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

Part 24: Safety information provisioning

Systèmes de transport intelligents — Cadre pour applications télématiques coopératives pour véhicules réglementés (TARV) —

Partie 24: Fourniture d'informations sur la sécurité

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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 of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 204, *Intelligent Transport Systems*.

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

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Freight vehicles are heavy and therefore require longer reducing speed and manoeuvring distance in comparison to lighter vehicles. To achieve safer freight road transport of freight vehicles, an information provision service providing traffic status and incident situation well ahead of the freight vehicle is indispensable. This information provision can increase vehicle safety during freight road transport.

This document standardizes the conceptual operational framework of safety information provision provided by service providers. The ISO 15638 series of TARV application standards are based on a triumvirate of vehicle operators with in-vehicle systems, on-board application service providers and jurisdictions. The basic TARV ISO 15638-1 standard focuses on the transactions between these parties via ITS-stations and roadside sensors, and using this system architecture, additional safety information provision services to freight vehicles can be realized. The new means of safe road transport management and enforcement can be enabled by using this document where jurisdiction requires such regulated monitoring.

It therefore seems appropriate to include this additional document (Part 24) in the ISO 15638 series to provide the means for adding safe road transport of freight vehicles.

It is necessary for telematic applications to be able to be integrated into the embedded computing systems available on the market. The need for interoperability of different solutions is also important as several actors with different solutions can be involved in information needs. Securing the data exchanged is also a particularly important point.

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

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

Part 24: Safety information provisioning

1 Scope

The ISO 15638 series (Parts 1 to 23) define the framework for online fleet management of regulated commercial freight vehicles utilizing data communication between in-vehicle systems and an application service provider via an on-board communication unit interfacing with road monitoring infrastructure and roadside sensors. This document defines an unregulated service architecture framework for freight vehicle safety information provision architecture. This statement does not preclude the regulated service where a jurisdiction requires such a function.

The objective of this document is to provide a freight vehicle safety information provision service function/application for non-enforcement applications (and sometimes for regulated application services [RAS]). This is for the road transport safety management purposes of regulated commercial freight vehicle movements.

This document intends to reinforce vehicle safety for non-enforcement and other purposes by providing safety advisory information provisions to the freight vehicle drivers/operators transporting heavy goods on freight vehicles.

This document defines the framework for remote vehicle safety information provision for non-enforcement and the conceptual operation of other management purpose applications.

This document is complementary to, and does not replace, any other documents in the ISO 15638 series. This document is beneficial to vehicle safety management purpose entities and it provides additional use cases for TARV service applications.

This document is specifically oriented towards the realization of safer road transport of freight vehicles by providing safety advisory information to the vehicle from the service provider. It utilizes the ISO 15638 series basic architecture framework, as defined in ISO 15638-21. The service provider provides users with safety information such as recommended safety information for that vehicle and gives adequate safety advice messages, as necessary. The various V2X communication paths can be used according to the various use cases.

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 15638-1, *Intelligent transport systems — Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 1: Framework and architecture*

ISO 15638-2, *Intelligent transport systems — Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 2: Common platform parameters using CALM*

ISO 15638-3, *Intelligent transport systems — Framework for collaborative telematics applications for regulated commercial freight vehicles (TARV) — Part 3: Operating requirements, 'Approval Authority' procedures, and enforcement provisions for the providers of regulated services*

ISO/TS 15638-4, *Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 4: System security requirements*

ISO 15638-5, *Intelligent transport systems — Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 5: Generic vehicle information*

ISO 15638-7:2013, *Intelligent transport systems — Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 7: Other applications*

ISO 15638-21, *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*

ISO 14816, *Road transport and traffic telematics — Automatic vehicle and equipment identification — Numbering and data structure*

ISO 17262, *Intelligent transport systems — Automatic vehicle and equipment identification — Numbering and data structures*

ISO 24534-3, *Intelligent transport systems — Automatic vehicle and equipment identification — Electronic registration identification (ERI) for vehicles — Part 3: Vehicle data*

ISO 26683-2, *Intelligent transport systems — Freight land conveyance content identification and communication — Part 2: Application interface profiles*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15638-21 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 http://www.electropedia.org/

4 Abbreviated terms

ASD file application service data file

ASP application service provider

CALM communications access for land mobiles

C-ITS cooperative intelligent transport system

CONOPS concept of operations

GNSS global navigation satellite system

ID identity

ITS-S intelligent transport system station

IVS in-vehicle system

LDM local dynamic map

QoS quality of service

RAS regulated application service

RTM remote tachograph monitoring

TARV telematics applications for regulated vehicles

5 Conformance

Requirements to demonstrate conformance to any of the general provisions or specific application services described in this document shall be within the requirements defined by the service provider. Conformance requirements to meet the provisions of this document are therefore deemed to be under the control of, and to the specification of, the service provider where the application service(s) is/are instantiated.

6 General overview and framework

This document utilizes the framework and architecture for freight vehicle stability monitoring defined in ISO 15638-21. The general conceptual operation description of the roles of the actors in "extended" TARV architecture is defined in ISO 15638-21.

To gain an in-depth understanding of the extended TARV framework, architecture, and detailed specification of the roles of the actors involved, the user shall consult ISO 15638-1, ISO 15638-7 and ISO 15638-21.

As a summary, Figure 1 shows the "extended" role model conceptual architecture showing the key actors and their relationships as defined in ISO 15638-21.

