INTERNATIONAL STANDARD

ISO 15638-7

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

Part 7:
Other applications

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

Partie 7: Autres applications

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Foreword

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

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

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

— *Part 1 Framework and architecture*

— *Part 2: Common platform parameters using CALM*

— *Part 3: Operating requirements, 'Approval Authority' procedures, and enforcement provisions for the providers of regulated services*

— *Part 5:Generic vehicle information*

— *Part 6: Regulated applications* [Technical Specification]

— *Part 7: Other applications*

— *Part 8: Vehicle access monitoring (VAM)* [Technical Specification]

— *Part 9: Remote electronic tachograph monitoring (RTM)* [Technical Specification]

— *Part 10: Emergency messaging system/eCall (EMS)* [Technical Specification]

— *Part 11: Driver work records (work and rest hours compliance) (DWR)* [Technical Specification]

— *Part 12: Vehicle mass monitoring (VMM)* [Technical Specification]

— *Part 14: Vehicle access control (VAC)* [Technical Specification]

— *Part 15: Vehicle location monitoring (VLM)* [Technical Specification]

— *Part 16: Vehicle speed monitoring (VSM)* [Technical Specification]

— *Part 17: Consignment and location monitoring (CLM)* [Technical Specification]

— *Part 18: ADR (Dangerous Goods) transport monitoring (ADR)* [Technical Specification]

— *Part 19: Vehicle parking facilities (VPF)* [Technical Specification]

The following parts are under preparation:

— *Part 4: System security requirements* [Technical Specification]

— *Part 13: Mass Penalties and Levies (VMC)*

Introduction

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

In such an emerging environment of regulatory and commercial applications, it is timely to consider an overall architecture (business and functional) that could support these functions from a single platform within a commercial freight vehicle that operate within such regulations. International Standards will allow for a speedy development and specification of new applications that build upon the functionality of a generic specification platform. A suite of standards deliverables is required to describe and define the framework and requirements so that the on board equipment and back office systems can be commercially designed in an open market to meet common requirements of *jurisdictions* [4.9].

This suite of standards addresses and defines the framework for a range of cooperative telematics applications for regulated commercial freights (such as access monitoring, driver fatigue management, speed monitoring, on-board mass monitoring and charging). The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative provision of services to regulated commercial freights, using an on-board ITS platform. The framework is based on a (multiple) *service provider* [4.13] oriented approach provisions for the approval and auditing of *service providers* [4.12].

This suite of standards deliverables will:

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

- allow for a powerful platform for highly cost-effective delivery of a range of telematics applications for regulated commercial freights.

- a business architecture based on a (multiple) *service provider* [4.13] oriented approach

- address legal and regulatory aspects for the approval and auditing of *service providers* [4.12].

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

This part of the ISO 15638 family of standards deliverables provides specifications for the generic requirements for and specifications for candidate commercial (unregulated) applications that may also use the *TARV* platform (in addition to any regulated services).

ISO 15638 has been developed for use in the context of regulated commercial freight vehicles. There is nothing however to prevent a jurisdiction extending or adapting the scope to include other types of regulated vehicles, as it deems appropriate.

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

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

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

Part 7:
Other applications

1   Scope

This part of ISO 15638 provides business framework based on a (multiple) *service provider [4.13]* oriented approach for the provision of additional unregulated services to regulated commercial freight vehicles using a common on-board telematics platform, including:

a)   Definition of the service that a 'Service Provider' [4.13] has to provide, including a given service level (the service definition comprises service elements such as "retrieve data from *IVS*", "map data to a map with access conditions", etc.)

b)   Means to realise the service

c)   Application data, naming content and quality that an *IVS* has to deliver

d)   Development of (any) rules for the approval and auditing of *service providers [4.12]* for non-regulated service provision.

NOTE   The definition of what comprises a 'regulated' service is regarded as an issue for national decision, and may vary from country to country. This part of ISO 15638 does not impose any requirements on nations in respect of which services for regulated commercial freights countries will require, or support as an option, but provides standardized sets of requirement descriptions for identified services to enable consistent and cost efficient implementations where *Instantiated [4.8]*.

This part of ISO 15638 defines the requirements for the scope and framework for all *TARV* commercial (unregulated) applications. These applications may then be simply *instantiated [4.8]* as commercial applications conforming to the requirements of this part of ISO 15638, in which case no further standardization is required, so long as conformance can be demonstrated, and service offerings may vary from *service provider [4.13]* to *service provider.* Where it is decided that there is benefit in standardized *instantiation [4.8]* to a common format for a particular service, a separate standards deliverable will be required, but may be developed by the consensus of experts in that area of application by reference to this part of ISO 15638 in respect of the *TARV* technical aspects.

ISO 15638 has been developed for use in the context of regulated commercial freight vehicles (hereinafter referred to as 'regulated vehicles'). There is nothing, however, to prevent a jurisdiction extending or adapting the scope to include other types of regulated vehicles, as it deems appropriate.

2   Conformance

This part of ISO 15638 defines requirements for additional regulated services, or non-regulated commercial services using the *TARV* communications platform within the *TARV* context, and has no specific conformance tests defined herein. Some aspects defined within may have conformance tests defined in other parts of ISO 15638.

Conformance declarations for the various parts of a *CALM*-compliant system shall be based on the relevant CALM-related International Standards that are normatively referenced in this part of ISO 15638.

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

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

3   Normative references

The following referenced documents are indispensable for the application 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 cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 1: Framework and architecture*

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

ISO 15638-3   *Intelligent transport systems — Framework for cooperative 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/TS15638-4   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 4: System security requirements*[1]

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

ISO/TS 15638-6   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 6: Regulated applications*

ISO/TS 15638-8   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 8: Vehicle access monitoring (VAM)*

ISO/TS 15638-9   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 9: Remote electronic tachograph monitoring (RTM)*

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[1] Under preparation.

ISO/TS 15638-10   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 10: Emergency messaging system/eCall (EMS)*

ISO/TS 15638-11   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 11: Driver work records (work and rest hours compliance) (DWR)*

ISO/TS 15638-12   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 12: Vehicle mass monitoring (VMM)*

ISO/TS 15638-14   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 14: Vehicle access control (VAC)*

ISO/TS 15638-15   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 15: Vehicle location monitoring (VLM)*

ISO/TS 15638-16   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 16: Vehicle speed monitoring (VSM)*

ISO/TS 15638-17   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 17: Consignment and location monitoring (CLM)*

ISO/TS 15638-18   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 18: ADR (Dangerous Goods) transport monitoring (ADR)*

ISO/TS 15638-19   *Intelligent transport systems — Framework for cooperative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 19: Vehicle parking facilities (VPF)*

4   Terms and definitions

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

4.1
application service
service provided by a *service provider* [4.13] accessing data from the *IVS* of a regulated commercial freight via a wireless communications network

4.2
application service provider
service provider [4.13] who provides an application service [4.1]

4.3
authentication
function intended to establish and verify a claimed identity

4.4
basic vehicle data
data that shall be maintained/provided by all *IVS*

4.5
approval authority (digital)
organization which issues digital certificates for use by other parties, specifically in the context of communications security

4.6
approval authority (regulatory)
organization (usually independent) which conducts approval and ongoing audit for '*service providers* [4.12]

4.7
core application data
CoreData
basic vehicle data [4.4] plus any additional data required to provide an implemented *regulated application service* [4.11]

4.8
instantiated/instantiation
represented by an actual example/instance

4.9
jurisdiction
government, road or traffic authority which owns the Regulatory Applications

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

4.10
prime service provider
service provider [4.13] who is the first contractor to provide regulated *application services* [4.1] to the regulated commercial freight vehicle, or a nominated successor on termination of that initial contract

NOTE   The prime service provider is also responsible to maintain the installed IVS; if the IVS was not installed during the manufacture of the vehicle the prime service provider is also responsible for installing and commissioning the IVS.

4.11
regulated application
approval arrangement utilized by *jurisdictions* [4.9] for granting certain categories of commercial vehicles rights to operate in regulated circumstances subject to certain conditions

NOTE   Each *jurisdiction* [4.9] may use their own terminology including, but not limited to, permit, application, scheme, concession, exemption, gazettal and notice.

4.12
regulated application service
TARV *application service* [4.1] that is mandated by a regulation imposed by a *jurisdiction* [4.9], or is an option supported by a *jurisdiction*

4.13
service provider
party which is approved by an *approval authority (regulatory)* [4.6] as suitable to provide regulated or commercial ITS *application services* [4.1]

4.14
user
individual or party that enrols in and operates within a regulated or commercial/civic *application service* [4.1]

EXAMPLE   Driver, transport operator, freight owner, etc.

5   Symbols (and abbreviated terms)

App
application

CALM
communications access for land mobiles

C-ITS
co-operative vehicle systems/co-operative ITS systems)

DRD
driver records device

IVS
In-vehicle system

LDT
local data tree

RFID
radio frequency identification device

ROAM
regime for open application management

TARV
telematics applications for regulated commercial freights

6   General overview and framework

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

To understand clearly the *TARV* framework the reader is referred to ISO/TS 15638-1.

