriented approach including provisions for the certification (3.11) and auditing (3.8) of service providers. This document is an extension to ISO 15638-1 to ISO 15638-7 which provide a standardised approach for telematics (3.43) aspects for regulated vehicles (3.35):

- ISO 15638-1, TARV — Framework and architecture;
- ISO 15638-2, TARV — Common platform parameters using CALM;
- ISO 15638-3, TARV — Operating requirements, certification procedures, and enforcement provisions for the providers of regulated services,
- ISO 15638-4, TARV — System security requirements,

- ISO 15638-5, *TARV — Generic vehicle information*,
- ISO 15638-6, *TARV — Regulated applications*, and
- ISO 15638-7, *TARV — Other applications*.

This document provides basic requirement use cases for the roadside sensor (3.37) added version of the generic telematics (3.43) and data requirements for candidate regulated applications (3.33) for TARV, and defines the generic modus of operations.

A regulated application (3.33) service (3.3) shall be a TARV application service (3.3) that is mandated by a regulation imposed by a jurisdiction (3.28) (government, road or traffic authority) which owns the regulatory applications (3.33) in which case all vehicles of a class defined by the jurisdiction shall support and provide this service, or is an option supported by a jurisdiction, in which case it provides a voluntary electronic means of satisfying a requirement of a jurisdiction. The regulated application service (3.34) can be deployed for other vehicle monitoring services provided by the service provider (3.39). In such case, the expression of jurisdictions shall be read as part of the service provider.

The roadside sensors (3.37) are usually a property of jurisdictions. The data collected at roadside sensors (3.38) may be available to the service provider. It may sometimes be provided through the roadside sensor owner so that the service provider can provide reinforcement role for jurisdiction enforcement by using the roadside sensor data. It can detect/avoid tampering/incorrectly setting of on-board equipment. It can provide means of using roadside sensors to validate the accuracy of on-board equipment. Jurisdictions can use the combination of data obtained from the regulated commercial freight vehicle and roadside/in-road sensors. It provides management /enforcement and control of regulated commercial freight vehicles for jurisdictions.

The roadside sensors are typically assumed to collect vehicle location data (present and accumulated), vehicle ID (privacy information such as VIN/license plate), vehicle history (privacy information such as time/location/type of road/motion sensor data/), vehicle on board unit holding data (engine running data, digital tachograph recorded data, on board weigh in motion data and etc.), vehicle engine emission data and etc. By enrolling the enforcement by Jurisdiction, the user (3.45) is assumed to have agreed with the reuse of user's (3.45) privacy information. ISO/TR 12859:2009 [System architecture (3.7) — Privacy aspects in ITS standards and systems] shall be applied to secure privacy management of the data collected from vehicles and roadside sensors.

The jurisdiction may use this link through roadside sensors to vehicles to pass data from the roadside to the vehicle on board unit. The possible examples of notification of warning are temporary speed restrictions, diversion advice for HGVs, reminder to take some action etc., even import VMS data into the vehicle.

A regulated application (3.33) service (3.3) is provided by a service provider, also called an application service provider (ASP)(3.4) who is a party which is certified by a certification authority (regulatory) (3.13) as suitable to provide certified regulated or commercial ITS application services (3.3).

NOTE A certification authority (regulatory) (3.13) is an agency or function within a jurisdiction regulator (3.29) who certifies that the requirements and level of service of the jurisdiction have been met, and should not be confused with a certification authority (digital) (3.12) which is an organization which issues digital certificates for use by other parties (specifically in the context of communications security).

The service provider provides the application service (3.3) to/for a user (3.45) who is an individual or party that enrolls in and operates within a regulated application (3.33) service (3.3) or commercial application (3.14) service (3.3) in order to meet specific aspects of the requirements of a jurisdiction for the operation of the regulated vehicle (3.35) within that jurisdiction.

Examples of users (3.45) are a transport operator (3.31), driver (3.19), freight owner, etc. Most commonly the user (3.45) is the transport operator (3.31).

Road side sensors are added to the basic TARV architecture (3.7) to enhance monitoring for enforcement and other purpose management for the regulated application (3.33) services (3.3). These roadside sensors provide jurisdictions and service providers a means for enhancing enforcement and/

or management by using/comparing roadside sensed vehicle data with data sensed by vehicle on board unit. Roadside sensor sensed vehicle data can also include vehicle licence plate data, VIN data, vehicle sensed WIM data, engine status data, emission gas data and on-board unit containing data such as of digital tachograph, vehicle laden mass measuring device, and these data can be used for additional regulated application (3.33) enforcement and other purpose application services (3.3).

For basic TARV information, refer to ISO 15638-1.

For reasons of efficiency, interoperability, ability to operate within multiple jurisdictions (3.28), ability to deploy rapidly, and maintenance, the jurisdiction may elect to use one of the regulated application (3.33) services (3.3) defined in this document to meet defined communications and data aspects of its requirement(s).

Regulated application (3.33) services (3.3) require clear definition in terms of the requirements made on the service provider (3.39).

The responsibility to make such requirements clearly defined and make such requirements available to the application service providers (3.39) shall rest with the jurisdiction.

The service definition for each application service (3.3) supported by ISO 15638-6 comprises

- A clear description of the generic high level service provided and its inputs, outputs and results, including a given service level,
- Generic data, naming content and quality that an IVS (3.23) has to deliver,
- Specific data, naming content and quality for the provision of that particular service,
- Generic service elements definition,
- Access methods (3.1) to provision and retrieve data,
- Provisions for quality of service,
- Provisions for test requirements, and
- Provisions for (but not the detailed requirements and arrangements for) the certification (3.11) of IVSs (3.23) and service providers (3.39).

This document defines the basic requirements for application service (3.3) enhancements using roadside sensors (3.37).

7 Requirements for services using generic vehicle data

7.1 General

Even though the roadside sensors (3.37) are added, this is in supplement to and makes no modification to ISO 15638-6.

The means by which the access commands for generic vehicle information specified in ISO 15638-5 can be used to provide all or part of the data required in order to support a regulated application (3.33) service (3.3) shall be as defined in ISO 15638-6.

This Clause provides a means by which the access commands for generic vehicle information specified in ISO 15638-5 can be used to provide all or part of the data required in order to support a regulated application (3.33) service (3.3), and defines general requirements to assure data interoperability.

7.2 Regulated application services using only generic basic vehicle data

Where all of the required data can be obtained via the access commands for generic basic vehicle data (3.10) specified in ISO 15638-5, the access methods (3.1) defined in ISO 15638-5 shall be used

consistently to obtain the values for the TARV LDT (and C-ITS LDT data concepts where required). No further international standardization is required, and jurisdictions (3.28), subject to the privacy regulations pertaining within the jurisdiction, may develop, operate, and update their regulated, or supported regulated voluntary services according to local design; International interoperability being maintained through the provisions of ISO 15638-5 (TARV Generic vehicle information). All vehicles that are equipped to support ISO 15638 shall be able to support such service provisions.