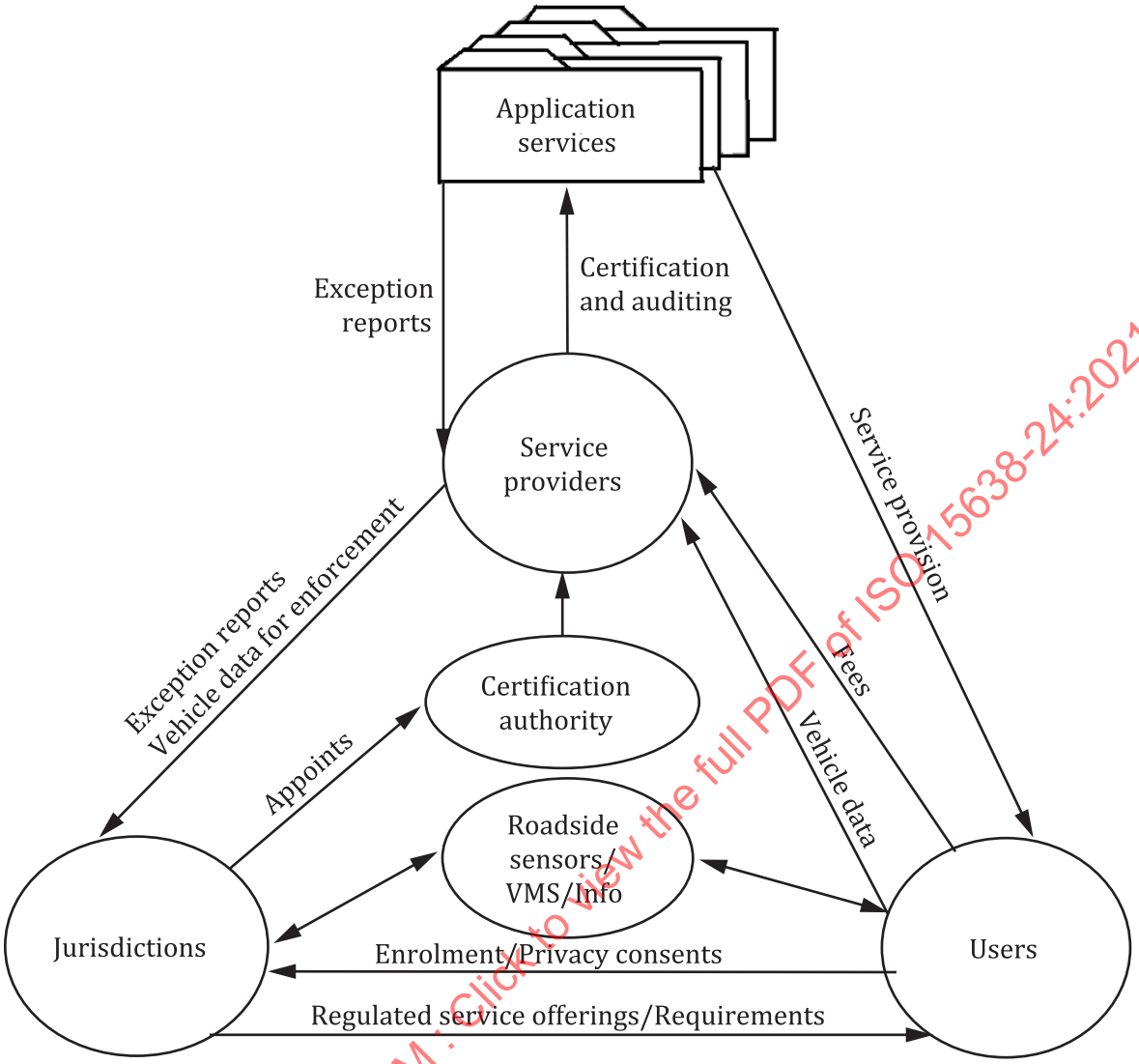


Figure 1 — Extended role model conceptual architecture

The ISO 15638 series provides a suite of deliverables addresses and defines the framework for a range of cooperative telematics applications for regulated vehicles (such as electronic tachograph monitoring, driver work records, emergency messaging/eCall, mass monitoring, 'Mass' information for jurisdictional control and enforcement, speed monitoring, access control, access methods, location monitoring, weigh in motion, freight vehicle stability monitoring, tyre monitoring, etc.). The overall scope includes the concept of operation, legal and regulatory issues, and the generic C-ITS service platform. The framework is based on a (multiple) service provider-oriented approach, including provisions for the certification and auditing of service providers.

This document is intended for an unregulated service provision application for safe road transport by freight vehicles, achieved through the safety information provision to the vehicle, such as safe driving information provision (including information such as recommended safe speed and recommended driving lane change advice information). Figure 2 shows the architecture from the viewpoint of the provision of an unregulated (commercial) application service, using the common "extended" TARV platform defined in ISO 15638-21.

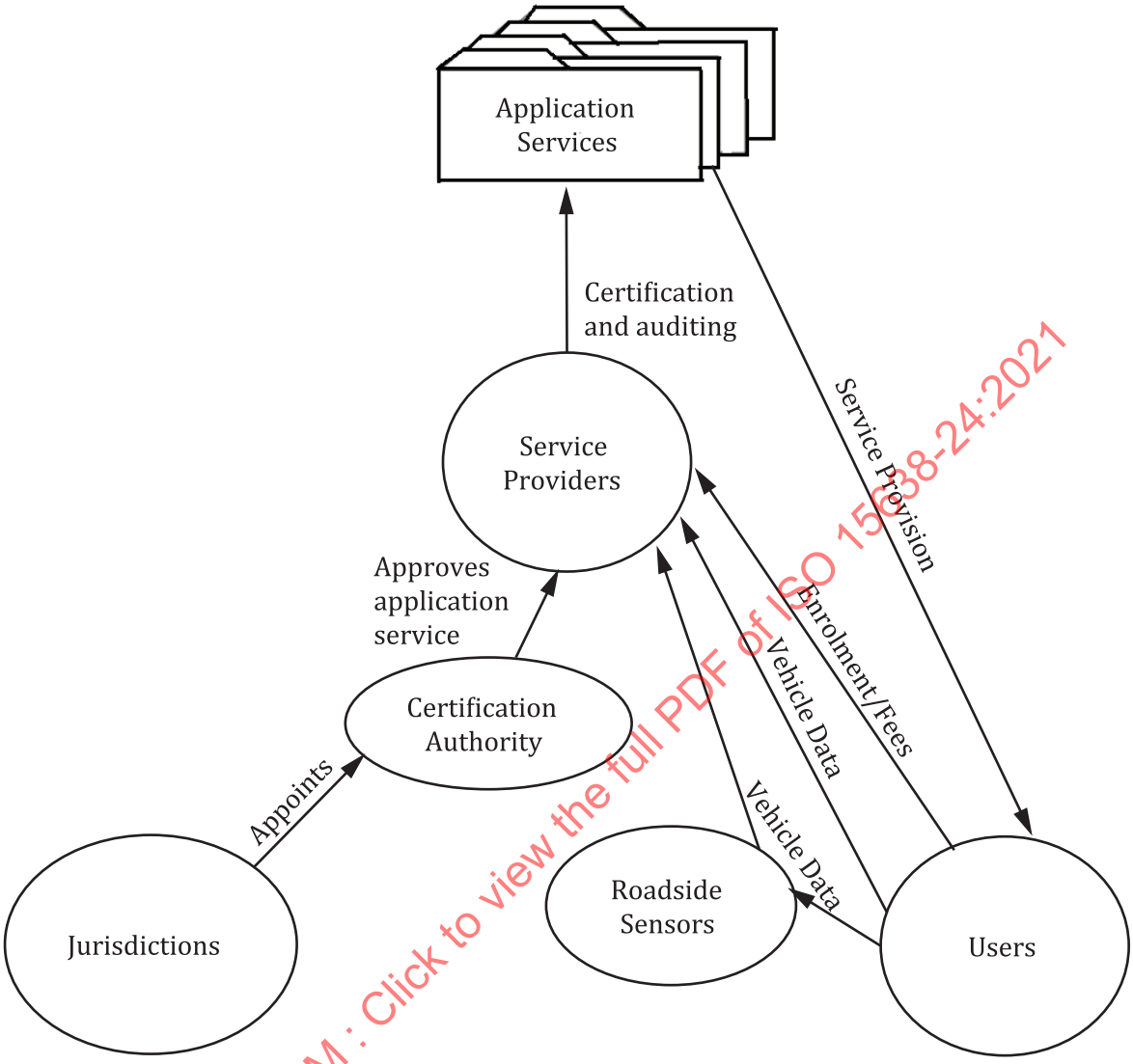


Figure 2 — Role model conceptual architecture unregulated service provisioning

Freight vehicles are heavy and therefore require longer reducing speed and manoeuvring distance in comparison to lighter vehicles. To achieve safer freight road transport of freight vehicles, an information provision service providing traffic status and incident situation well ahead of the freight vehicle is indispensable. The purpose of this document is to realize safe freight vehicle road transport, in particularly increasing the vehicle safety by maintaining the safe speed and lane change of a freight vehicle transporting freight and container. The proper recommended speed and lane information given to the vehicle driver/operator is generated at the service provider; they monitor vehicle speed/lane and give safety advisory messages to the driver when necessary. This document enables safe freight vehicle road transport stability realization and efficient freight fleet transport operation of the user vehicles by avoiding accidents or serious incidents on the roadways.