Figure 1 shows the role model conceptual architecture showing the key actors and their relationships.
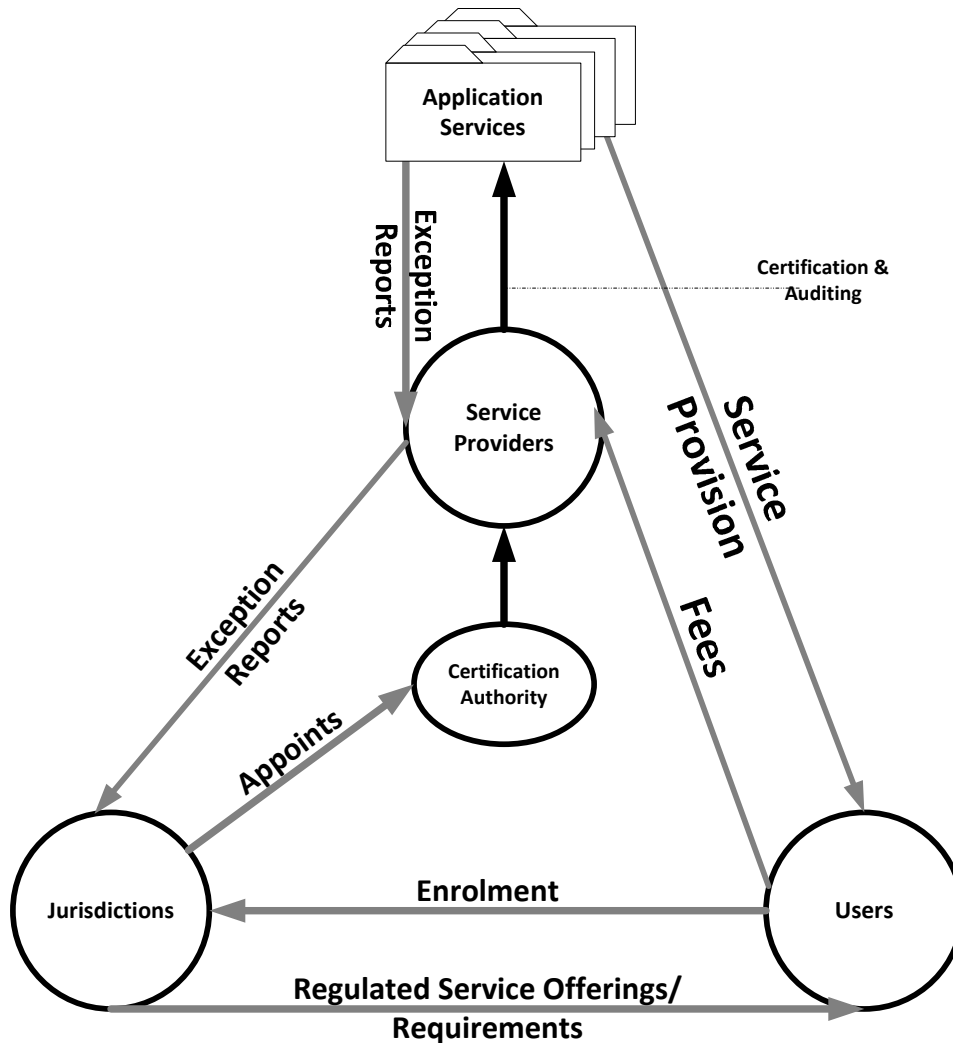
Figure 1 — Role model conceptual architecture
(Source: ISO 15638-1)

ISO 15638 provides a suite of standards deliverables addresses and defines the framework for a range of cooperative telematics applications for regulated* commercial freight vehicles (such as access monitoring, driver fatigue management, speed monitoring, on-board mass monitoring and charging). The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative ITS service platform. The framework is based on a (multiple) *service provider [4.13]* oriented approach provisions for the approval and auditing of *service providers.*

- Part 1 Framework and architecture
- Part 2: Common platform parameters using CALM
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The following parts are under preparation:
- Part 4: System security requirements [Technical Specification]
- Part 13: Mass Penalties and Levies (VMC)

The context for ISO 15638-7 is a business framework based on a (multiple) *service provider [4.13]* oriented approach in order to support unregulated (commercial) application service provision in addition to *regulated application service [4.12]* provision, using a common on-board platform.

Figure 2 shows the architecture from the view of the provision of unregulated (commercial) *application services [4.1]*, using the common *TARV* platform.
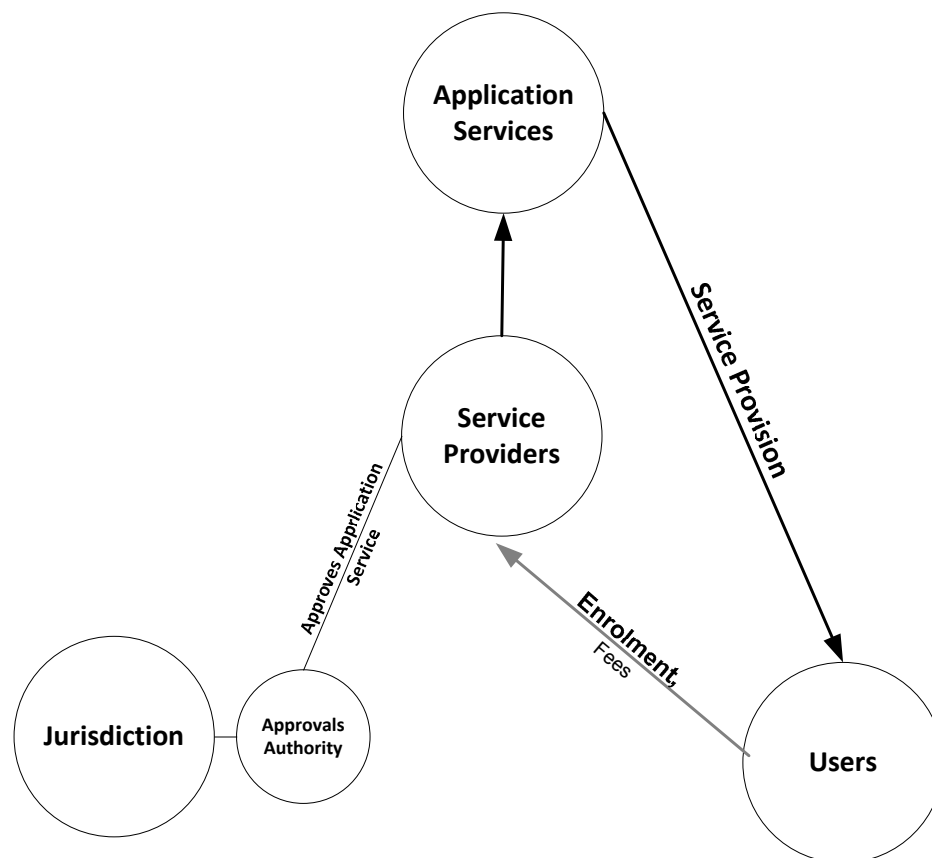
Figure 2 — Role model conceptual architecture unregulated service provision

This part defines the general requirements and conditions for non regulated systems in order to enable them to use the *TARV IVS* and the *basic vehicle data [4.4]* in order to provide *application services [4.1]* other than *regulated application services [4.12]* for *TARV*.

It is important to note that where a commercial (unregulated) service can be *Instantiated [4.8]* using only the generic vehicle data specified in ISO 15638-5, no further standardisation is required. Where a *TARV* commercial application is be simply *instantiated* as a commercial application conforming to the requirements of this part of ISO 15638, no further standardisation is required so long as conformance to the requirements of this part of ISO 15638 can be demonstrated, and service offerings may vary from *service provider [4.13]* to *service provider.*

Where it is decided that there is benefit in standardised *instantiation [4.8]* to a common format for a particular service, a separate standards deliverable will be required, but may be developed by the consensus of experts in that area of application by reference to this part of ISO 15638 in respect of the *TARV* technical aspects.

The service definition for each application service supported by this part of ISO 15638 comprises:

   a) A clear description of the service provided and its inputs, outputs and results, including a given service level

   b) Generic data, naming content and quality that an *IVS* has to deliver

   c) Specific data, naming content and quality for the provision of that particular service

   d) Service elements (such as "retrieve data from *IVS*", "map data to a map with access conditions", "report non-compliance", etc.)

   e) Access methods to provision and retrieve data

   f) Provisions for quality of service

   g) Provisions for test requirements

   h) Provisions for the approval of *IVS*s and '*Service providers [4.12]*'

This part provides specifications for candidate commercial applications for *TARV*, and defines the generic modus of operations, and the requirements, and where appropriate constraints for specification of unstandardised commercial applications using the *TARV* platform, and provides definition of the parameters to be specified in any standardised commercial/civic application that uses *TARV*.

A 'commercial/civic application service'/'unregulated service' in the context of this part of ISO 15638 is a *TARV* application service that is not mandated by a regulation imposed by a *jurisdiction [4.9]* (government, road or traffic authority which owns the 'Regulatory Applications') and is therefore a voluntary 'commercial' or 'civic' service, supported using a *TARV* communications link and platform in the vehicle.

A 'commercial/civic application service' is provided by a 'service provider', also called an '*application service provider*'[*4.2]*. Although these 'application *service providers*' are actors in a free commercial market, they will require to be approved, approved by a '*approval authority (regulatory) [4.6]* ' function as suitable to provide commercial/civic ITS *application services [4.1]*, in accordance with a regime established by the jurisdiction, in order to enable them to to share use of the *TARV* equipment. The *jurisdiction [4.9]* approving such a service shall set up a means through its approval authority function to ensure that the proposed service does not conflict with any regulated service provision.

NOTE   A *approval authority (regulatory) [4.6]* is an agency of or function within a *jurisdiction [4.9]* regulator who certifies that the requirements of the *jurisdiction* have been met, and should not be confused with a certification authority (digital) which is an organization which issues digital certificates for use by other parties (specifically in the context of communications security).

The *service provider [4.13]* provides the application service to/for a '*user [4.14]*' who is an individual or party that enrols and contracts to receive the commercial/civic *application service [4.1]*.

Examples of a *user [4.14]* are a transport operator, driver, freight owner, etc. Most commonly the *user* is the transport operator.

For further information refer to ISO 15638-1.