ISO 15638-5:2013, Clause 7 defines the following relevant commands:

- GET TARV LDT (local data tree) data (3.30);
- GET C-ITS (co-operative vehicle systems) LDT data.

See ISO 15638-5 for details of these commands.

7.3 Regulated application services using both generic vehicle data and additional regulated application specific data

See ISO 15638-5:2013, Clause 8 for the generic sequence of operations for regulated application (3.33) services (3.3) using both generic vehicle data and additional regulated application (3.33) specific data.

7.4 Conveyance identifiers

The regulated vehicle (3.35) conveyance type shall be identified in accordance with ISO 26683-2 , ISO 14816,/ ISO 17262 , ISO 24534-3.

8 Application services that require data in addition to basic vehicle data

8.1 General

7.2 above provides a means by which two of the access commands specified in ISO 15638-5 can be used to provide all of the data required in order to support a regulated application (3.33) service (3.3).

It shall be conducted as defined in ISO 15638-6.

Subsequent versions/issues of this document may include additional regulated application (3.33) services (3.3) where these have been subsequently identified and specified.

8.2 Concept of operations for identified regulated application services with additional data requirements using roadside sensors

8.2.1 General

This Clause describes the characteristics of a proposed system from the viewpoint of a user (3.45) who will employ that system. Its objective is to communicate the quantitative and qualitative system characteristics to all stakeholders.

This Clause defines the general concept of operations for 'standardised' regulated application (3.33) services (3.3) for TARVs that require data in addition to that available from the basic vehicle data (3.10), and provides the generic modus operation for the provision of the application services (3.3) defined in the subsequent Clauses of this document that relate to provisions for specific regulated application (3.33) services (3.3).

A 'concept of operations' (CONOPS) generally evolves from a concept and is a description of how a set of capabilities may be employed to achieve desired objectives. In ISO 15638, the CONOPS concerns the standardisation of data concepts to be exchanged and the wireless means to exchange that data. ISO 15638 does not specify the capabilities or form of any product/system offering on the market, or the

form of the instantiation of the application service (3.3). Those aspects are defined by the jurisdiction (3.28) and the application service provider (3.39).

This document enables data from roadside sensors (3.37) to supplement data collected from within the vehicle.

8.2.2 Statement of the goals and objectives of the system

The overall objective of TARV regulated application (3.33) services (3.3) with additional data requirements shall be as defined in ISO 15638-1 to ISO 15638-6 with the addition of the collection of data from roadside sensors (3.37).

TARV does not specify the application service (3.3) itself [enabling the differing requirements of different jurisdictions (3.28) to be met within the Standard, and for different commercial offerings to provide market differentiation], but specifies the key generic data concepts required to enable the service provision and their transfer via a wireless communication to the application service provider (3.39), and the provision of key data to the IVS (3.23) of the regulated vehicle (3.35) from the application service provider (3.39) or another ITS-station (3.25), such as that of a jurisdiction.

It is an underlying assumption that the regulated vehicle (3.35) is equipped with the means to acquire and provide the data (additional to the 'basic vehicle data'), required by the specific application service (3.3). The generic requirements for additional data for the specified service is defined below for the particular application service (3.3), as is the functional source of the means of such data provision.

This document determines the nature of the data and how it is to be received/sent by the IVS (3.23), but does not standardise the equipment used to obtain the data.

8.2.3 Strategies, tactics, policies, and constraints affecting the system

Strategies, tactics, policies and constraints, and, the services that are regulated as mandatory or optionally supported, may vary from jurisdiction to jurisdiction. Such definition is outside the scope of this document, which defines only the generic data and protocols to support a 'standard' application service (3.3), where such an application service (3.3) is elected by a jurisdiction to meet their requirements.

A core strategy of this document, and a central facet of its security, is to ensure that an app (3.2) is only loaded legitimately, and that this previously loaded app (3.2) contains the destination address where the basic vehicle data (3.10) or core data is to be sent. Instigating a 'GETTARVLDT' or 'GETCoreData' data command therefore only results in that data being sent to the previously determined destination address.

8.2.4 Organizations, activities, and interactions among participants and stakeholders

The classes, attributes and key relationships are described in ISO 15638-1 and ISO 15638-6, with the addition of the ability to collect data from roadside sensors (3.37).

8.2.5 Clear statement of responsibilities and authorities delegated

The responsibilities and authorities are described in ISO 15638-1:2012, 8.2.7, 8.2.8, ISO 15638-6.

8.2.6 User

The 'user' (3.45) is most usually the operator (3.31) of the regulated vehicle (3.35), but in some cases may be the driver (3.19). He shall enrol with the jurisdiction to have his service provided automatically by wireless communications. He shall appoint an approved service provider (3.39) to provide the regulated application (3.33) service (3.3) for the regulated vehicle (3.35) [or driver (3.19) where appropriate].

It shall be the responsibility of the operator of the regulated vehicle (3.35) to enrol, and to have his vehicle equipped to enable it to provide the service [regardless of whether the user (3.45) of the service is the regulated vehicle (3.35) operator or the driver (3.19) of the regulated vehicle (3.35)]. So long as he uses certified service providers (3.39), IVS (3.23) installers and IVS (3.23) maintainers, the operator (3.31) may then assume that the application service (3.3) shall be provided in accordance with the legislation/regulations.

The user (3.45) shall be responsible to pay any fees for the provision of the service agreed with the service provider (3.39) to the service provider. The means by which this is achieved is a subject for the commercial marketplace and is outside the scope of this document.

8.2.7 Application service provider

In the case where the standardised application services (3.3) are clearly defined, the application service provider (3.4) shall offer to users (3.45) to provide the specific application service (3.3), to the requirements of a jurisdiction (3.28), using the TARV standardised data concepts and data exchanges with the regulated vehicle (3.35) defined.

8.2.8 Application service

This shall be a service defined in one standardised application service (3.3) and provided by the application service provider (3.4) to the jurisdiction to meet the requirements of the jurisdiction.

8.2.9 Operational processes for the system

The operational processes for the exchange of data over a wireless medium are described at a generic level in ISO 15638-6.

8.2.10 Service requirements definition

It shall be as defined in ISO 15638-6, with the addition of the capability to collect data from roadside sensors (3.37).

8.3 Sequence of operations for identified regulated application services with additional data requirements

8.3.1 General sequence of operations

The general sequence of operations shall be as defined in ISO 15638-1 within the framework (3.21) and processes of ISO 156381 to ISO 15638-5.

In the case of this document, the 'regulated application (3.33) service' (3.3) is a software application system comprising four parts:

- 'Landside' application software system;
- On-board app (3.2) to generate the core data for the system;
- Data collected from roadside sensors (3.37);
- Instruction to provide data (to ASP) instigated by a roadside sensor (3.37) (for example identifying a potential irregularity or regulation violation).

The landside application software system that provides the regulated application (3.33) service (3.3) may, at the election of the jurisdiction (3.28), either be provided by the jurisdiction to application service providers (3.4), or the jurisdiction may provide its requirements and allow the application service provider (3.4) to develop the software; but shall use one of these two approaches.