The freight vehicle information can be obtained from various sources, such as roadside embedded sensors, freight vehicle on-board equipped sensors. The sensor information is sent to the service provider to realize real time remote monitoring of freight vehicles and the service provider provides the safety driving advice for that part of the road for that vehicle. By providing the freight vehicle location (GNSS) data to the service provider, the service provider can provide adequate safe road transport driving information for that part of the road and for that vehicle (model).

The service provider provides this application service to/for a user who is an individual or party that enrols in and operates within an unregulated application service or commercial application service

to meet specific aspects of the requirements of a service provider for the operation of the regulated vehicle.

Examples of users are a transport operator, driver, freight owner, etc. Most commonly the user is the transport operator.

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

This document defines the basic conceptual operational requirement for this application service, the freight vehicle safety information provision.

It is important to note that where a commercial (unregulated) service can be instantiated using only the generic vehicle data specified in ISO 15638-5, no further standardization is required. Where a TARV commercial application is simply instantiated as a commercial application conforming to the requirements of this document, no further standardization is required so long as conformance to the requirements of this document can be demonstrated, and service offerings may vary from service provider to service provider. The service provider provides the application service to/for a 'user' who is an individual or party that enrols and contracts to receive the commercial/civic application service.

7 Basic conceptual operational requirement

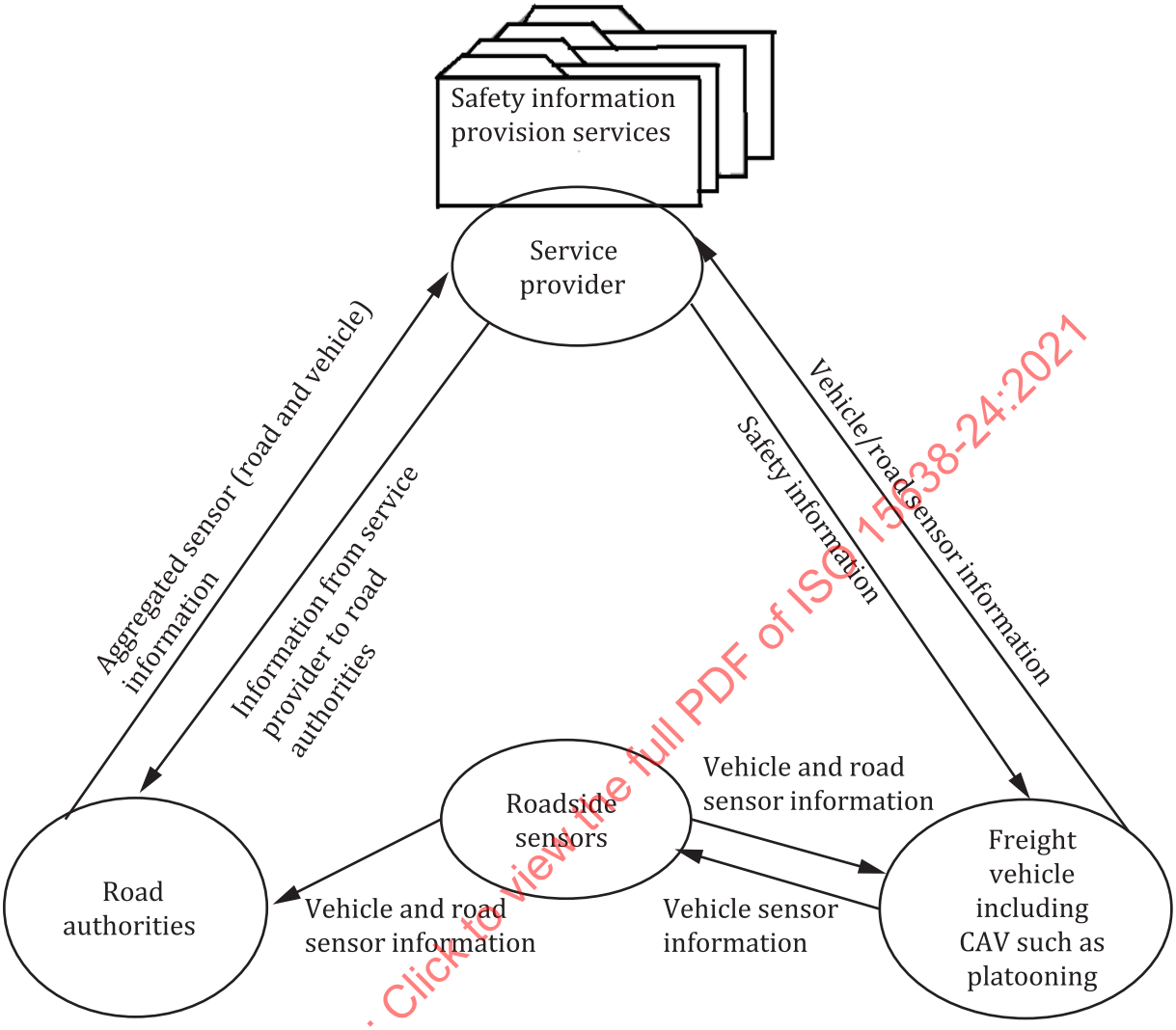
7.1 General

The basic conceptual framework is described as shown in Figure 3.

The telematic application generates adequate safety information so that an accident is avoided (tail end collision, crush, rollover, jack-knifing). This safety information depends on the road characteristic and the dynamic behaviour of the vehicle configuration.

It is important that dealing with the vehicle model/configuration (power unit and connected trailer(s)) is based on the interaction between the road and the vehicle, because this depends on the vehicle model/configuration.

Moreover, the quality of the estimated speed is based on the accuracy of the model.



NOTE 1 Vehicle sensor information: braking, steering, turn signals, etc.

NOTE 2 Road sensor information: traffic volume, speed, road works, accidents, ice, snow, stationary vehicles, obstacles, etc.

Figure 3 — Basic conceptual framework for vehicle safety information provisioning service

7.2 Basic requirement

The basic requirements are as follows:

a) The vehicle shall be equipped with vehicle safety monitoring sensors and such data shall be sent to the service provider through on-board unit ITS communication media connected with the service provider. If the vehicle does not have such sensors, only roadside sensor data is used, and continuous data acquisition is not possible.

b) An on-board safety sensor shall monitor vehicle safety continuously and shall detect driving status. A roadside sensor shall detect similar status when a freight vehicle passes through it.

c) Vehicle location data shall be sent to the service provider so that service provider is able to track and trace the vehicle on the LDM and the vehicle location can be utilized to provide adequate safety advice for that vehicle.

d) The service provider shall obtain LDM map data from the map data service provider when such data are required for that service provision.

e) The service provider shall perform data fusion processes for vehicle stability monitoring by combining sensor data, location data and LDM map data, as necessary.

f) The service provider shall provide safety information to the vehicle operator when necessary and the information described below as examples shall be given:

— Merging traffic support: “merging traffic ahead”

: meaning “make space for merging vehicle”

— Road incident alert: “road incident ahead”

: meaning “slow down and prepare for stop”

— Lane closure alert: “this lane closed ahead”

: meaning “change lane”

— Lane closure pre-information: “this lane will be closed after xx min”

: meaning “prepare for change lane”

— Detour alert: “detour ahead”

: meaning “slow down and prepare for detour”

— Merging traffic support for entering vehicle: “platooning fleet in main lane”

: meaning “hold entering until platooning fleet passes”

— Traffic incident alert: “platooning fleet ahead”

: meaning “slow down and prepare for lane change”

— Other safety driving supports

NOTE This document defines a framework and does not define safety message details; these are defined by other standards and take into consideration regional regulations applicable to the freight vehicles.