7   Requirements

7.1   General

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 in order to support a commercial/civic application service, and defines general requirements to assure data interoperability. Services that require only generic vehicle information shall obtain and use such information in accordance with ISO 15638-5.

A number of specified regulated services are defined in ISO 15638 Parts 8 – 19.

7.1.1   Unregulated application services using only generic 'basic vehicle data'

Where all of the required data can be obtained via the access commands for generic 'essential vehicle information' 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 [4.9]*, subject to the privacy regulations pertaining within the jurisdiction, may develop, operate, and update their 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 will normally be able to support such service provision.

ISO 15638-5 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.

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

Where the *application service [4.1]* requires both generic vehicle information *and* additional data, the generic vehicle information shall be via the access commands for generic vehicle information specified in ISO 15638-5, the access methods defined in ISO 15638-5 for 'CREATE **CoreData**' and 'GET *CoreData*' shall be used consistently, and additional data and *application service* requirements shall be provided as specified in the general methods defined in Clauses 8-10 of this part of ISO15638.

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

   a)   CREATE **CoreData**

   b)   GET **CoreData**

See ISO 15638-5 for detail of these commands.

See Clause 8 (of ISO 15638-5) for the generic sequence of operations for *regulated application services [4.12]* using both generic vehicle data and additional *regulated application [4.11]* specific data.

7.2   Conveyance identifiers

The regulated commercial freight conveyance type shall be identified in accordance with one of ISO 26683-2 (Intelligent transport systems — Freight land conveyance content identification and communication — Part 2: Application interface profiles /ISO 14816 (— Automatic vehicle 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 — AVI/AEI Electronic registration identification — Part 3: Vehicle data.

7.3   Load data

It is recommended, but not required, that any commercial freight vehicle load data is identified in accordance with one of ISO 26683-2 (Intelligent transport systems — Freight land conveyance content identification and communication — Part 2: Application interface profiles /ISO 14816 (— Automatic vehicle identification — Numbering and data structures) /ISO 17262 (Intelligent transport systems — Automatic vehicle and equipment identification — Numbering and data structures) / ISO 24534-3 Intelligent transport systems — AVI/AEI Electronic registration identification — Part 3: Vehicle data.

8.   Concept of operations for unregulated application services with additional data requirements

8.1   General

This Clause describes the characteristics of a proposed system from the viewpoint of an individual who will use 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 [4.1]* provider for *TARV* commercial/civics that require data in addition to that available from the *basic vehicle data [4.4]*, and provides the generic modus operandi for the provision of commercial/civic (unregulated) *application services* defined in the subsequent Clauses of this Part of ISO 15638 that 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.

8.2   Statement of the goals and objectives of the system

The overall objective of *TARV* commercial/civic *application services [4.1]* with additional data requirements is use of 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 [4.4]* defined in ISO 15638-5, do not require further standardisation measures, so this part of ISO 15638 is focussed to meet the requirements for commercial/civic provision in circumstances where data is required in addition to that provided by the *basic vehicle data* data concept.

It is an underlying concept (described in ISO 15638-1) that these services are provided by agreement with the *user [4.14]*, and using an approved *service provider [4.13]* to meet the requirements of the *jurisdiction [4.9]* via an in-vehicle system (*IVS*) with communications capability between the vehicle and the *service provider [4.13]*, 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 [4.4]*), required by the specific *application service [4.1]*. The requirements for specific additional data are not defined in this part of ISO 15638, which standardises only the general framework for commercial/civic provision using *TARV*. That means that the *instantiation [4.8]* of services of the same title or description may be implemented differently by different *application service* providers, and therefore 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 may well be cases where, although the service is not required by regulation, there is benefit in standardising some or all of the aspects and data exchanges of the service. Such services will require a further standardisation deliverable, which refers to this part of ISO 15638 as the baseline standard for the provision of commercial/civic *application services [4.1]* using *TARV*, and needs to specify only the additional aspects that require standardisation.

As with provisions for *regulated application service [4.12]* provision using *TARV*, the actual equipment to be installed in order to provide that data provision functionality is not standardised and is a commercial decision of the *application service provider [4.2]*, unless it is specified by the jurisdiction.

That is to say that this part of ISO 15638 determines the nature of the data and how it is to be sent and received by the *IVS*, but does not standardise the equipment used to obtain the data, nor the definition of the actual service features received.

EXAMPLE   Refrigerated trailer temperature. The Standard would define that the temperature was measured and transmitted to the *IVS* either on demand or at prescribed intervals and reported to the *IVS* using a defined interface as degrees Celsius or Fahrenheit, and the degrees of precision of that temperature measurement. It would not specify the location nor type of thermometer, only the form and frequency in which the data is made available. However it is possible that a *Jurisdiction [4.9]* may additionally specify that the equipment if of a particular type or operates within some parameters that it has specified, but such specification is outside this part of ISO 15638.

However, so long as the general requirements for service provision are compatible, *TARV* may also be used to provide a range of services defined by appropriate expert groups.

EXAMPLE   The expert group defining Standards for electronic fee collection/road tolling may decide to develop a standards deliverable for road tolling for commercial vehicles using the *TARV* platform. It could then specify this part of ISO 15638 and any other relevant ISO 15638 Part by reference, and focus its work on the data definition and transfer frequency and timing, enabling a standard to be developed rapidly, and implemented wherever *TARV* capability is present on vehicles (which will be widespread within *Jurisdictions [4.9]* that use *TARV* to support *regulated application services [4.12]*).

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

The services that are regulated as mandatory or optionally supported, may vary from *jurisdiction [4.9]* to jurisdiction. So it is possible that a service that is mandatory in one jurisdiction, may be not required by another jurisdiction, but offered as a commercial/civic *application service [4.1]* within that domain. If the requirements are met within the service definition in ISO 15638-6, or require only *basic vehicle data [4.4]*, no further standardisation is required.

Modern trends in computing have moved away from the insular stand alone solution where the demands for the provision of the service have to be 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 [4.1]* provider, and that the on-board equipment therefore largely services 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 [4.8]* of a similar service using different wireless media, and enables early implementation and deployment of such systems.

In respect of standardisation, it means that the commercial/civic *application services [4.1]* that are supported by this part of ISO 15638, require only the standardisation of the data to be collected, its organisation 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 [4.13]*, or receive data from its *service provider.*

A core strategy of this part of ISO 15638 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 [4.7]*. 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.

8.4 Organisations, activities, and interactions among participants and stakeholders

The classes, attributes and key relationships are described in ISO 15638-1 and in Clause 6 of this part of ISO 15638.

The responsibilities and authorities are described in ISO 15638-1, and in 8.5 — 8.15 and Clause 9 below.

The sequence of operational processes are described at a generic level in Clause 9 (Sequence of operations for *regulated application services [4.12]* with additional data requirements).

8.5 Operational roles and processes for the system

8.5.1 Common role of the prime service provider

To facilitate the correct installation and monitoring of *TARV IVS*, a *prime service provider [4.10]* has been contracted by the *user [4.14]*. 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 [4.2]* for a particular service, is not responsible for the operation of *application service [4.1]* software.

The *prime service provider [4.13]* shall be responsible to ensure that the multiple applications operate properly, and do not adversely impact each other.

It is envisaged that the *IVS* operating systems may require updating from time to time to improve functionality, fix software 'bugs' or update the protection from electronic threats such as software viruses and it shall be the responsibility of the *prime service provider [4.10]* to undertake such tasks, possibly in collaboration with *application service providers [4.2]*.

The role of the *prime service provider [4.10]* 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 a number of means including receiving test data files generated by the on-board 'app' for that *application service [4.1]*. The *prime service provider* shall be responsible to determine the *IVS* operational state, perform any necessary enhancements and efficiently deals with malfunctions when they occur.

The *prime service provider [4.10]* shall report any malfunctions to the driver and *application service [4.1]* 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 [4.13]* shall work closely with the *application service [4.1]* provider and vehicle operator to permit and enable the prompt repair and rectification of any malfunction with a *TARV IVS*.

8.5.2 Common role of the application service provider

The *application service provider [4.2]* is the actor who is responsible for providing and operating *application service* system.

The *application service provider [4.2]* shall offer to *users [4.14]* to provide the specific *application service* defined in the specification for that *application service.* This part of ISO 15638 specifies the format for key provisions of *application service* provision, but does not define any specific *application service.*

The *application service provider [4.2]* is envisaged normally to be a commercial entity, but may well also be a road users association, or department of the *jurisdiction [4.9]* providing a civic service to road users.

The *application service provider* [4.2] shall be responsible to ensure that the *application service users* [4.1] 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* [4.10], 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* [4.2] shall notify the *prime service provider* [4.10] and they shall jointly rectify the problem according to their defined responsibilities.

It is envisaged that the *application service* [4.1] systems may 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* [4.2] to undertake such tasks, possibly in collaboration with the *prime service provider* [4.10].

8.5.3   Role of the application service

This is the service defined and offered by an *application service* [4.1] provider for a 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.

To complicate matters, in some cases, *application services* [4.1] defined in ISO 15638-6, which are *regulated application services* [4.12] in one jurisdiction, may be unregulated (commercial) services in another.

EXAMPLE   'Weigh in motion', may be required as part of regulatory control in one jurisdiction, whereas in another it may simply be offered as a commercial, or free, service to freight hauliers, with no linkage to a regulation. While the objective of the service and use of information collected will be different in these two examples, but the practical means of communicating with the vehicle, and/or providing data back to the *user [4.14]*, via *TARV*, may be the same.

If an existing *application service* [4.1] definition already exists in ISO 15638-6, or parts 8 - 19, and the functionality in respect of the operation of the system from a *TARV* perspective, remains the same, although it is not being operated in support of a regulation, there is no need for further specification or standard, and the specification in ISO 15638-6 and the appropriate part from Parts 8 - 19 will suffice.