During the operation of the vehicle on the highway, roadside sensors (3.37) (which are usually a property of or operated on behalf of jurisdictions) and data collected at roadside sensors (3.37) can be conveyed to the service provider through the roadside sensor owner so that the service provider can reinforce jurisdiction enforcement by using roadside sensor data, can detect/avoid tampering/incorrectly setting of on-board equipment, can provide means of using roadside sensors to validate the accuracy of on-board equipment, and jurisdictions can use the combination of data obtained from the regulated commercial freight vehicle and roadside/in-road sensors to manage/enforce control of regulated commercial freight vehicles.

The roadside sensors (3.37) collect typically: vehicle weight, vehicle location data (present and accumulated), vehicle ID (privacy information such as VIN/license plate), vehicle movement history (privacy information such as time/location/type of road/motion sensor data), vehicle IVS (3.23) data (engine, digital tachograph, weigh in motion), vehicle engine emission data and etc. By enrolling the enforcement by jurisdiction, the user (3.45) is assumed to have agreed with the use of the user's (3.45) privacy information.

The jurisdiction (3.28) could use this link through roadside sensors to vehicles to pass data form from the roadside to the vehicle. The possible examples of notification of warning are: temporary speed restriction, diversion advice for HGVs, reminder to take some action etc., even import VMS data into the vehicle.

There could be circumstances where roadside data may be loaded to the vehicle.

A Trigger of this action may be caused by the vehicle position/type/class detection.

- Accurate geographical position [correction to typical GNSS (3.22) position data]
- Roadside sensor measured data (emission gas, weight, etc.)
- Caution to the driver (3.19) (dangerous intersection ahead, etc.)
- Warning to the driver (3.19) (potential violation)
- Instruction to the driver (3.19)
- Information to the driver (3.19)
- SPaT-MAP data
- LDM data
- Road sign
- Other useful information

There could be circumstances where vehicle data may be loaded to the roadside sensors.

A Trigger of this action may be caused by the vehicle position/type/class detection.

- Vehicle location data, current and accumulated past position record
- Engine running characteristics data
- Digital tachograph data
- Weight in motion data (application defined in ISO 15638-20)
- Type of cargo (such as dangerous and/or perishable goods)
- Other useful information

There could be circumstances to have the on board device advise the driver (3.19) of an issue or an unsafe situation. For example, if roadside equipment identifies that a tire is underinflated or missing,

the driver (3.19) should be advised that this is the case when the information is loaded into the on board device. As another example, if the roadside equipment identifies that the vehicle or an axle is overloaded or that the load on the vehicle is unbalanced, the driver (3.19) should be advised that this is the case when the information is loaded onto the on board device.

The on-board app (3.2) may, at the election of the jurisdiction, either be provided by the jurisdiction to application service providers (3.39), or the jurisdiction may provide its requirements and allow the application service provider (3.39) to develop the software, but shall use one of these two approaches.

In the event that the jurisdiction provides the app (3.2), it has two ways to provide the on-board data library with the app (3.2). It can provide the app (3.2) to the application service provider (3.39), and it is then the responsibility of the application service provider (3.39) to load it onto the IVS (3.23) of the regulated vehicle (3.35), or, using TARV-ROAM (3.36) it can dynamically request the application service provider (3.39) to upload the app (3.2) directly to the regulated vehicle (3.35) as it enters the jurisdiction.

In local situations, the jurisdiction may prefer to have the application service provider (3.39) install the app to the regulated vehicle (3.35), however, where a vehicle is roaming through different jurisdictions, the jurisdiction will probably want to dynamically request the application service provider (3.39) to upload the app (3.2) to the regulated vehicle (3.35) as it enters the jurisdiction and act as the application service provider (3.39), or have an agent it appoints do so on its behalf, while the regulated vehicle (3.35) remains within its domain.

This is possible because of TARV-ROAM (3.36) and is secure because the application service (3.3) only has access to the values in the data pantry of the IVS (3.23) which it is authorised to access, and does not have access to other apps (3.2) or equipment or data in the regulated vehicle (3.35).

8.3.1.1 Commands

Providing a regulated TARV service is envisaged as one or a series of short transactions, in which, in order to obtain basic vehicle data or core application data, one or two (of three) commands is invoked.

GET TARV LDT data

CREATE core data

GET core data

The objective is to invoke the shortest possible link with the vehicle to obtain the required data, and then close the communication. If data is required at several geographical points or several points in time, this comprises a series of short sessions (3.40), where required by the regulated application (3.33) further detail of generic data specification (3.41) for identified regulated application (3.33) services (3.3) is provided in the definitions in ISO 15638-6:2014, Clause 10, which may, or may not, require basic vehicle data (3.10) or core application data as part of that service provision).

In some instantiations the application service provider (3.39) will be the jurisdiction (3.28) or its agent.

Communication link between user (3.45) IVS (3.23) and application service provider (3.39) application includes the route through road side sensors (3.37).

Building the application service (3.3) results, and providing required information to jurisdictions, is architecturally conceived as a process that is performed by the application service (3.3) software and hosted in the landside system of the application service provider (3.39). It is not transacted while the communication with the regulated vehicle (3.35) is in progress, nor is the service directly provided by the IVS (3.23), except for the transaction 'CREATE' to update the on-board data pantry, or to 'GET' the data.

If further data is subsequently required, or the data obtained is in any way deficient, this is resolved by a subsequent communication session (3.40) with the regulated vehicle (3.35).

All further data processing of the application service (3.3) is effected by the application service provider (3.39), landside, using the application provider’s application service (3.3) software, not on-board by the IVS (3.23) (and therefore outside the scope of the ISO 15638 series).

This is designed to minimise the duty on the wireless interface (and with several wireless media cost models, also to minimise its cost), and to maximise on-board security.