8 Requirements for services using generic vehicle data

8.1 General

8.1.1 Introduction

The means by which the access commands for generic vehicle information specified in ISO 15638-7 can be used to provide all or part of the data required to support a regulated application service shall be as defined in ISO 15638-7.

This clause provides 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 to support an unregulated application service. This clause also defines general requirements to assure data interoperability.

8.1.2 Unregulated application services using only generic basic vehicle data

Where all the required data can be obtained via the access commands for generic ‘essential vehicle information’ as specified in ISO 15638-5, the access methods defined in ISO 15638-5 shall be used consistently to obtain the values for the TARV LDT and C-ITS LDT data concepts. No further international

standardization is required, and jurisdictions, subject to the privacy regulations pertaining within that jurisdiction, can develop, operate, and update their services according to local design with international interoperability being maintained through the provisions of ISO 15638-5 (TARV Generic vehicle information). All vehicles that are equipped to support the ISO 15638 series are generally able to support such service provision. ISO 15638-5:2013, Clause 7 defines the following relevant commands:

a) GET TARV LDT (local data tree) data

b) GET C-ITS (co-operative intelligent transport systems) LDT data

See ISO 15638-5 for details of these commands.

8.1.3 Unregulated application services using both generic vehicle data and additional application specific data

See ISO 15638-7:2013, 7.1.2 for the generic sequence of operations for unregulated application services using both generic vehicle data and additional application specific data.

8.2 Conveyance identifiers

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

9 Concept of operations for unregulated application services with additional data requirements including roadside sensors

9.1 General

This clause describes the characteristics of a proposed system from the viewpoint of a user 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 commercial/civic provision using the TARV platform and an application service provider for TARV commercial/civics that require data in addition to that available from the basic vehicle data. It also provides the generic *modus operandi* for the provision of commercial/civic (unregulated) application services defined in the subsequent clauses of this document which relate to provisions for unregulated application services.

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.

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

9.2 Statement of the goals and objectives of the system

The overall objective of TARV commercial/civic application services with additional data requirements is to use a common telematics platform (which was most probably installed to meet a regulatory requirement for the control of regulated commercial freights) to provide additional commercial/civic application services. Those services that require only the basic vehicle data defined in ISO 15638-5 do not require further standardization measures, so this document is focused on meeting the requirements for commercial/civic provision in circumstances where data is required in addition to that provided by the basic vehicle data concept.

It is an underlying concept (described in ISO 15638-1) that these services are provided by agreement with the user and using an approved service provider to meet the requirements of the jurisdiction via an in-vehicle system (IVS) with communications capability between the vehicle and the service provider, and access to relevant data from the regulated commercial freight.

It is an underlying assumption that the vehicle is equipped with the means to acquire and provide the data (additional to the basic vehicle data), required by the specific application service. The requirements for specific additional data are not defined in this document, which standardizes only the general framework for commercial/civic provision using TARV. This means that the instantiation of services of the same title or description may be implemented differently by different application service providers, and therefore are most frequently not interoperable. Such differences provide product differentiation, and where the service is discrete, enable a commercial market to flourish with competing product offerings. However, there can be cases where, although the service is not required by regulation, there is benefit in standardizing some or all aspects and data exchanges of the service. Such services require a further standardization deliverable, which refers to this document as the baseline standard for the provision of commercial/civic application services using TARV and needs to specify only the additional aspects that require standardization.

As with provisions for regulated application service provision using TARV, the actual equipment to be installed to provide that data provision functionality is not standardized and is a commercial decision of the application service provider, unless it is specified by the jurisdiction.

This document determines the nature of the data and how it is to be sent and received by the IVS but does not standardize the equipment used to obtain the data, nor the definition of the actual service features received.

9.3 Strategies, tactics, policies and constraints affecting the system

The services that are regulated as mandatory or optionally supported can vary from jurisdiction to jurisdiction. So, it is possible that a service that is mandatory in one jurisdiction will not be required by another jurisdiction, but will instead be offered as a commercial/civic service within that domain. If the requirements are met within the service definition in ISO 15638-6, or require only basic vehicle data, no further standardization is required.

Modern trends in computing have moved away from the insular standalone solution where the demands for the provision of the service are entirely met by local capability, towards a 'cloud' computing conceptual architecture, where the bulk of the data processing and service provision is provided elsewhere within or behind the 'cloud', where it can be performed more efficiently and economically, and enabling simplification of the terminal equipment. It is a feature of TARV that the actual service provision takes place at and within the systems of the application service provider, and that the on-board equipment therefore largely serves only to collect and provide data to enable that service provision, and in some cases, to receive a result.

This fundamentally simplifies the capabilities required by the TARV on-board platform, enables practical instantiation of a similar service using different wireless media, and enables early implementation and deployment of such systems.

In respect of standardization, it means that the commercial/civic application services that are supported by this document require only the standardization of the data to be collected, its organization within on-board memory to meet the requirements of ISO 15638-1, and the means and frequency of its collation, and possibly, but not always (indeed probably infrequently) the download back to the vehicle of the result of the service provision.

A service that requires complex on-board processing, or intensive bidirectional communication, is outside the scope of TARV, although it may use TARV to forward its data to its service provider or receive data from its service provider.

A core strategy of this document is to ensure that an 'app' is only loaded legitimately, and that this prior loaded 'app' contains the destination address for the core application data. Instigating a 'GET TARVLDT' or 'GET CoreData' command only results in that data being sent to the previously determined destination address, and not to a spoof enquirer. While this has the advantage of security, and economy in/of use, it does mean that TARV is probably not the appropriate means for highly interactive 'on-line' services (for example collision avoidance). However, because TARV uses the same CALM communications platforms, the same on-board equipment can be used to support other 'cooperative vehicle systems'(C-ITS). See ISO 15638-1, ISO 15638-2, ISO 15638-3 and ISO 15638-5.

9.4 Organizations, activities and interactions among participants and stakeholders

The classes, attributes and key relationships are described in ISO 15638-1 and ISO 15638-7, with the addition of the ability to collect data from roadside sensors.

9.5 Operational roles and processes for the system

9.5.1 Common role of the prime service provider

To facilitate the correct installation and monitoring of TARV IVS, a prime service provider has been contracted by the user. See ISO 15638-1 (TARV Framework and architecture). The prime service provider is the technical expert of their system and shall be responsible for its installation, maintenance, and (as necessary) upgrade, but unless also appointed as an application service provider for a particular service, it is not responsible for the operation of application service software.

The prime service provider shall be responsible for ensuring that the multiple applications operate properly and do not adversely impact each other.

It is envisaged that the IVS operating systems can require updating from time to time to improve functionality, fix software 'bugs' or update the protection from electronic threats such as software viruses. It shall be the responsibility of the prime service provider to undertake such tasks, possibly in collaboration with application service providers.

The role of the prime service provider shall be to ensure that the IVS performs during day-to-day operation in the same manner as it did when it was approved. The prime service provider shall put in place a regime to the satisfaction of the approval authority which shall periodically monitor the IVS via several means including receiving test data files generated by the on-board 'app' for that application service. The prime service provider shall be responsible for determining the IVS operational state, performing any necessary enhancements and efficiently dealing with malfunctions when they occur.