NOTE   *TARV* specifies how to manage data from/to the vehicle, none of the *TARV* standards specify the specific *application service* [4.1] characteristics.

8.5.4   Service requirements definition

Service requirements definition will vary from service to service, and in many cases from one *application service* [4.1] provider *instantiation* [4.8] to another. The *application service* specification, or a standards deliverable specifying an interoperable service definition, will provide such specification within the guidance of this part of ISO 15638. This part of ISO 15638 provides generic requirements, not application specific requirements.

8.5.5   Common role of the user

In the case of the most *regulated application services* [4.12] the *user* [4.14] may be the driver, the vehicle operator, or potentially, the vehicle owner, or a combination of all three.

Within this part of ISO 15638 'operator', 'driver' and 'owner' are considered as sub-classes of the class 'user'.

That said, the 'user' is most usually the operator of the regulated commercial freight, but in some cases may be the driver or owner. The driver will enrol to have the service provided automatically by wireless communications. The driver will appoint an approved *service provider* [4.13] to provide the *application service* [4.1].

The *user [4.14]* will be responsible to pay any fees for the provision of the service agreed with the *service provider [4.13]* 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 part of ISO 15638.

8.5.5.1   Role of the driver

The driver shall be responsible, where required by the system, for using the identification and *authentication [4.3]* method supplied by the *prime service provider [4.13]* / *application service* provider *[4.2]*.

The driver shall be responsible for reporting any system malfunction alerts, or apparent system failures to the operator and/or *application service [4.1]* 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 to immediately advise the vehicle operator and *application service [4.1]* provider.

NOTE   Some *application services [4.1] or regulated application services [4.12]* may only enable the vehicle to operate once the driver has registered (signed on) with the vehicle and the vehicle recognises the driver as a legitimate driver.

8.5.5.2   Role of the operator

The operator of the vehicle shall be responsible to advise and request action from the *application service [4.1]* provider in the event that the driver advises the operator of a potential or actual system malfunction and shall make the vehicle reasonably accessible to the *application service provider [4.2]* in order that they may rectify the problem.

8.5.6   Common role of the jurisdiction

8.5.6.1   General

In the environment of specified *regulated application services [4.12]*, the *jurisdiction [4.9]* provides the role of developing the laws and enforcement as determined by the jurisdiction. In order to have access to the *TARV* equipment for additional commercial/civic *application service* provision, the specification of the commercial application will need to be approved by the *jurisdiction* or its agent (approval authority function) to ensure that it will not conflict with the provision of *regulated application services*.

8.5.6.2   Common role of the 'agent of the jurisdiction'

An agent of the *jurisdiction [4.9]* is a party appointed by the *jurisdiction* to be responsible for providing one or more of the aspects under the responsibility of the jurisdiction.

8.5.6.3   Common role of the 'approval authority'

Within ISO 15638, and as more fully described in ISO 15638-1, the 'Approval Authority' is a role within the system architecture, not necessarily an institution. In the context of ISO 15638-7 (this part of ISO 15638) it is recognised that the provision of commercial unregulated services has to operate within a system provided primarily for the provision of *regulated application services [4.12]*. Someone somewhere has to be sure that the commercial/unregulated service provision will not interfere with the provision of *regulated application services*. Permission needs to be granted for a commercial/unregulated system to use the same equipment. How this is achieved will vary from *jurisdiction [4.9]* to *jurisdiction*, and it is not the intention of this Part of ISO 15638 to require or influence how a *jurisdiction* conducts its affairs. That is of course for the *jurisdiction* to decide.

In some cases the 'approval authority' will be an independent organisation charged by the *jurisdiction [4.9]* to carry out approval for some or all aspects of the system. In other cases the function may simply be effected by

a department of the *jurisdiction* or subcontracted by the *jurisdiction*. In other cases, or for some aspects, a self approval regime may be in place.

The importance of this role is the recognition that it is the *jurisdiction* [4.9] who decides who and what *application services* [4.1] can be operated, what the quality of service requirements are, and how the system is controlled, and creates the means to control the operation of such systems. These functions, however *instantiated* [4.8], are described within ISO 15638 as the role of the 'approval authority'.

8.5.7   Framework for operations

The security requirements are such that a common and secure provision for security needs to be provided on all cooperative ITS systems in order to both maintain security and offer interoperability, common use and reuse of data. These aspects are dealt with in ISO 15638-4 and all *instantiations* [4.8] claiming compliance with this part of ISO 15638 shall also comply with ISO 15638-4 (TARV system security requirements).

ISO 15638-5 provides the specifications for generic *basic vehicle data* [4.4] that it is required for all *TARV IVS*s to support and make available to *application service* [4.1] providers via a wireless communications link supported by the *IVS*, in order to support the provision of regulated and commercial/civic *application services* [4.1].

The combination of `basic vehicle data [4.4]` and those additional data concepts required within a particular *jurisdiction* [4.9] (or class of *TARV*s) are known as '`core application data [4.7]` `(CoreData)`' for an *application service* [4.1] within a particular jurisdiction. `Basic vehicle data`' will therefore be found in all equipped *TARV*s, while *core application data* `(CoreData)`' will be required in all equipped *TARV*s (or class of *TARV*s) within a particular jurisdiction.

The *ROAM* (Regime for Open Application Management) architecture defined in ISO 15638-1 (TARV - Framework and architecture) 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 not only to support *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 is 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 *TARV*s to operate within the requirements of *jurisdictions* [4.9] within which they drive their vehicles, and gain advantages from direct co-operative management of transport safety and efficiency wherever they drive.

Within the *TARV* environment, regulated applications are developed by *jurisdictions* [4.9] and deployed by *application service* [4.1] providers to 'Host Management Centres' (HMC). The host management centre provides a service gateway that supervises the secure provision of software and services *TARV*s. HMCs manage the provisioning of applications to any authorised and subscribed *user* [4.14] 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, 6.1.3

8.5.8   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 Apps'- which are generally small Java 'applets', organised 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 will service the updating of individual data elements in the *basic vehicle data* [4.4] concept, and for the '*core application data* [4.7] *(CoreData)*' concept where a jurisdiction/*application service* [4.1] has specified or provided an 'App' to do this. The process is defined in ISO 15638- 1 (TARV -Framework and architecture).

A key feature of this 'layering' is the principal that a particular layer can only communicate with the adjacent layer immediately above or below it or to its side. The communication infrastructure is therefore hidden from the application by the middleware, and the 'apps' are separated from the resultant data.

It is crucial also that the data pantry contains just calculated data. The calculated data in the data pantry is accessible to an app, so long as it has authorisation, but the software of any of the apps is not available to another app or interrogation during an online session.

This data is calculated by 'apps' placed by the *application service* [4.1] provider in the on-board data library, and stored as discrete data concept values in the on-board 'data pantry'. The frequency of such updates is determined by the 'app'. ISO 15638-5 defines that additional 'apps' in the library collate the data into data concepts containing collated data element values, stored as discrete files in the data pantry. The processes are illustrated in Figure 3.

Figure 3 shows apps being uploaded into the app library, and the execution environment running the apps and updating the data concept values in the data pantry. It shows the *LDT* values being updated to the instructions of the appropriate app. It then shows a jurisdiction/*application service* [4.1] uploading an app for its *CoreData* [4.7], which then demands that the *core application data* concept values be updated. This is done. The *jurisdiction* [4.9] then requests the *core application data* values which are supplied.

An example of an 'app' demanding the *TARV LDT* is then shown, with the 'app' in the execution environment stimulating a refresh of the *TARV LDT* values, updating the file in the data pantry and then supplying them to the *application service* [4.1] provider via the wireless interface.

Finally the example of a safety 'app' requesting the *C-ITS* (cooperative vehicle systems) *LDT* is shown, it is not relevant within this part of ISO15638, other than to show how this can also be achieved with a similar mechanism.