8.3.1.2 GET TARV LDT

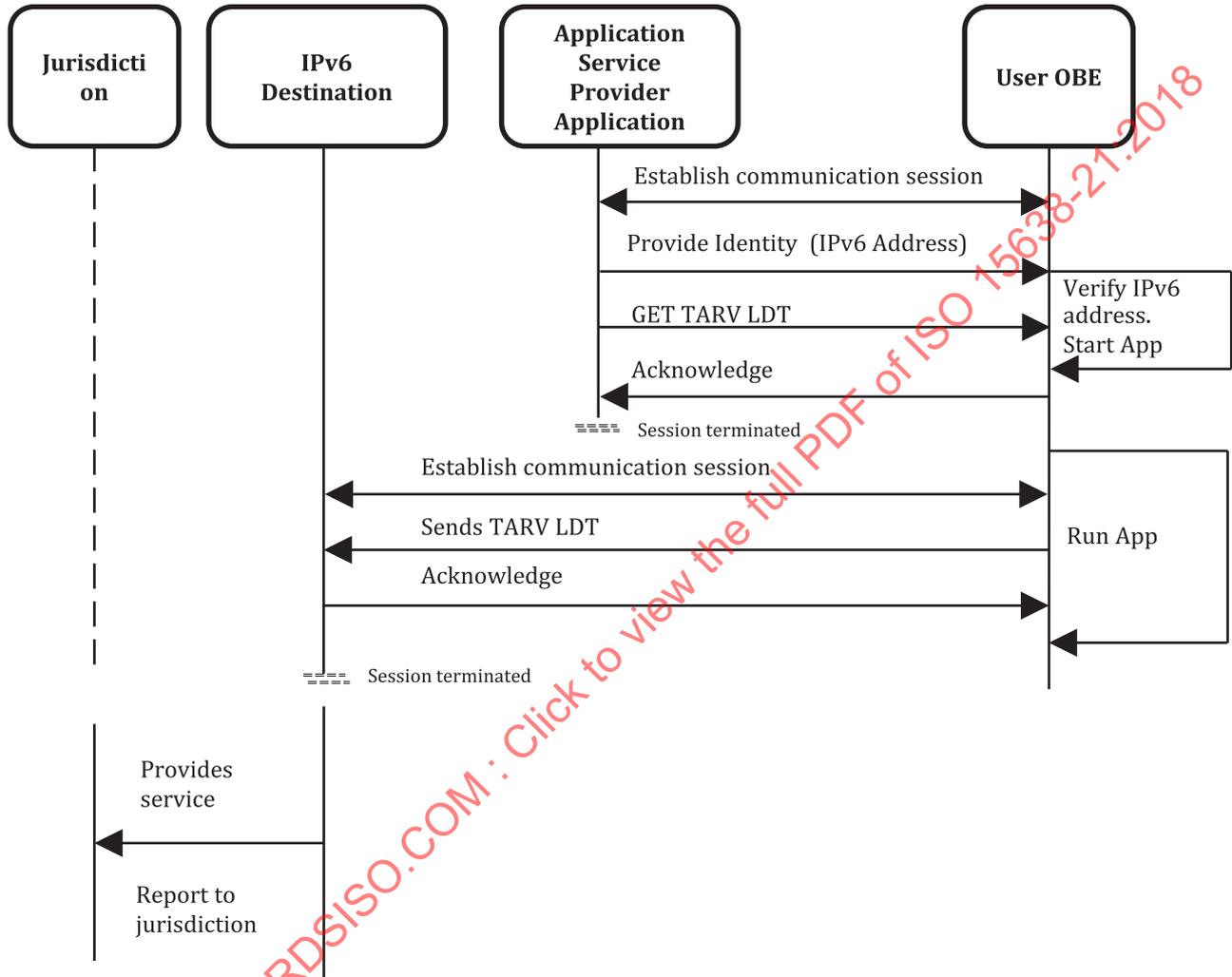


Figure 2 — Communications sequences to obtain TARV LDT

The Figure 2 shows the communications sequences to obtain TARV LDT.

8.3.1.3 CREATE and GET CoreData

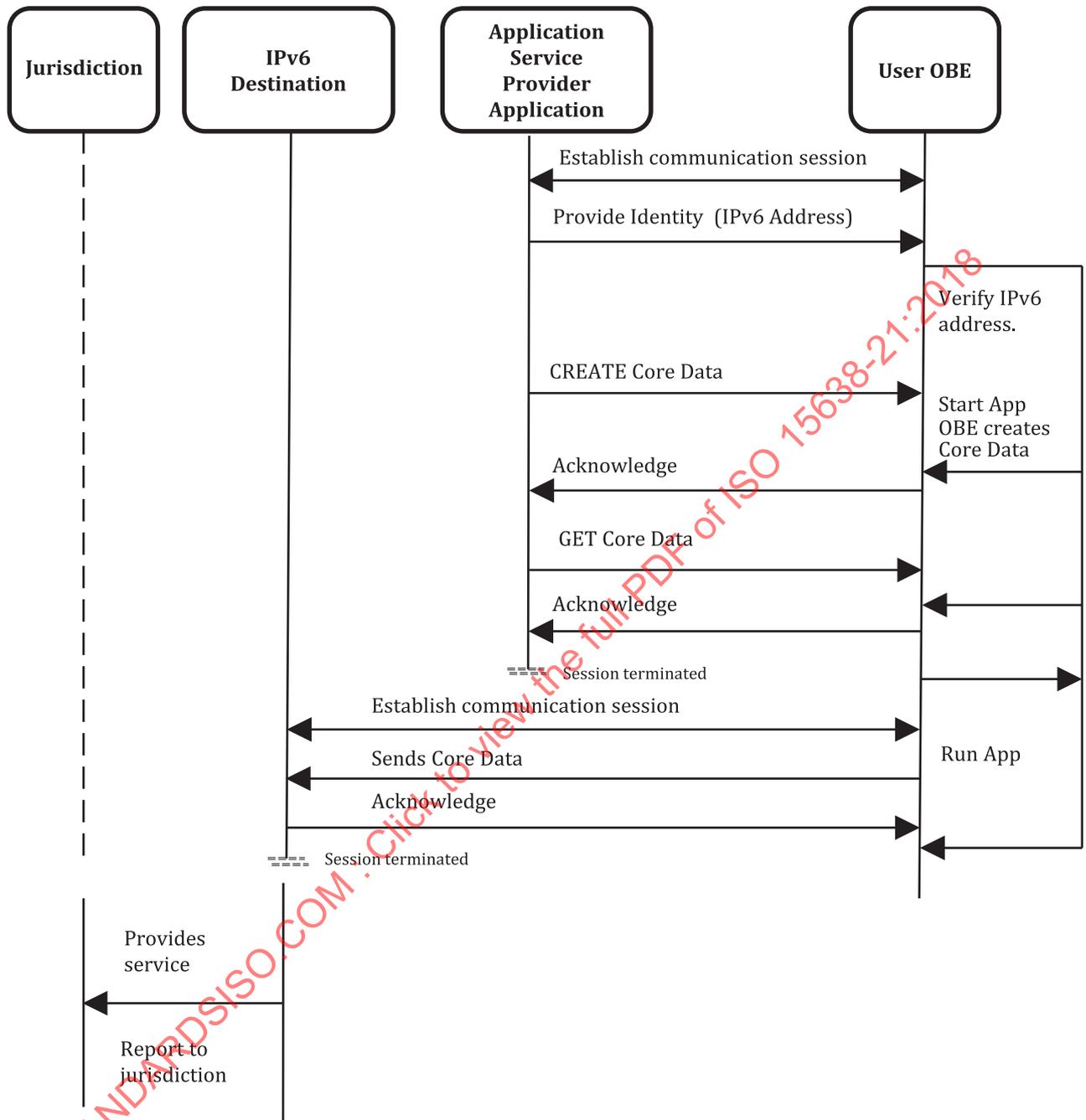


Figure 3 — Communications sequences to obtain CoreData

Most of the application services (3.3) defined in this document require data in addition to the basic vehicle data (3.10), and therefore, before the data can be obtained, the data pantry has to be updated. Figure 4 below shows a hypothetical example of CoreData.