The prime service provider shall report any malfunctions to the driver and application service provider as appropriate, and as technically possible (for example it may not be possible, during a working session, to advise the driver if the IVS has failed entirely, and such advice would have to be by post event 'offline' means).

The prime service provider shall work closely with the application service provider and vehicle operator to permit and enable the prompt repair and rectification of any malfunction with a TARV IVS.

9.5.2 Common role of the application service provider

The application service provider is the actor who is responsible for providing and operating the application service system.

The application service provider shall offer to provide to users the specific application service defined in the specification for that application service. This document specifies the format for key provisions of application service provision but does not define any specific application service.

The application service provider is normally envisaged to be a commercial entity, but they can also be a road users association or department of the jurisdiction providing a civic service to road users.

The application service provider shall be responsible for ensuring that the application service system is correctly installed and performs during day-to-day operation in the same manner as it did when it was approved. The application service provider shall monitor the operation of the application service system and shall report malfunctions to the driver, the prime service provider, and if required, to the jurisdiction. The application service provider shall maintain operational knowledge of the system to determine its operational state, perform any necessary enhancements and deal efficiently with malfunctions if they occur.

Where physical maintenance of the IVS is required, the application service provider shall notify the prime service provider and they shall jointly rectify the problem according to their defined responsibilities.

It is envisaged that the regulated application service systems can require updating from time to time to improve functionality, update maps, fix software 'bugs' or update the protection from electronic threats such as software viruses and it shall be the responsibility of the application service provider to undertake such tasks, possibly in collaboration with the prime service provider.

9.5.3 Role of the application service

This is the service defined and offered by an application service provider for an unregulated application service. Normally, this is expected to be a commercial/civic provision but may be provided by or on behalf of the jurisdiction, a not-for-profit body, or road users association, providing a civic service to road users. The important characteristic that separates these application services from those defined in ISO 15638-6 is that the service provision has nothing to do with the requirements of a regulation.

9.5.4 Service requirements definition

The service requirements definition will vary from service to service, and in many cases from one application service provider instantiation to another. The application service specification, or a standards deliverable specifying an interoperable service definition, will provide such specification within the guidance of this document. This document provides generic requirements, not application specific requirements.

9.5.5 Common role of user

In the case of the most unregulated application services, the user may be the driver, or the driver, the vehicle operator, or potentially, the vehicle owner, or a combination of all three. Within this document, 'operator', 'driver' and 'owner' are considered as sub-classes of the class 'user'.

The 'user' is most usually the operator of the regulated commercial freight, but in some cases, it can be a driver or an owner. The driver enrols to have the service provided automatically by wireless communications. The driver appoints an approved service provider to provide the application service.

The user is responsible for paying any fees for the provision of the service agreed with the service provider 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.

9.5.6 Role of driver

The driver shall be responsible, where required by the system, for using the identification and authentication method supplied by the prime service provider/ application service provider.

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

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

9.5.7 Role of operator

The operator of the vehicle shall be responsible for advising and requesting action from the application service provider in the event that the driver advises the operator of a potential or actual system

malfunction. The operator of the vehicle shall make the vehicle reasonably accessible to the application service provider in order that they may rectify the problem.

9.5.8 Framework for operation

The security requirements are such that a common and secure provision for security needs to be provided on all cooperative ITS systems to both maintain security and offer interoperability, common use, and reuse of data. These aspects are dealt with in ISO/TS 15638-4 and all instantiations claiming conformance with this document shall also conform to ISO/TS 15638-4 (TARV system security requirements).

ISO 15638-5 provides the specifications for the generic basic vehicle data that all TARV IVSs are required to support and make available to application service providers (via a wireless communications link supported by the IVS) in order to support the provision of regulated and commercial/civic application services.

The combination of basic vehicle data and those additional data concepts required within a particular jurisdiction (or class of TARVs) are known as 'core application data (CoreData)' for an application service within a particular jurisdiction. 'Basic vehicle data' is therefore found in all equipped TARVs, while 'core application data (CoreData)' is required in all equipped TARVs (or class of TARVs) within a particular jurisdiction.

The ROAM architecture defined in ISO 15638-1 provides the framework and operational environment for developing and deploying platforms for TARV applications within a general framework of cooperative vehicle telematics systems and is designed to support not only TARV application systems, but also general cooperative vehicle systems for all classes of vehicles. It is therefore designed to be compatible and interoperable with other cooperative vehicle standards and has used the successful results of research programmes and applications in these areas as its source of inspiration.

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. Drivers and vehicle operators will be able to rely on their integrated in-vehicle system to allow TARVs to operate within the requirements of jurisdictions within which they drive their vehicles, and gain advantages from direct cooperative management of transport safety and efficiency, wherever they drive.

Within the TARV environment, regulated applications are developed by jurisdictions and deployed by application service providers to 'Host Management Centres' (HMC). The HMC provides a service gateway that supervises the secure provision of software and services TARVs. HMCs manages the provisioning of applications to any authorized 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/OSGi (open services gateway initiative). See ISO 15638-1:2012, 6.1.3.

9.5.9 ROAM 'app' library and data pantry

A layer below these applications is the provision of data for the data pantry. This data provisioning is not generated by a single application, but by a number of small task-specific 'Facilities Applications', which are generally small Java 'applets', organized as software bundles, that generally busy themselves keeping the data pantry provisioned with up-to-date data. This data provisioning is envisaged to be carried out by the 'Facilities Apps', each of which services the updating of individual data elements in the basic vehicle data concept, and for the 'core application data (CoreData)' concept where a jurisdiction/application service has specified or provided an 'App' to do this. The process is defined in ISO 15638-1.

10 Sequence of operations for identified unregulated application services with additional data requirements

10.1 Overview

10.1.1 General

For the general sequence of operations, reference shall be made to the definitions described in ISO 15638-7:2013, Clause 9.

In the case of this document, the 'unregulated application service' is a software application system comprising four parts:

1) 'landside' application software system;

2) on-board app to generate the core data for the system;

3) data collected from roadside sensors;

4) instruction to provide data (to ASP) instigated by a roadside sensor.

The landside application software system that provides the unregulated application service is provided by the application service providers.

During the operation of the vehicle on the highway, data collected at roadside and on-board sensors shall be conveyed to the service provider. When both data from on-board and roadside sensors are available, the service provider can detect/avoid tampering/incorrect setting of on-board equipment and can provide means of using roadside sensors to validate the accuracy of on-board equipment.

The roadside sensors shall collect freight vehicle status data. Roadside sensors typically collect:

— vehicle weight, tyre footprint;

— vehicle location data (present and accumulated);

— vehicle ID (privacy information such as VIN/licence plate);

— vehicle driven history (privacy information such as time/location/type of road/motion sensor data);

— vehicle IVS data (engine, digital tachograph, and weigh in motion);

— vehicle engine emission data.

There can be circumstances for having an on-board device which gives advice to the driver of an issue or an unsafe situation. The appropriate safety information is given to the vehicles by utilizing vehicle location data. The service provider monitors each vehicle location and surrounding traffic situation (particularly road traffic status far ahead of the vehicle) so that timely safety advice to the driver is possible. Examples use cases are given in Annex A. Furthermore, if roadside equipment identifies that freight vehicle stability is decreasing, the driver should be advised. This is the case where the information is loaded into the on-board device. As another example, if the on-board sensor equipment identifies that the vehicle is unbalanced, the driver should be advised.