All *application services* [4.1] conformant to this part of ISO 15638 shall operate in the *CALM-ROAM* environment as specified in ISO 15638-1.
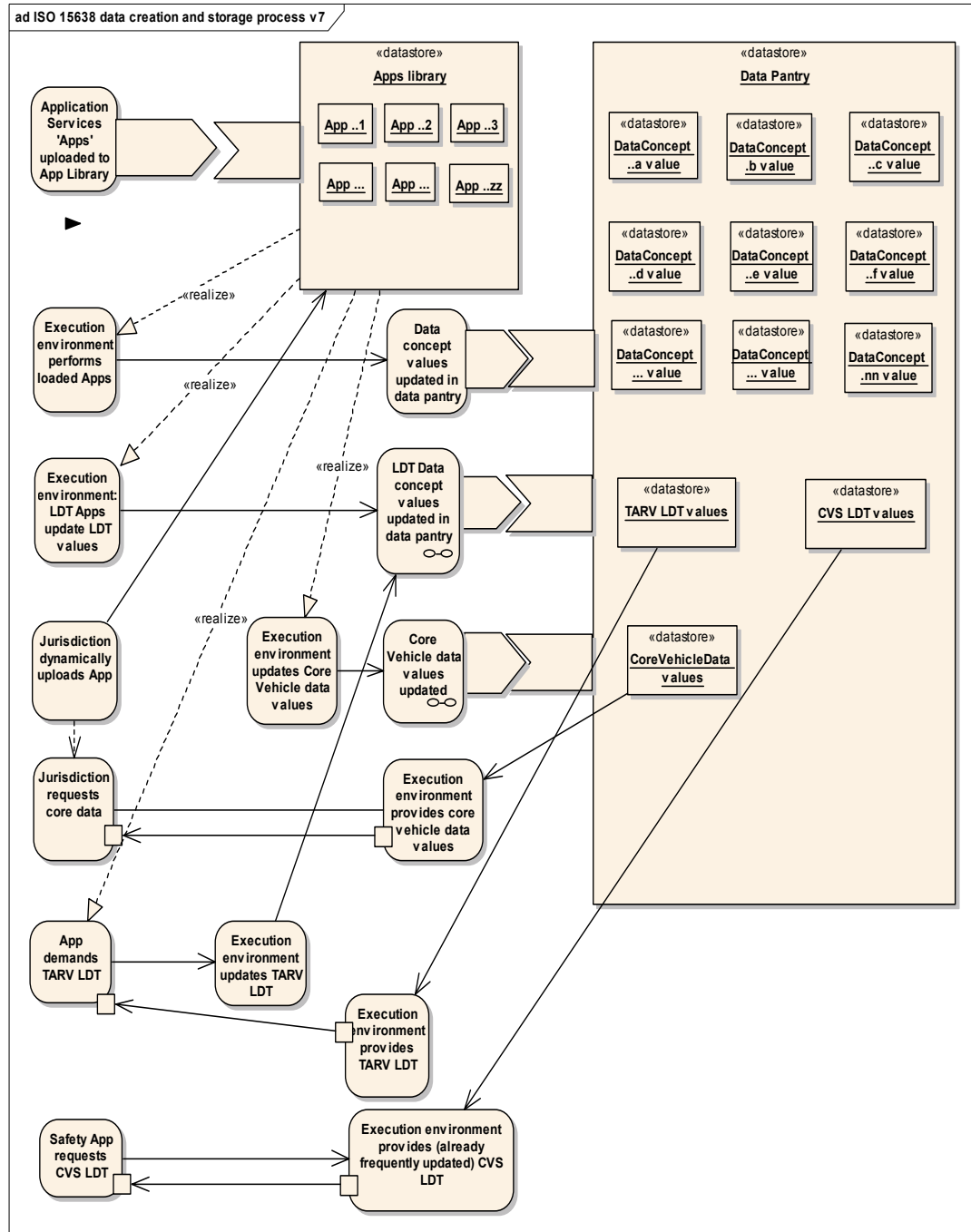
Figure 3 — The ISO 15638 data creation and storage process
(Source ISO 15638-5)

Figure 4 shows the generic environment in which standardised *application services [4.1]* are provided.
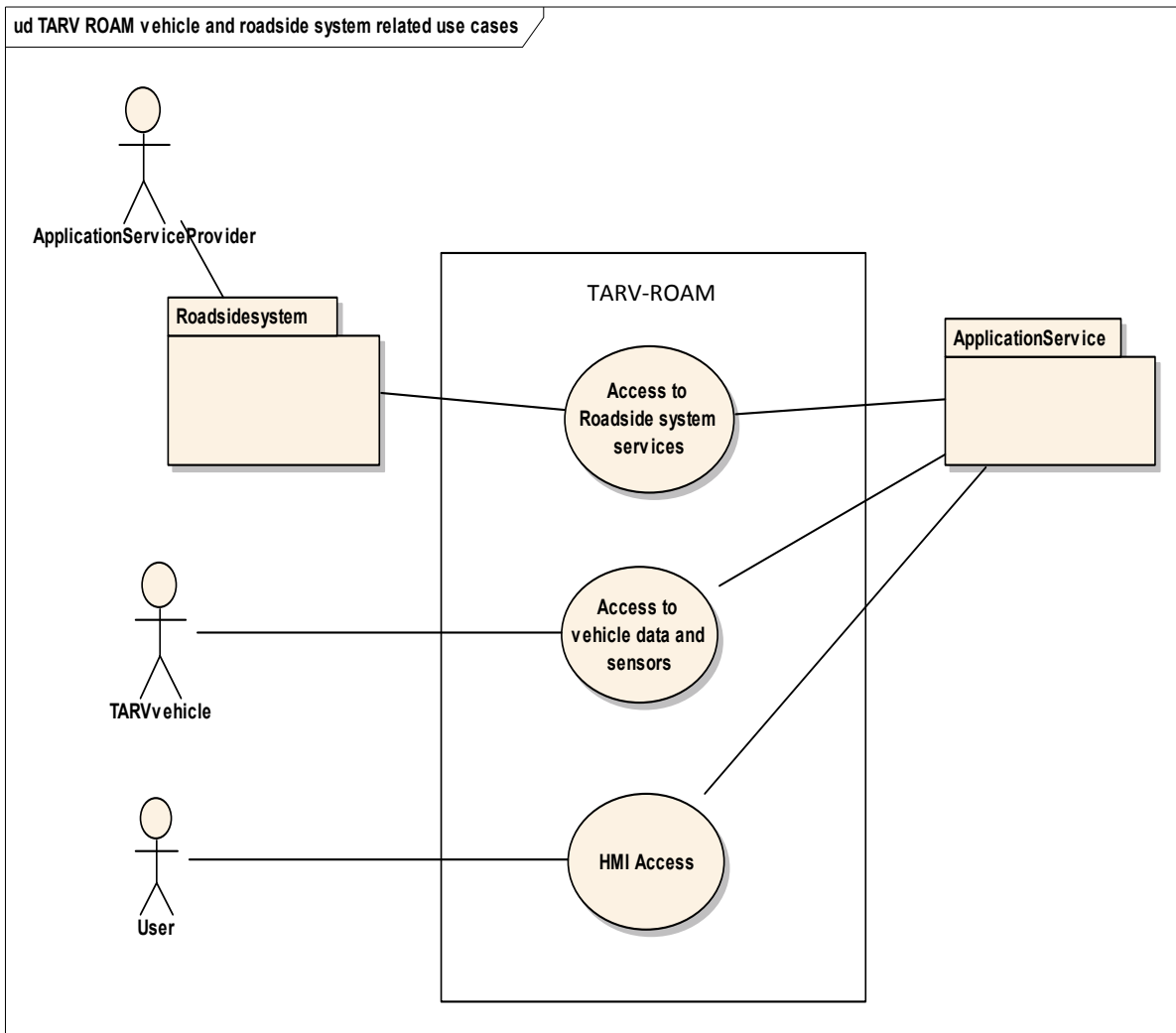
Figure 4 — TARV- ROAM vehicle and roadside system related use cases
(Source: ISO 15638-1)

8.5.9   Concurrent multiple 'apps' and 'CoreData'

It is important to understand that, whereas *basic vehicle data [4.4]* (*TARV LDT* always provides the same data concepts), '*CoreData [4.7]*' is a transient data concept. It is created by an app at a point in time, and its content is the content determined by that 'app' (subject to the constraints of ISO 15638 various parts).

Although separate commands, the 'CREATE' and 'GET' **CoreData** commands are used together in sequence. The first populates the transient core-data data concept with values, the second sends those values to a previously determined address.

In this manner, this single command services multiple applications that are concurrent in the 'apps' library in a way that simplifies the application system and 'app' and makes efficient use of the limited memory of the *IVS*.(i.e. the single command and file can service multiple 'apps', even if running concurrently).

NOTE   in the event that a *service provider [4.13]* issues a 'GET **CoreData**' command without preceding it with a CREATE **CoreData**' command, this would only result in the current values of the *core application data [4.7]* data concept being sent to their legitimate predetermined IPv6 address, and not to the instigator of the 'GET **CoreData**' command.

8.6   Common operational processes for the system

The details of the *application service [4.1]* are as designed by the *application service* system to meet the requirements for the provision of a particular *application service* and are not defined herein. This part of ISO 15638 specifies the roles and responsibilities of actors in the systems, and the interoperability of key operational steps and actions required to support all *TARV application service* systems. This Clause addresses the provision of *application services* that require data in addition to, or instead of, *basic vehicle data [4.4]* and '*core application data [4.7] (CoreData)*' and specifies how the form and content of such data required to support such systems, and access methods to that data are to be defined.

Unless it is a specifically and explicitly defined feature of an *application service [4.1]* definition, it shall not be possible for collected or stored *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 authorised by the *application service provider [4.2]*.

The means by which data is provisioned into the data pantry, and the means to obtain the *TARV LDT* and *core application data [4.7]* are described in Clause 8 above.

Specific *application services [4.1]* will collect and transfer application specific data. Sometimes this will be or will include the *TARV LDT* or *core application data [4.7]*, in many cases additional application specific data will be required. This data is defined in the specification for any specific *application service [4.1]*.

Different *application services [4.1]* may require connection to different application specific equipment – for example a tachograph, temperature sensor, or perhaps some form of driving licence reading equipment. However there are common basic processes behind *TARV application services*.

In order to minimise demand on the *IVS* (which it is assumed will be performing multiple *application services [4.1]* 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 application services*.

The *TARV* approach is for the on-board 'app' supporting the *application service [4.1]* to collect and collate the relevant data, and at intervals determined by the 'app', pass that data to the *application service provider [4.2]*. All of the actual application service processing will occur in the mainframe system of the *application service provider*.