NOTE 1 In the TARV-ROAM (3.36) architecture (3.7), the application system has no direct access to the source of data, only data in the data pantry that it is authorised to access.

In this event the application operating system shall establish the communication link in accordance with ISO 15638-2, and shall issue the command 'CREATE core data', The IVS (3.23) then populates the CoreData data concept with data as instructed by the on-board app (3.2) associated with the IVS (3.23) sends an acknowledgement that the command has been received and the session (3.40) is closed.

The IVS (3.23) then sends the Core Data to the predetermined IPv6 address contained in the content of the Core Data. The receiving IPv6 address sends an Acknowledgement. Once the IVS (3.23) receives the ACKnowledgement) that TARV LDT is successfully received by the destination address, the session shall be closed.

NOTE 2 Core data includes the TARV LDT data.

Once the IVS (3.23) receives an acknowledgement (ACK) that the 'CoreData' is successfully received by the enquirer, the session shall be closed. An example of the construct of 'core data' is provided in Figure 4.

Example

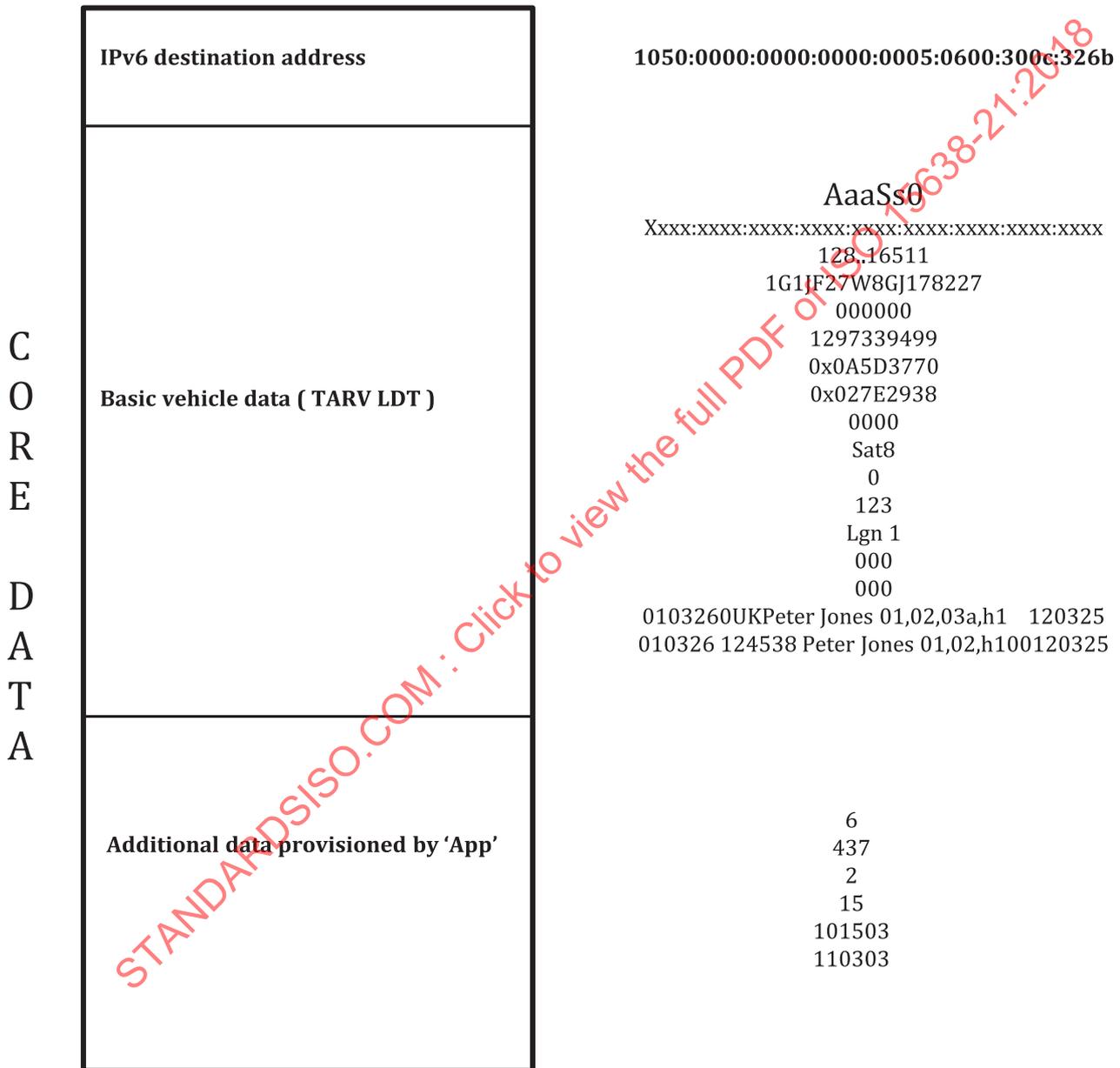


Figure 4 — Core application data

8.4 Quality of service requirements

This document contains no general requirements concerning quality of service (Q of S). Such aspects shall be determined by a jurisdiction (3.28) as part of its specification (3.41) for any particular regulated application (3.33) service (3.3). However, where a specified regulated application (3.33) service (3.3)

has specific Q of S requirements essential to maintain interoperability, these aspects shall be specified in the regulated application (3.33) service (3.3) document.

8.5 Test requirements

This document contains no general requirements concerning test requirements. Such aspects shall be determined by a jurisdiction as part of its specification for any particular regulated application (3.33) service (3.3), and issued as a formal test requirements specification document. However, where a specified regulated application (3.33) service (3.3) has specific test requirements essential to maintain interoperability, these aspects shall be specified in the document relating to that regulated application (3.33) service (3.3), or in a separate standards deliverable referenced within that Clause. And where multiple jurisdictions recognise a benefit to common test procedures for a specific regulated application (3.33) service (3.3), this shall be the subject of a separate standards deliverable.

8.6 Marking, labelling and packaging

This document has no specific requirements for marking, labelling or packaging.

However, where the privacy of an individual may be potentially or actually compromised by any instantiation based on the ISO 15638 series of standards, the contracting parties shall make such risk explicitly known to the implementing jurisdiction and shall abide by the privacy laws and regulations of the implementing jurisdiction and shall mark up or label any contracts specifically and explicitly drawing attention to any loss of privacy and precautions taken to protect privacy. Attention is drawn to ISO/TR 12859 in this respect.

9 Common features of regulated TARV application services

9.1 Generic operational processes for the system

The details of the instantiation of regulated application (3.33) service (3.3) are as designed by the application service (3.3) system to meet the requirements of a particular jurisdiction and are not defined herein. This document specifies the generic roles and responsibilities of actors in the systems, and the interoperability of key operational steps and actions required to support all TARV regulated application (3.33) service systems, and this Clause addresses the generic provision of regulated application (3.33) services (3.3) that require data in addition to, or instead of, basic vehicle data (3.10) and core application data, and specifies the generic form and content of such data required to support such systems, and access methods (3.1) to that data.