10.1.2 Commands

Providing an unregulated TARV service is envisaged as one or a series of short transactions, in which, to obtain basic vehicle data or core application data, one or two (of three) commands are 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 (and where required by the regulated application further detail of generic data specification for identified unregulated application services is provided in the definitions in ISO 15638-7, which can or cannot, require basic vehicle data or core application data as part of that service provision).

The communication link between user IVS and application service provider application includes the route through roadside sensors.

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

All further data processing of the application service is carried out by the application service provider, landside, using the application provider's application service software, not on-board by the IVS (and therefore outside the scope of the ISO 15638 series).

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

10.1.3 GET TARV LDT

Communications sequences to obtain TARV LDT are provided in Figure 4 below.

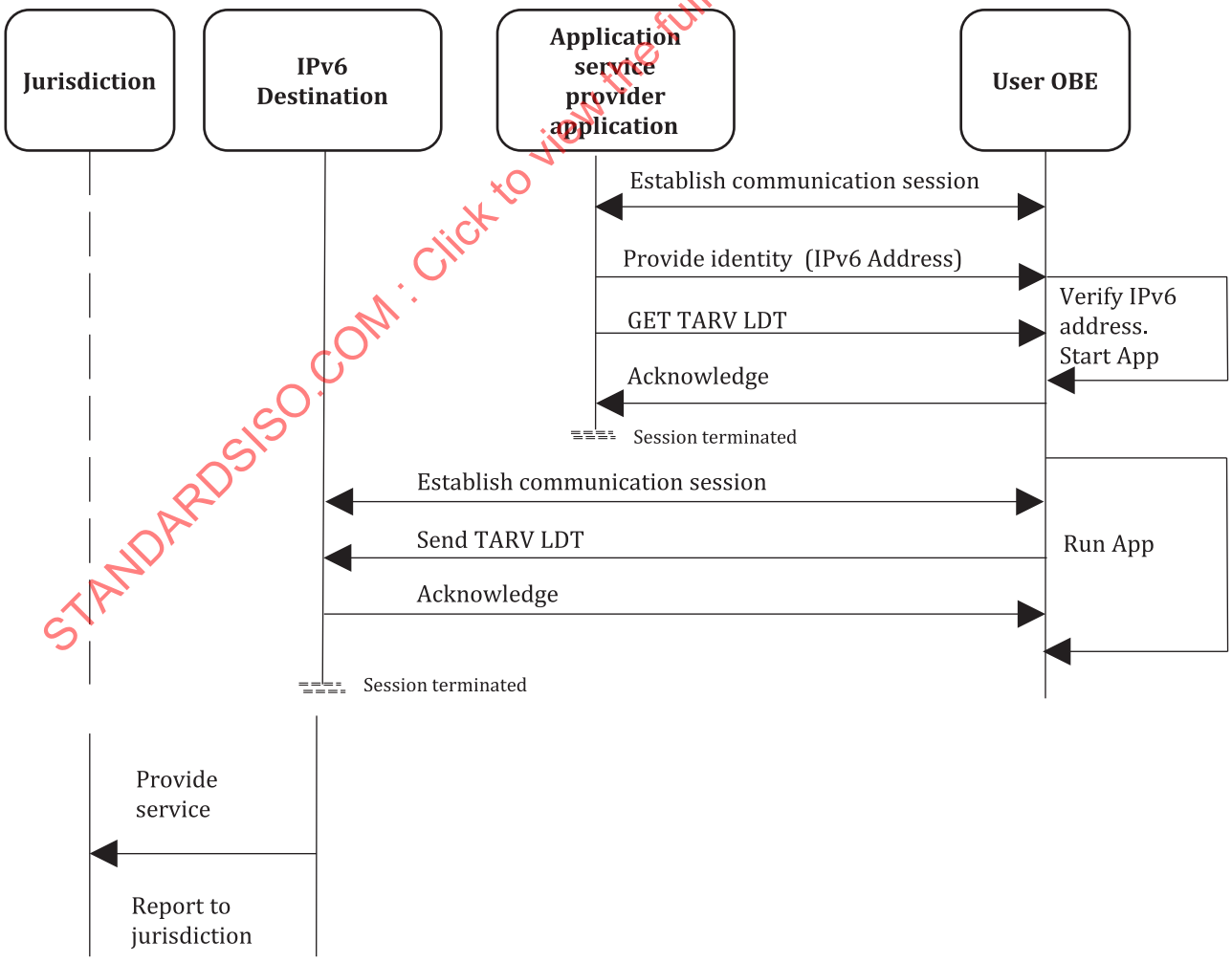


Figure 4 — Communications sequences to obtain TARV LDT

10.1.4 CREATE and GET core data

Communications sequences to obtain core data is provided in Figure 5 below.