At a conceptual level, The *TARV* system is therefore essentially simple as shown in Figure 5. The process is similar to that for `CoreData [4.7]`, but data is supplied to a different on-board file in the data pantry.
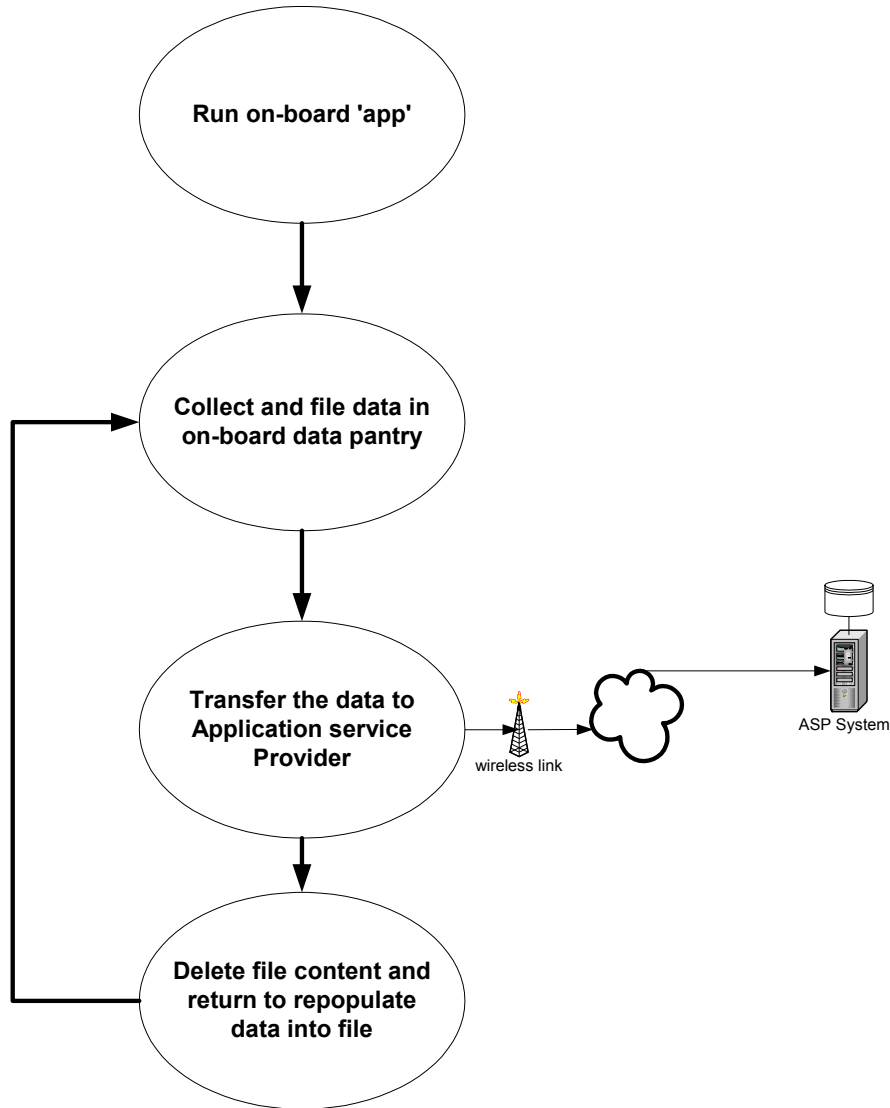
Figure 5 — TARV application service on-board procedure
(Source ISO 15638-6)

At a common generic functional level, the process may be seen as shown in Figure 7 below, however the connected equipment may/may not be required in all cases.

8.7 Common characteristics for instantiations of commercial/civic application services

8.7.1 An unregulated commercial/civic *application service [4.1]* is approved; it utilises a *TARV IVS* which communicates to the *prime service provider [4.13]* / *application service provider [4.2]* and may have the ability connect with other equipment.

8.7.2 The *application service [4.1]* provider shall design/install/operate its regulated system as approved by the approval authority.

8.7.3 The *application service [4.1]* provider shall load an 'app' for commercial (unregulated) *application service* into the *IVS* of the *users [4.14]* vehicle(s).

8.7.4 The 'app' for commercial (unregulated) *application service [4.1]* shall run whenever the vehicle is operating, or in accordance with specific requirements defined in the system specification.

8.7.5   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 purposes.

8.8   Data naming content and quality

TARV application services [4.1] are built around short communication sessions that simply transfer a file of data to an *application service provider* [4.2] at intervals/times determined by the application, and receive back a confirmation that the data has been received. Figure 11 illustrates the generic sequence. Figure 11 is illustrative of the process, but individual *application services* may have slightly more complex transactions.

An *application service* [4.1] provider may stimulate the transfer of a file from the *IVS* 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 instantiations* [4.8] it may be a combination of both.

Variations for specific *application services* [4.1] are shown in the clauses describing that particular *application service* (below).
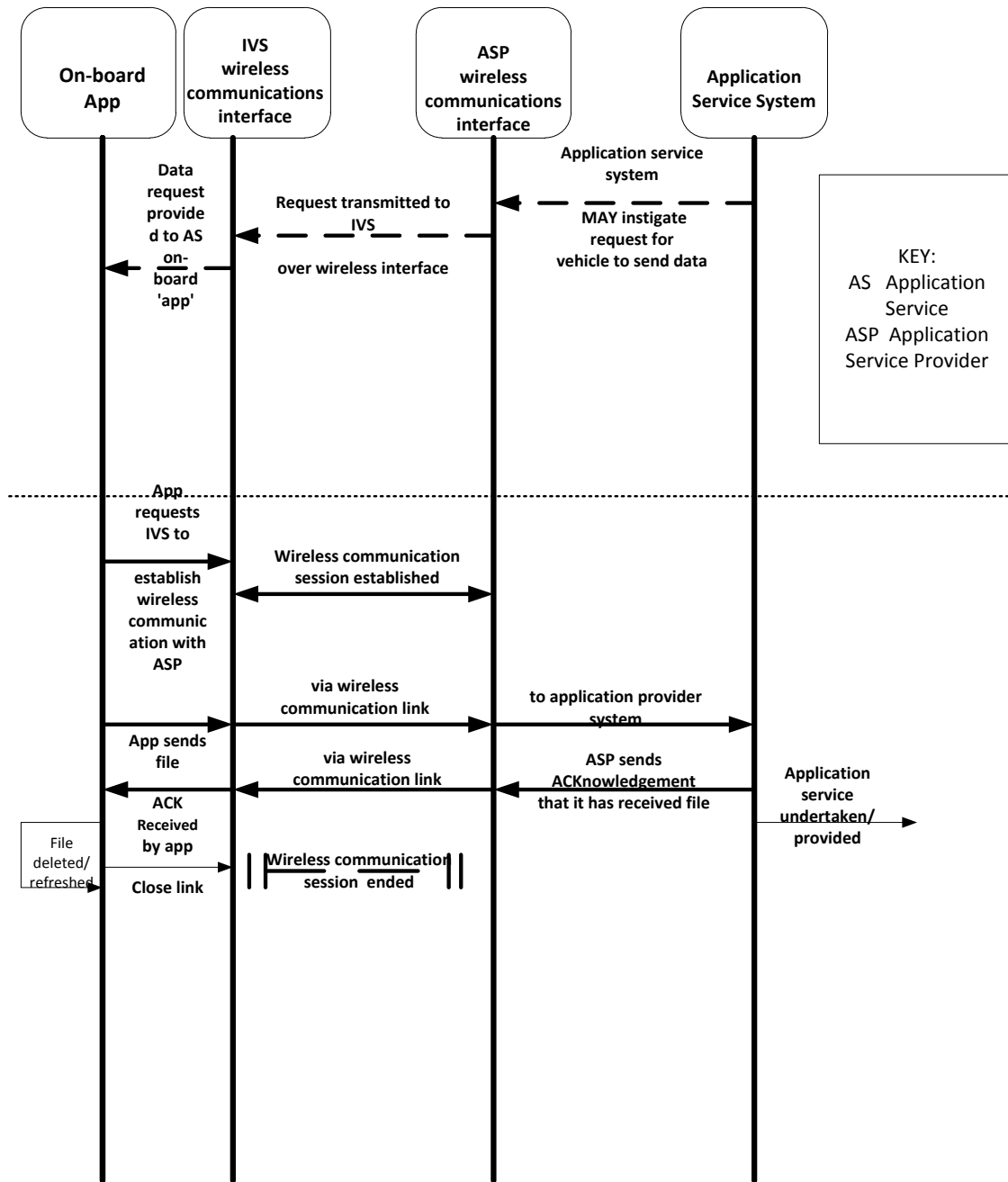
Figure 6 — Generic file transfer sequence from *IVS* **to application service provider** [4.2] **system**
(Source ISO 15638-6)

The process to obtain *basic vehicle data* [4.4] (*TARV LDT*) data content shall be as defined in this Part of ISO 15638 and ISO 15638-5.

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

The specifications for *application services* [4.1] shall specify the precise naming convention for that *application service,* which shall uniquely identify the application and its data files. The unique filename and its origin and ownership shall be maintained in a data registry maintained in accordance with ISO 14817.

8.9   Quality of service requirements

This part of ISO 15638 contains no general requirements concerning quality of service. Such aspects will be determined as part of the specification for any particular *application service (4.1)*. However, where a specified *application service* has specific quality of service requirements essential to maintain interoperability, these aspects shall be specified in the *application service* specification.

8.10 Test requirements

This part of ISO 15638 contains no general requirements concerning test requirements. Such aspects will be determined as part of the specification for any particular *application service (4.1),* and issued as a formal test requirements specification document. However, where a specified *application service* has specific test requirements essential to maintain interoperability, these aspects shall be specified in the specification relating to that *application service,* or in a separate standards deliverable for that *application service.*

8.11 Marking, labelling and packaging

This part of ISO 15638 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 [4.8]* based on the ISO 15638 family of Standards, the contracting parties shall make such risk explicitly known to the implementing *jurisdiction [4.9]* 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.

8.12 Information security

The *prime service provider [4.13]* and *application* service providers *[4.2]* shall both be required to implement an 'Information Security Management System' (ISMS) necessary for the on-going operation of the system.

The ISMS shall provide assurance that the risks to evidentially-significant information will be managed appropriately by the *users [4.14]* of the system.