For details of the operational processes see the sequence of operations in the clauses defining the regulated application (3.33) service (3.3) and their related figures below.

It shall not be possible for collected or stored regulated application (3.33) service data in any software or non-volatile memory within the application service system to be accessible or capable of being manipulated by any person, device or system (including via any self-declaration device), other than that authorised by the application service provider (3.39).

The means by which data is provisioned into the data pantry, and the means to obtain the TARV LDT and core data are described in [Clause 8](#) above.

Specific regulated application (3.33) services (3.3) [defined in Application Service (3.3) Parts of the ISO 15638 series, and see examples in Annex A], shall collect and transfer application specific data. Sometimes this shall be or shall include the TARV LDT or core data, in many cases additional application specific data will be required. This data shall be defined in the specific regulated application (3.33) services document.

Different application services (3.3) may require connection to different application specific equipment — for example a tachograph, or some form of driving licence reading equipment. However there are common basic processes behind TARV regulated application (3.33) services (3.3).

In order to minimise demand on the IVS (3.23) (which it is assumed will be performing multiple application services (3.3) simultaneously, as well as supporting general safety related cooperative vehicle systems), and because national requirements and system offerings will differ, a ‘cloud’ approach has been taken in defining TARV regulated application (3.33) services (3.3).

The TARV approach is for the on-board app (3.2) supporting the application service (3.3) to collect and collate the relevant data, and at intervals determined by the app (3.2), or on demand from the application service provider (ASP) (3.39), passes that data to the ASP. All of the actual application service (3.3) processing shall occur in the mainframe system of the ASP (in the ‘cloud’).

At a conceptual level, the TARV system is therefore essentially simple, as shown in Figure 5. The process is similar to that for CoreData, but data is supplied to a different on-board file in the data pantry.

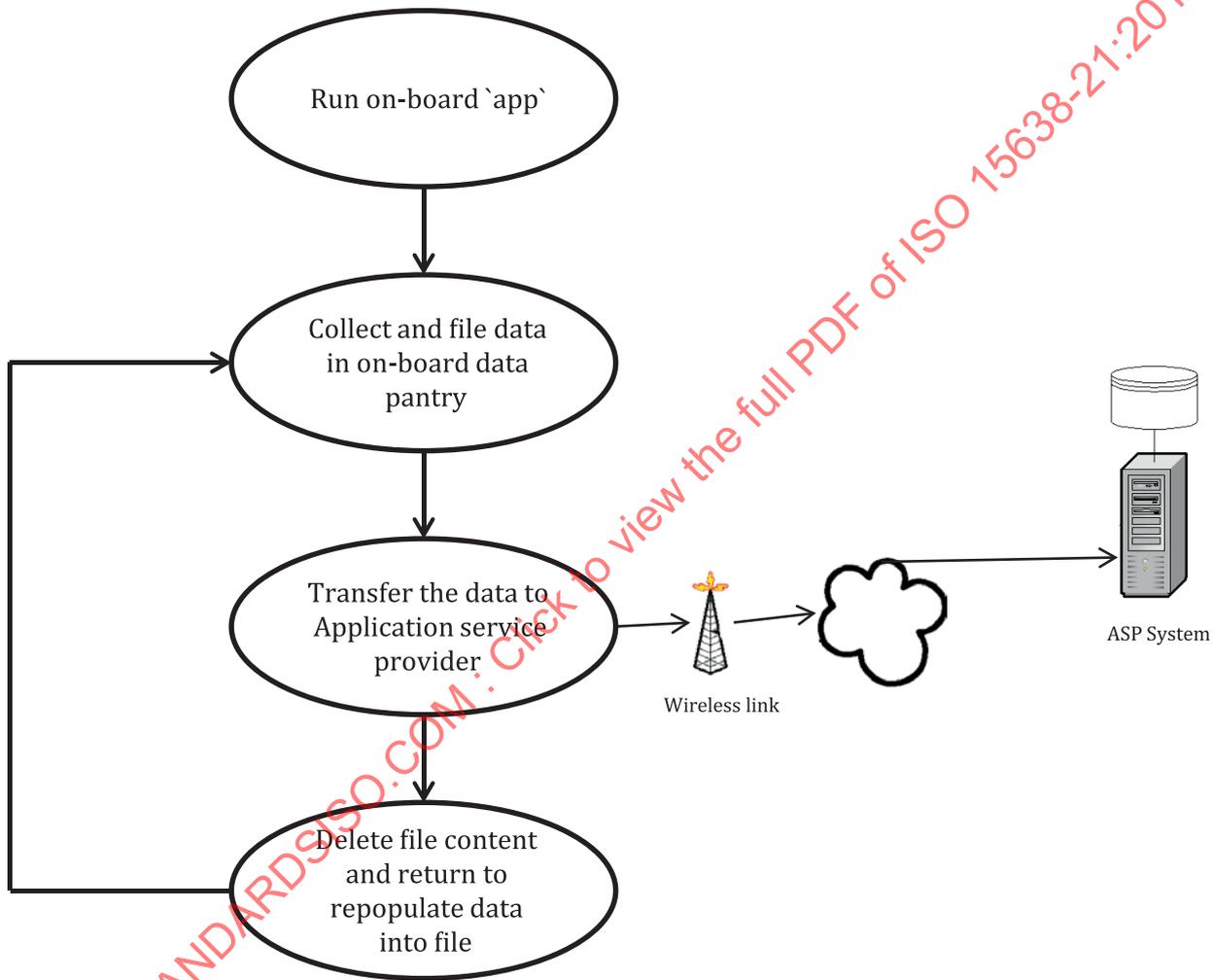


Figure 5 — TARV Regulated application service on-board procedure

NOTE The data in the on board device can be stored for a period of time as required by any specific jurisdiction (3.28).

At a common generic functional level, the connected equipment may or may not be required in all cases.

The common role of the jurisdiction, approval authority, and application service provider (3.39) shall be as defined in ISO 15638-6. The jurisdiction may require or offer data from roadside sensors (3.37) to supplement the requirements of its application requirements.

The Figure 5 indicates that data is deleted from the on board device after it has been sent to the ASP system; given the architecture (3.7) of the ASP system, there may be multiple jurisdictions (3.28) interested in not only the most recent information but information that has been stored in the on board

device for some extended period of time (i.e. 24 h). The system should support the storage of information on the on board device for some jurisdiction defined period of time in order to allow the ASP service to request either the most current data records or the records for the last xx hours/days, etc.

9.2 Common role of the user

In the case of the most regulated application (3.33) services (3.3), the user (3.45) may be the fleet operator or the driver (3.19), or both, depending on the specific application service (3.3) as defined by the regime imposed by the jurisdiction. Within this document, 'operator' (3.31) and 'driver' (3.19) are therefore considered as sub-classes of the class 'user' (3.45).