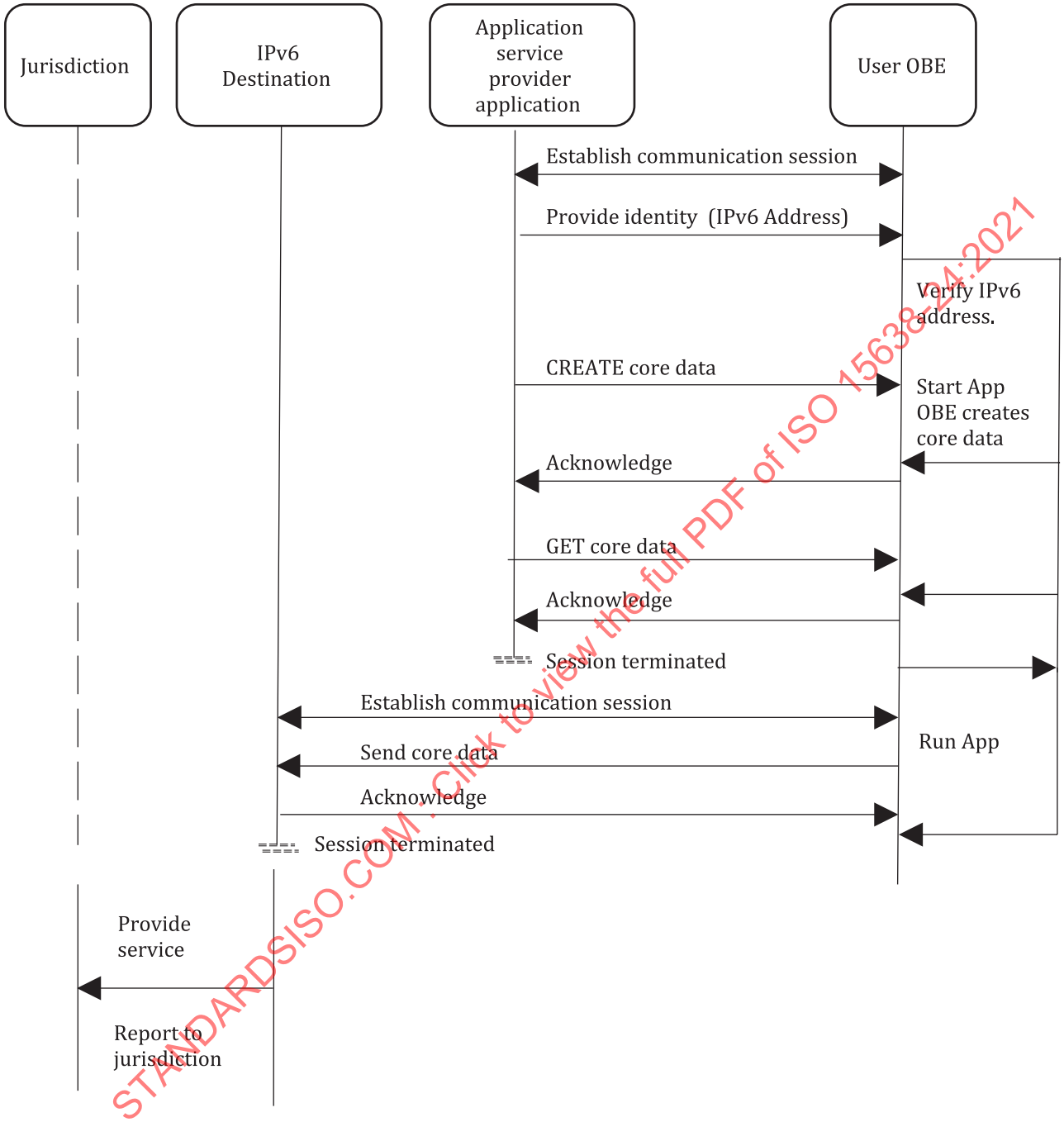


Figure 5 — Communications sequences to obtain core data

Most of the application services defined in this document require data in addition to the basic vehicle data, and therefore, before the data can be obtained, it is necessary to update the data pantry. Figure 6 shows a hypothetical example of core data.

In the TARV-ROAM architecture, the application system has no direct access to the source of data, only data in the data pantry that it is authorized 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 then populates the core data

concept with data as instructed by the on-board app associated with the IVS sends an acknowledgement that the command has been received and the session is closed.

The IVS 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 receives the Acknowledgement) that TARV LDT is successfully received by the destination address, the session shall be closed.

NOTE Core data includes the TARV LDT data.

Once the IVS receives an acknowledgement (ACK) that the 'core data' is successfully received by the enquirer, the session shall be closed. An example of the contents of 'core data' is provided in Figure 6.

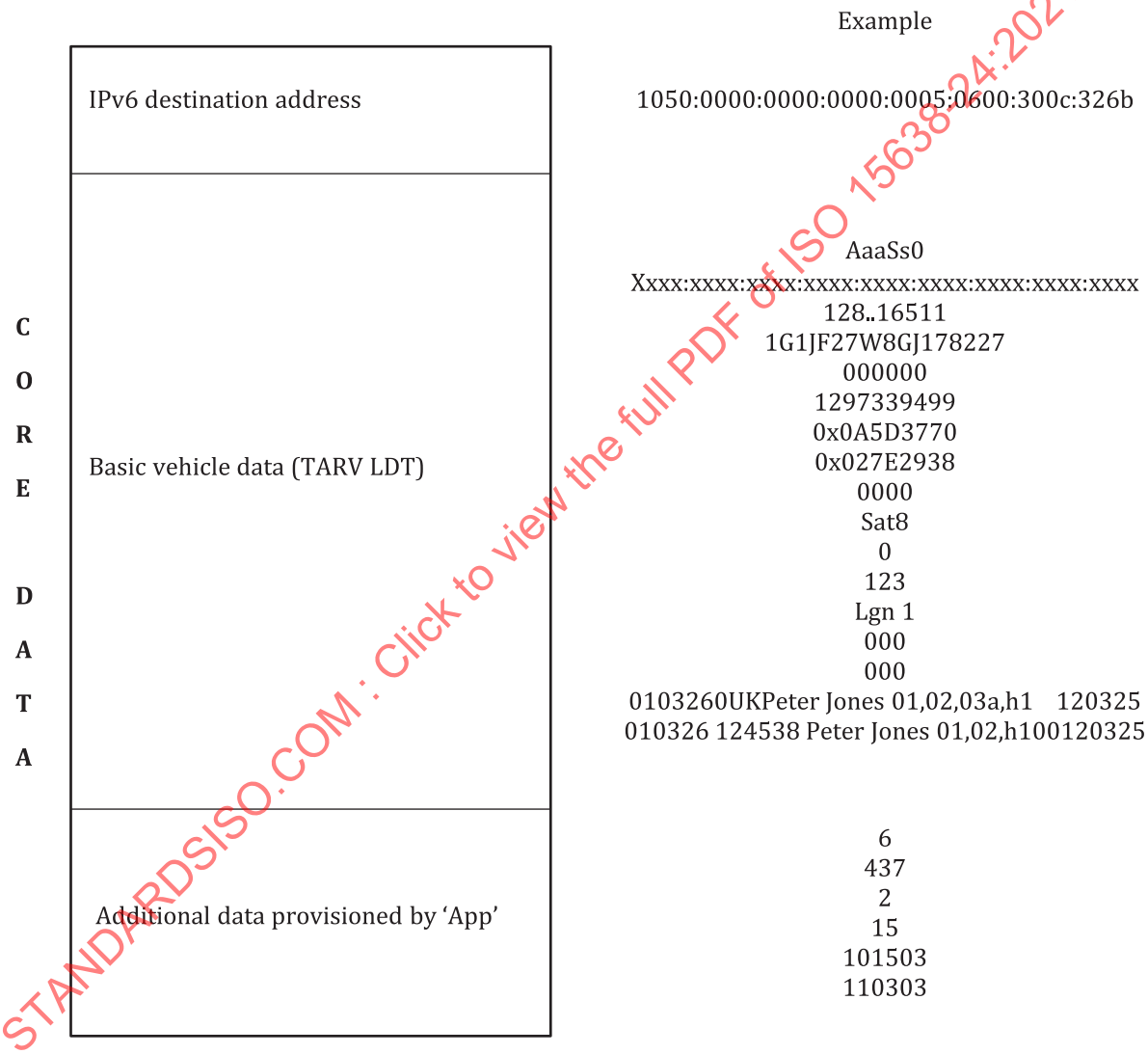


Figure 6 — Core application data

10.2 Quality of service requirements

This document contains no general requirements concerning quality of service (QoS). Such aspects shall be determined by a service provider as part of its specification for any unregulated application service. However, where a specified unregulated application service has specific Q of S requirements essential to maintaining interoperability, these aspects shall be specified in the unregulated application service document.

10.3 Test requirements

This document contains no general requirements concerning test requirements. Such aspects shall be determined by a service provider as part of its specification for any unregulated application service and issued as a formal test requirements specification document. However, where a specified unregulated application service has specific test requirements essential to maintaining interoperability, these aspects shall be specified in the document relating to that unregulated application service, or in a separate standards deliverable referenced within that clause. Where multiple service providers recognize a benefit to common test procedures for a specific unregulated application service, this shall be the subject of a separate document.

10.4 Marking, labelling and packaging

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

However, where the privacy of an individual can be potentially or actually compromised by any instantiation based on the ISO 15638 series, 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.

11 Common features of unregulated TARV application services

11.1 Generic operational processes for the system

The details of the instantiation of unregulated application service are as designed by the application service system to meet the requirements of a service provider 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 unregulated application service systems, and this clause addresses the generic provision of unregulated application services that require data in addition to, or instead of, basic vehicle data and core application data, and specifies the generic form and content of such data required to support such systems, and access methods to that data.

For detail of the operational processes see the sequence of operations in the following subclauses defining the unregulated application service and their related figures.

It shall not be possible for collected or stored unregulated application 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 authorized by the application service provider.