8.13 Software engineering quality systems

The specification, design, development and testing of the *IVS*, *application service [4.1]* provider system and on-board *application service* 'app' shall employ a recognised software engineering quality system methodology declared to and approved by the approving authority.

The quality system shall also control the process of updates and changes and shall be in alignment with a recognised International quality standard.

8.14 Quality monitoring station

As the *application service [4.1]* provider's end to end system is comprised of a complex arrangement of components (i.e. *IVS*, wireless communications provider, *application service provider [4.2]* system etc.), the *prime service provider* shall provide, maintain and make available to the *application service provider* a 'Quality Monitoring Station' (QMS). The QMS provides the *application service provider* with a working example of an *IVS* and enables them to monitor each of the components of their end to end system.

8.15 Audits

The *prime service provider [4.13]* shall undergo both internal and external audits at intervals defined by the jurisdiction/approval authority to ensure that they continue to provide high quality services. The results of these audits shall be provided into the quality systems of the *prime service provider* for continuous improvement actions, and the results shall be provided to the jurisdiction/approval authority.

The *application service [4.1]* provider shall undergo both internal and external audits at intervals defined by the jurisdiction/approval authority to ensure that they continue to provide high quality services. The results of these audits shall be provided into the quality systems of the *application service provider [4.2]* for continuous improvement actions, and the results shall be provided to the jurisdiction/approval authority.

8.16 Access control policy

To protect the data and information held by the *application service provider [4.2]*, each provider shall adopt a risk based data access control policy for employees of the provider.

9.   Sequence of operations for unregulated application services with additional data requirements

9.1   Overview

The business process and sequence of operations is shown in Figure 7.

In understanding Figure 7, it is important to comprehend that different unregulated commercial/civic *application services [4.1]* will exist, and that *application service provider [4.2]* service offerings for services of the same name will also vary (unless they are designed to an agreed common specification or Standard). 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 [4.2]* system via a wireless interface.
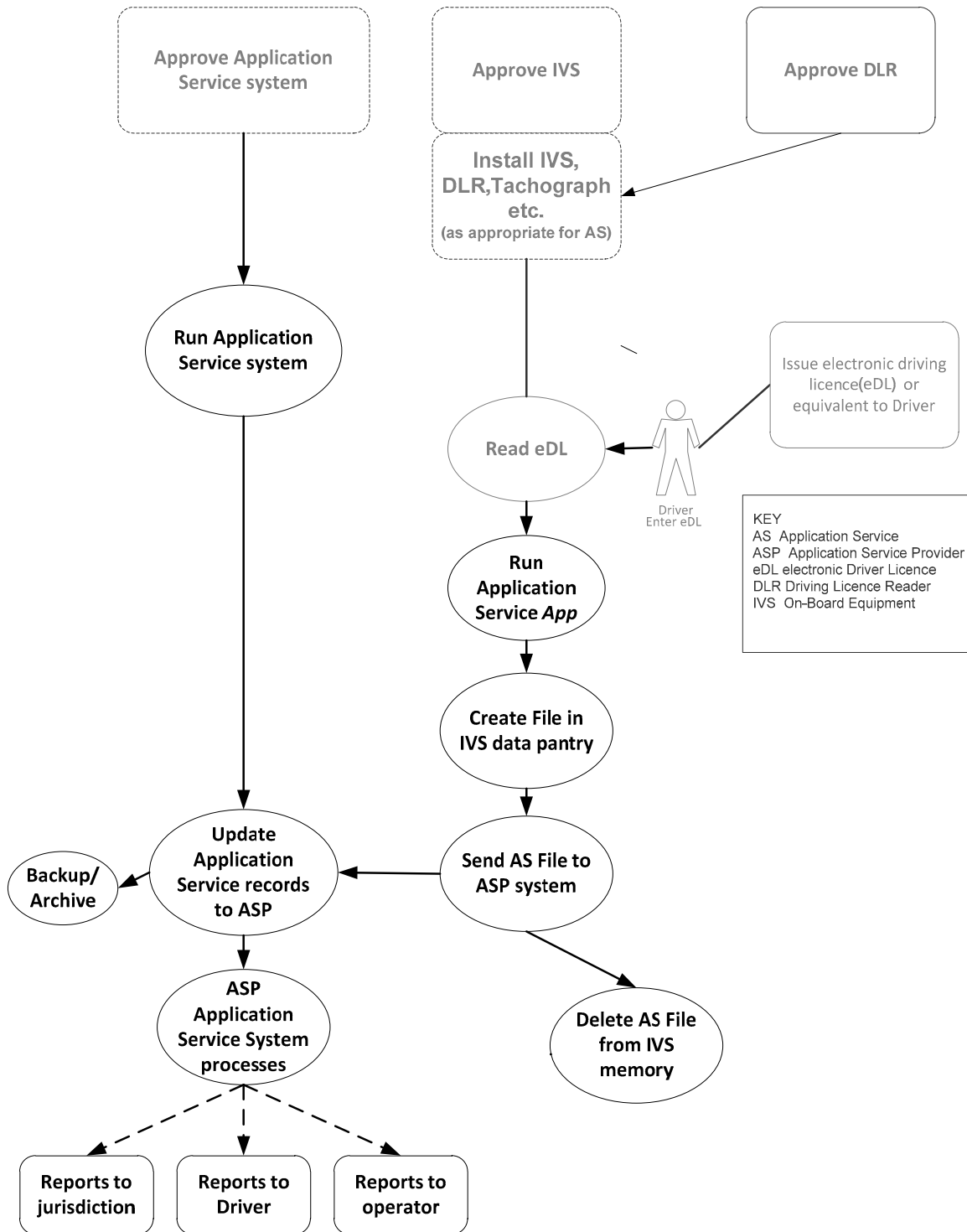
Figure 7 — Generic commercial (unregulated) application service business process and procedure

9.2   Provisioning the application service

The 'application service' is a software application system comprising two parts.

a)   Landside application software system

b)   On-board 'app' to generate the *core application data* [4.7] for the system

The on-board 'app' shall be provided by the *application service* [4.1] provider and it is the responsibility of the *application service provider* [4.2] to load it onto the vehicle *IVS*, or, using *TARV-ROAM* it can dynamically upload the 'app' directly to the vehicle.

Figure 8 shows the routes that the *application service* [4.1] software is provided to the *application service provider* [4.2], and the two routes that the 'app' can be provisioned in the 'app' library of the *IVS*. See ISO 15638-1 Clause 12 for further detail.
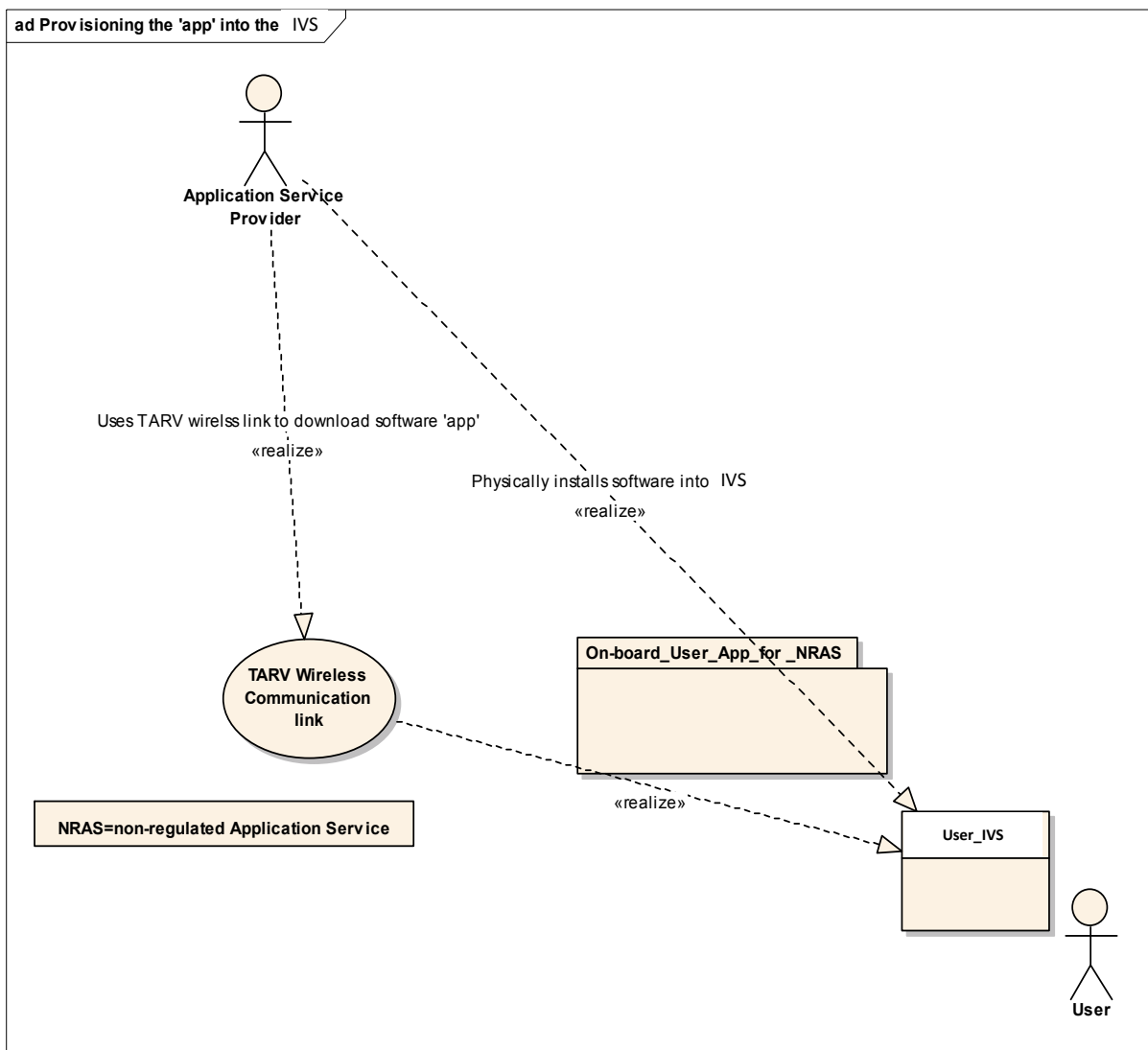

Figure 8 — Provisioning the 'App' into the IVS

The first stage shown in Figure 9 below also represents this process as the first step in the sequence of operations.