9.2.1 Role of the driver

The driver (3.19) shall be responsible, where required by the system, for using the identification and authentication (3.9) method supplied by the prime service provider (3.32)/ application service provider (3.39). The declaration of his/her personnel details such as name, driver's licence number and issuing jurisdiction shall be automatically declared by the method of identification and authentication (3.9). However the technical means of provision (electronic driving licence identification device, keyboard, iris recognition, barcode, RFID, DRD, etc.) of this information, shall be a function of system/equipment design (or a requirement of the jurisdiction and is not standardised within this document).

The driver (3.19) shall be responsible for reporting any system malfunction alerts, or apparent system failures to the operator (3.31) and/or application service provider (3.39) as per the instructions provided to them at the commencement of their service contract. The driver (3.19) is not responsible for IVS (3.23) or other equipment malfunction or rectification processes beyond these actions.

The driver (3.19) shall be responsible for any equipment (such as a DRD, smart card, RFID device, barcode) provided to him to identify him/herself to the IVS (3.23) when in control of the regulated vehicle (3.35). If the driver (3.19) loses any such device, he/she shall be responsible to immediately advise the regulated vehicle operator (3.31) and application service provider (3.39).

NOTE Some regulated application (3.33) services (3.3) can only enable the regulated vehicle (3.35) to operate once the identification of the driver (3.19) is recorded.

9.2.2 Role of the operator

The operator (3.31) of the regulated vehicle (3.35) shall be responsible to advise and request action from the application service provider (3.39) in the event that the driver (3.19) advises him of a potential or actual system malfunction and shall make the regulated vehicle (3.35) reasonably accessible to the application service provider (3.39) in order that they may rectify the problem.

If required, and according to the regime of the jurisdiction, the operator (3.31) shall identify the driver (3.19) of the regulated vehicle (3.35) at a particular point of time, to the jurisdiction or its agents.

9.3 Common characteristics for instantiations of regulated application services

9.3.1 The common characteristics for instantiations of regulated application (3.33) services (3.3) shall be as defined in ISO 15638-6.

Namely, a regulated application (3.33) service is approved; it utilises a TARV IVS (3.23) which communicates to the prime service provide and may have the ability to insert a means to provide driver licence details, or link to another device such as a digital tachograph.

9.3.2 The application service provider (3.39) shall load an app (3.2) for a regulated application (3.33) service (3.3) into the IVS (3.23) of the operator's (3.31) vehicles.

9.3.3 The app (3.2) for the regulated application (3.33) service (3.3) shall run whenever the regulated vehicle (3.35) is operating, or to the instruction of the application service provider (3.39) or operator (3.31).

9.3.4 The app (3.2) for the regulated application (3.33) service (3.3) shall record the data specified within the appropriate clauses of this part of ISO 15638, in a uniquely named file (to a naming convention specified) [the 'application service data file {ASD file} (3.6)] in the data pantry of the IVS (3.23).

9.3.5 The application service provider (3.39) shall design/install/operate its regulated system as approved by the certification authority (regulatory)(3.13).

9.3.6 The IVS (3.23) shall provide the ASD file to the application service provider (3.39) using the TARV IVS (3.23) wireless link, on demand from the application service system or at the instigation by the on-board app (3.2) for the regulated application service (3.34), or at least once every 24 h.

Every transfer shall include framing data that identifies its sequential order, IVS (3.23) ID, version number of IVS (3.23) and version number of the app (3.2) for the regulated application (3.33) service (3.3).

The system shall acknowledge receipt of the data via the TARV IVS (3.23) wireless link. Once the data has been acknowledged it shall be deleted from the IVS (3.23) memory unless the operator (3.31) chooses to retain it in the IVS (3.23) memory for other openly declared purposes with the assent of the user (3.45).

9.3.7 The application service system shall retain and back up the 'ASD file' data to the requirements of the jurisdiction (3.28).

9.3.8 The application service provider (3.39) shall provide reports to the jurisdiction or its agents as specified and required by the jurisdiction when approving the service product.

Where required by the application service specification (3.41) approved by the certification authority (regulatory) (3.13), the driver (3.19) shall provide their identification to the system at commencement of a session (3.40) using the identification and authentication (3.9) method provided by the application service provider (3.39). When the regulated vehicle (3.35) ignition is turned off, the system shall automatically close the session. Each time the regulated vehicle (3.35) ignition is turned on, the driver (3.19) shall be required to identify and authenticate himself/herself.

If drivers (3.19) change without turning the engine off, the new driver (3.19) shall identify himself/herself by the means provided by the application service provider (3.39).

Where required by the application service specification approved by the certification authority (regulatory) (3.13), the application service provider (3.4) provides the driver (3.19) [i.e. driver (3.19) specific] with their identification and authentication (3.9) method for the IVS (3.23). The method of identification and authentication (3.9) may be unique to each application service provider (3.39).

9.3.9 Electronic records are generated periodically by the IVS (3.23) when the regulated vehicle (3.35) is moving. The electronic record contains accurate time and location data as defined herein. These ASD file records are generated automatically during the session (3.40) and also stored in the IVS (3.23).

9.3.10 'ASD files' generated by the IVS (3.23) are sent to the application service provider (3.39). The application service provider (3.39) transmits reports/data to the regulated vehicle (3.35) operator (3.31) in accordance with the system specification, and in the event of contravention, to the jurisdiction, in accordance with the regime of the jurisdiction.

9.4 Common sequence of operations for regulated application services

It is important to understand that different jurisdictions will require their own form of a regulated application (3.33) service, and that application service provider (3.39) service offerings will also vary. The specific detail of these application services are not defined within this part of ISO 15638 and for this part of ISO 15638, at a generic level, the 'business process' is to collate the required data (as specified by the on-board app), and provide a uniquely named file containing that data to the application service provider (3.39) system via a wireless interface.

9.5 Quality of service

Generic quality of service provisions for application services (3.3) shall be as defined in ISO 15638-6.

Variations for specific application services (3.3) are shown in the clauses describing that particular application service (3.3) defined.

9.6 Information security

Information security shall be as defined in ISO 15638-6.

9.7 Data naming content and quality

Data naming and quality shall be as defined in ISO 15638-6

In summary: TARV application services (3.3) are built around short communication sessions (3.40) that simply transfer a file of data to an application service provider (3.39) at intervals/times determined by the application, and receive back a confirmation that the data has been received.

An application service provider (3.39) may stimulate the transfer of a file from the IVS (3.23) to the application service system. In other situations it is the on-board app that stimulates the file to be sent, in some application service (3.3) instantiations it may be a combination of both.

Variations for specific application services (3.3) are shown in the clauses describing that particular application service (3.3) defined.

The process to obtain basic vehicle data (3.10) (TARV LDT) data content shall be as defined in ISO 15638-5.

The electronic records declared and stored by the IVS (3.23) shall be authenticated, have integrity and be secure from interception or corruption.

In order to enable the application service (3.3) to identify files received, the files are named to the following convention:

<service name><date><time><vehicle registration number><driver licence number>

EXAMPLE

VDLM 110316 070603 GB 1 KV76WRR WILLI502139RK9MA85

As:

VDLM110316070603KV76WRR WILLI502139RK9MA85

Vehicle registration number shall be as specified in ISO 14816 CS4.