The means by which data is provisioned into the data pantry, and the means for obtaining the TARV LDT and core data are described in ISO 15638-7.

Specific unregulated application services (defined in Application Service Parts of the ISO 15638 series of standards, 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 unregulated application services document.

Different application services can require connection to different application-specific equipment. However, there are common basic processes behind TARV unregulated application services.

To minimize demand on the IVS (which it is assumed will be performing multiple application services 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 unregulated application services.

The TARV approach is for the on-board app supporting the application service to collect and collate the relevant data, and at intervals determined by the application, or on demand from the application service provider (ASP), to pass that data to the ASP. All the actual application service 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 1. The process is like that for CoreData, but data is supplied to a different on-board file in the data pantry.

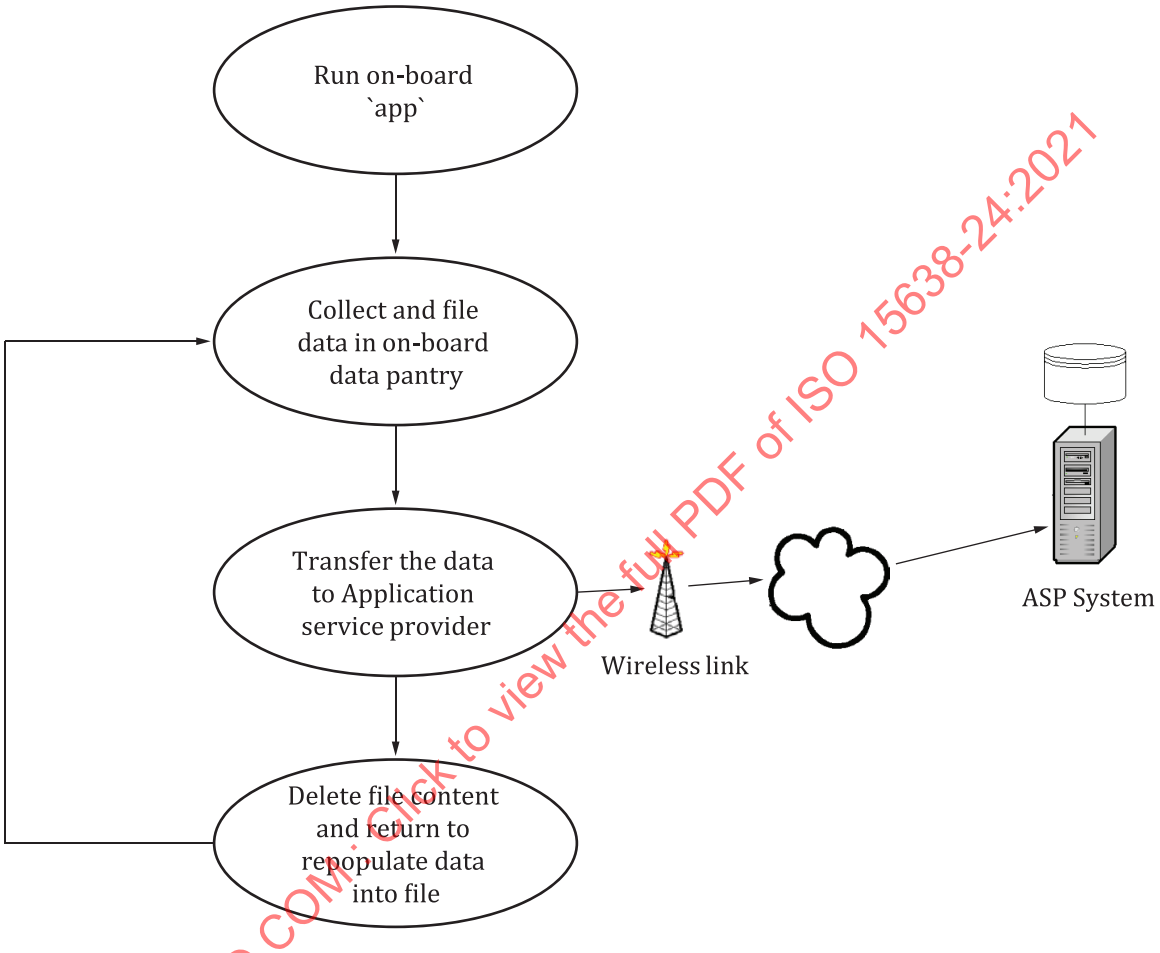


Figure 7 — TARV Regulated application service on-board procedure

NOTE The data in the on-board device can be stored for a period as required by any specific purposes.

At a common generic functional level, the connected equipment is required in all cases.

The common role of the jurisdiction, approval authority, and application service provider shall be as defined in ISO 15638-7.

Figure 7 considers that data is deleted from the on-board device after it has been sent to the ASP system; given the architecture of the ASP system, there can be multiple service providers interested in not only the most recent information but information that has been stored in the on-board device for an extended period (e.g. 24 hours). The system should support the storage of information on the on-board device for a defined period to allow the ASP service to request either the most current data records or the records for the last *x* hours/days, etc.

11.2 Common characteristics for instantiations of unregulated application services

11.2.1 The common characteristics for instantiations of unregulated application services shall be as defined in ISO 15638-7.

Namely, an unregulated application service is approved. It utilizes a TARV IVS which communicates to the prime service provider application service provider and can insert a means to provide driver licence details, or link to another device, such as a digital tachograph.

11.2.2 The application service provider shall load an application for an unregulated application service into the IVS of the operator's vehicles.

11.2.3 The application for the unregulated application service shall run whenever the regulated vehicle is operating, or to the instruction of the application service provider or operator.

11.2.4 The application for the unregulated application service shall record the data specified within the appropriate clauses of this document, in a uniquely named file (to a naming convention specified) (the 'application service data file {ASD file}) in the data pantry of the IVS.

11.2.5 The application service provider shall design/install/operate its unregulated system as approved by the certification authority (regulatory) if necessary.

11.2.6 The IVS shall provide the ASD file to the application service provider using the TARV IVS wireless link, on demand from the application service system or at the instigation by the on-board app for the unregulated application service, or at least once every 24 hours.

Every transfer shall include framing data that identifies its sequential order, IVS ID, version number of IVS and version number of the application for the unregulated application service.

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

11.2.7 The application service system shall retain and back up the 'ASD file' data to the requirements of the system.

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

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

Where required by the application service specification approved by the certification authority (regulatory), the application service provider provides the driver (i.e. driver specific) with their identification and authentication method for the IVS. The method of identification and authentication can be unique to each application service provider.

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

11.2.9 'ASD files' generated by the IVS are sent to the application service provider. The application service provider transmits reports/data to the regulated vehicle operator in accordance with the system specification.

11.3 Common sequence of operations for unregulated application services

It is important to understand that different regions require their own form of an unregulated application service, and that application service provider service offerings also vary. The specific details of these application services are not defined within this document and for this document, 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 system via a wireless interface.

11.4 Quality of service

Generic quality of service provisions for application services shall be as defined in ISO 15638-7.

Variations for specific application services are shown in the clauses in which that application service is defined.

11.5 Information security

Information security shall be as defined in ISO/TS 15638-4.

11.6 Data naming content and quality

Data naming and quality shall be as defined in ISO 15638-7.

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

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

Variations for specific application services are shown in the clauses describing that application service defined.

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

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

To enable the application service to identify files received, the files are named according 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.