Driver licence number shall be as specified by the issuing driver licence jurisdiction (3.28).

Some application services may not require either the vehicle registration number or the drivers licence number in which case that element of the data concept name may be omitted, however there shall always be at least one of these two elements present.

The Clauses defining the specific application services (3.3) specify the precise naming convention for that application service (3.3).

9.8 Software engineering quality systems

Software engineering quality systems shall be as defined in ISO 15638-6.

9.9 Quality monitoring station

The availability of quality monitoring stations shall be as defined in ISO 15638-6.

9.10 Audits

Audits (3.8) shall be as defined in ISO 15638-6.

9.11 Data access control policy

To protect the data and information held by the application service provider (3.39), each provider shall adopt a risk based data access control policy for employees of the provider.

9.12 Approval of IVSs and service provider

Generic provisions for the certification (3.11) of IVSs (3.23) and service providers shall be as specified in ISO 15638-3 [TARV — Operating requirements, certification (3.11) procedures and enforcement provisions for the providers of regulated services]. Detailed provisions for specific regulated applications (3.33) shall be as specified by the regime of the jurisdiction (3.28).

9.13 Approval of road side sensors

Generic provisions for the certification (3.11) of roadside sensors (3.37) shall be maintained and managed by jurisdictions as the roadside equipment usually is the property of jurisdictions and certification (3.11) within the scope of its duties. Detailed provisions for specific regulated applications (3.33) shall be as specified by the regime of the jurisdiction.

Annex A (informative)

Application examples

A.1 General

Present and emerging deployed use cases are shown here for reader's reference.

A.2 Regulated heavy vehicle movement enforcement enhancement system

A.2.1 Use case definitions

The following role model is applied to this use case.

Use Case	Regulated heavy vehicle (RHV) movement enforcement enhancing system (Japan) based on V2I and I2V communications
Description	<p>This system uses roadside sensed data for enforcement of RHV. The RHV user (3.45) usually applies advanced permission to use road for regulated heavy vehicle transport. Jurisdiction(s) (3.28) provide the permit together with the designated route to applier and RHV user follows this designated road for actual movement of vehicle. The jurisdictions system monitors automatically and on real-time basis the movement and weight of the RHV. WIM devices are installed on or under the road surface.</p> <p>Japanese application details :</p> <p>In Japan ETC 2.0 application services (3.3) which are C-ITS applications, provided by MLIT, each RHV stores vehicle movement data (location data/probe data) every 200m or any sudden movement location data. The location data is obtained from GNSS (3.22) system.</p> <p>Those data are transmitted at nearest roadside TARV probe data collector through secured ETC2.0 communication protocol. Roadside sensor (3.37) collects the vehicle weight at this point through WIM device under the road or below surface. These data are sent to the data processing center maintained/operated by MLIT, Ministry of Land, Infrastructure, Transport and Tourism of Japan through secured land line.</p> <p>Vehicle ID disclosure to the central system is mandatory to RHV commercial freight vehicle users and this is optional for passenger car users.</p> <p>That data should carry vehicle ID for RHV, however, for the passenger car, it is up to user's choice and if user accepts the use of privacy data by MLIT beforehand, user can get value added service from MLIT. All RHV users have to accept this clause with no exceptions.</p> <p>Users who accept, or are required to accept this monitoring policy, receive value added services such as better and uncongested dynamic route selection guidance information etc.</p> <p>When the service provider has access to this data, they may also be able to provide further enhanced ITS services (3.24) to users.</p> <p>The probe data stored in on board unit is transmitted to MLIT service provider (3.39) part through roadside probe data collector TARV RSU via secured ETC2.0 protocol 5.8GHz transceiver type DSRC communication link.</p>

Use Case	Regulated heavy vehicle (RHV) movement enforcement enhancing system (Japan) based on V2I and I2V communications
	<p>Roadside DSRC probe data collectors are named as ITS Spot. This is a 2-way communication link.</p> <p>All the probe data from the vehicles are processed to produce structured data which can be used for traffic management, publically available traffic information services, road infrastructure development planning and other service provider application ITS services (3.24).</p> <p>These data can also be used for dynamically changing road pricing to avoid traffic congestions on certain toll roads.</p> <p>In fact, at each ETC2.0 spot, vehicles can receive information such as dynamically variable road congestion charge rates, suggested uncongested routes for navigation, etc. from the MLIT service provider.</p> <p>This application example utilizes full part of the Extended Role model conceptual architecture (3.7) defined in paragraph 6. In this case, Jurisdiction (3.28) may include information provider provider role.</p>
Actor	<p>Jurisdiction: the entity who gives the RHV user the permission to use the designated road routes for movement of regulated heavy vehicle. The jurisdiction monitors on real time basis the movement of the RHV for any violation of rules defined, such as route, weight, time and etc. by using data from roadside sensors (3.37) and vehicle data collected by service provider through TARV link from vehicle. Roadside probe data collector device can also gather in-vehicle data such as digital tachograph data, vehicle ID such as VIN and other IVS (3.23) data.</p> <p>User: the entity who uses vehicle or driver (3.19) itself. User usually enrolled real time monitoring system service in advance and he/she is assumed to have accepted his/her privacy information use for enforcement purposes. Vehicle to be equipped with designated on board unit which can communicate with MLIT service provider part through secured ETC2.0 protocol roadside probe data collector communication device. On board unit releases the accumulated past vehicle location data to MLIT service provider part through TARV service provider link when the vehicle reaches nearest roadside probe data collector position.</p> <p>Roadside senders: the device which detects vehicle status/information and senses vehicle status such as vehicle ID, weight, emission gas with engine data. The reverse link can be used for information provision from jurisdiction, such as advice/instruction/warning to drivers (3.19) through on board unit display.</p>
Assumptions	<p>User enrolled to the service in advance. User/vehicle data should be properly recorded on to the data base of the system.</p> <p>On board unit should be properly installed/inspected in advance per regulations.</p>
Interactions	<ol style="list-style-type: none"> 1. User vehicle probe data is collected at each TARV probe data collector. The roadside sensors (3.37) collect vehicle weight history (loading and unloading through the transportation route) and data is sent to MLIT service provider part through secured MLIT land line. 2. Probe data and sensor data are sent to service provider (3.39) through separate link but both data are aggregated and processed at service provider to verify that RHV is obeying designated route, time and weight limit. 3. When violation is found, jurisdiction (3.28) enforces user to obey rules through jurisdiction officers.
Results	<p>Jurisdiction can perform enforcement efficiently and successfully on real-time basis. Road condition is kept in ideal condition without damages caused by overloaded vehicles.</p>
Issues	<p>*The statement of issues to make this use case perform better; see below.</p> <p>*System improvements; to be more precise to real-time status, number of roadside sensors (3.37) should be enough for practical enforcement purposes. The hybrid communication link with 5.8GHz DSRC and cellular and other network could improve the quality of enhancements.</p>