9.3   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* [4.4] or '*core application data* [4.7] *(CoreData)*' one or two (of three) commands is invoked.

- GET TARV *LDT* data
- CREATE *CoreData'*
- GET *CoreData'*

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 shall be detailed further in a subsequent definition provided in the form specified in this part of ISO 15638).

Figure 9 shows the high level conceptual sequence of operations.
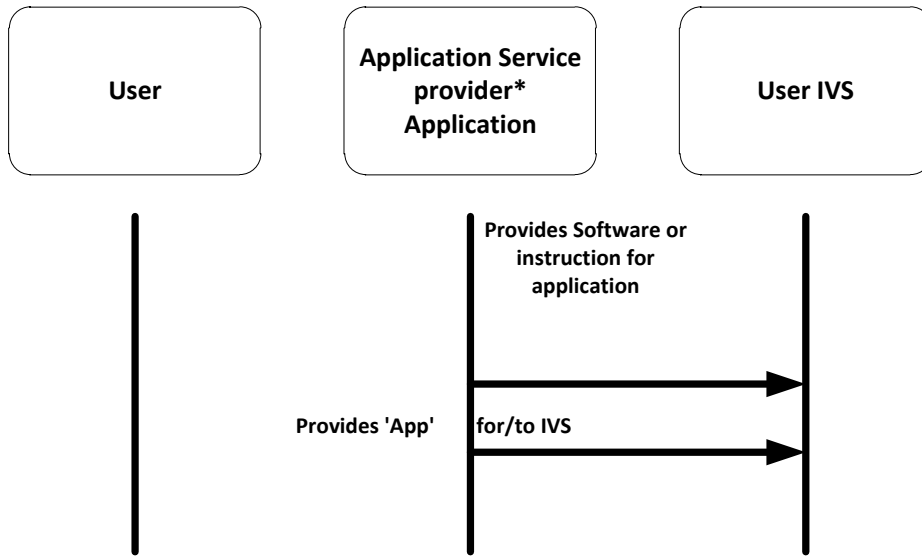
Where only 'Essential vehicle data (TARV LDT) is required
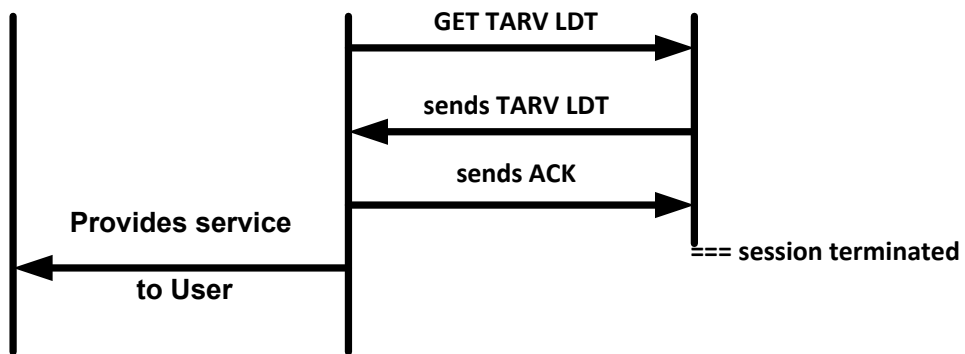
Where Core vehicle data (TARV LDT + application specific data) is required
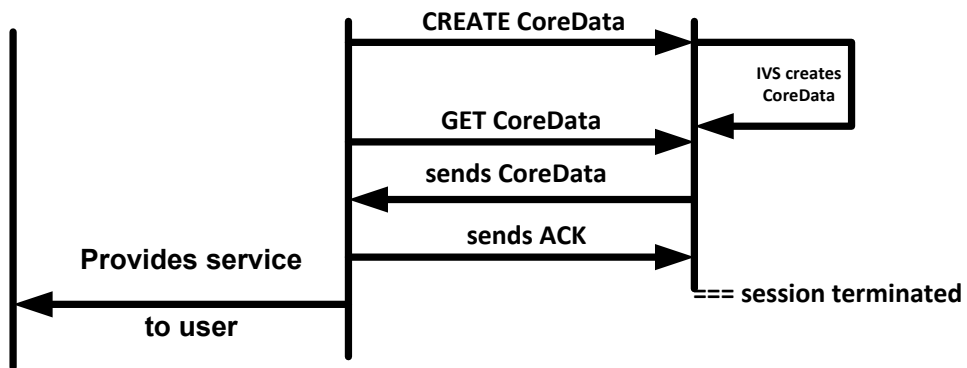
Figure 9 — Sequences to obtain TARV LDT and *CoreData*

NOTE   In some instantiations [4.8] the application service [4.1] provider will be the jurisdiction [4.9] or its agent.

Building the *application service [4.1]* results, and providing required information to *jurisdictions [4.9]*, is architecturally conceived as a process that is performed by the *application service* software and hosted in the landside system of the *application service provider [4.2],* and is not transacted while the communication with

the vehicle is in progress, nor is the service directly provided by the *IVS*, 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 solved by a subsequent communication session with the vehicle.

All further data processing of the *application service [4.1]* is effected by the *application service provider [4.2]*, landside, using the application provider *application service* software, not on-board by the *IVS*.

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.

The resulting communications sequence is therefore, in realisation, more staccato, as shown in Figures 10 and 11.

9.4   GET TARV LDT
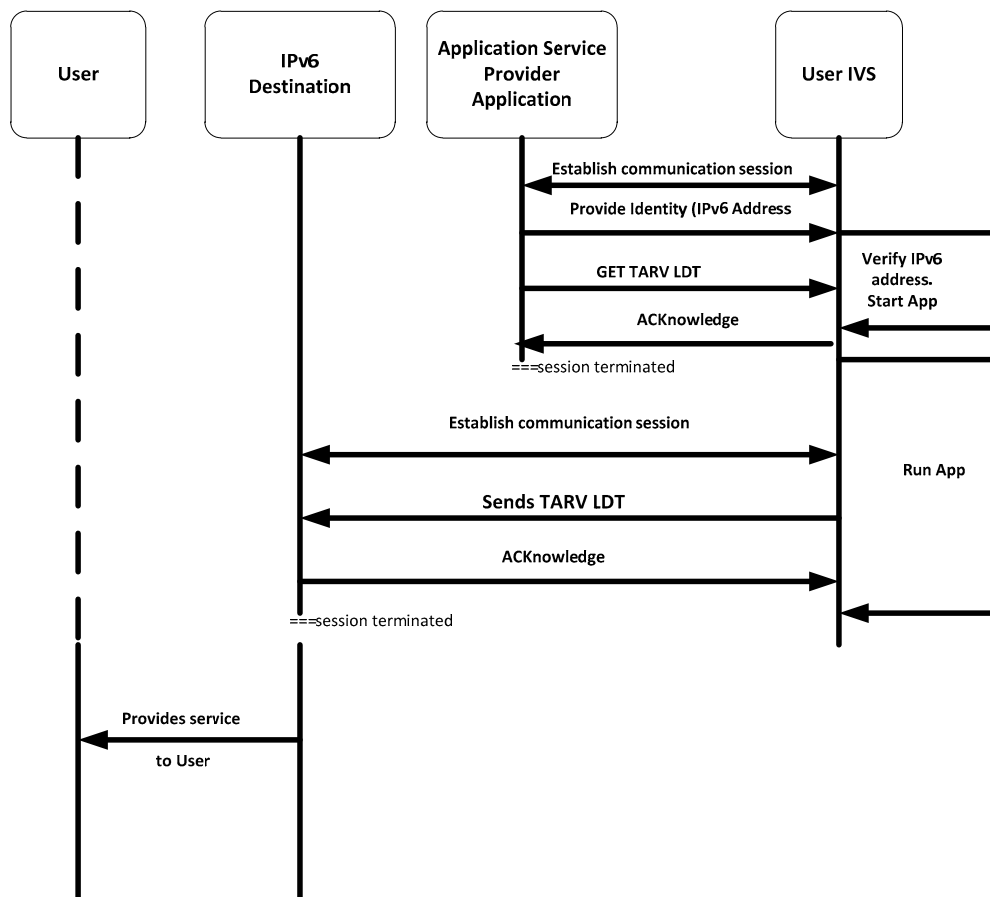
Figure 10 — Communications sequences to obtain TARV LDT

If only the *basic vehicle data [4.4]* is required, the application operating system shall simply establish the communication link in accordance with ISO 15638-2 (TARV -Common platform parameters using *CALM*), and shall:

 a) issue the command 'GET TARV LDT data' in accordance with ISO 15638-5 (TARV – Basic vehicle data).

 b) The *IVS* then sends an acknowledgement that the command has been received and the session is closed.

c) The *IVS* then sends the *TARV LDT* to the predetermined IPv6 address.

d) The receiving IPv6 address sends an ACKnowledgement.

e) Once the *IVS* receives the ACKnowledgement) that *TARV LDT* is successfully received by the destination address, the session shall be closed. (See Figure 6).

9.5   CREATE and GET *CoreData*
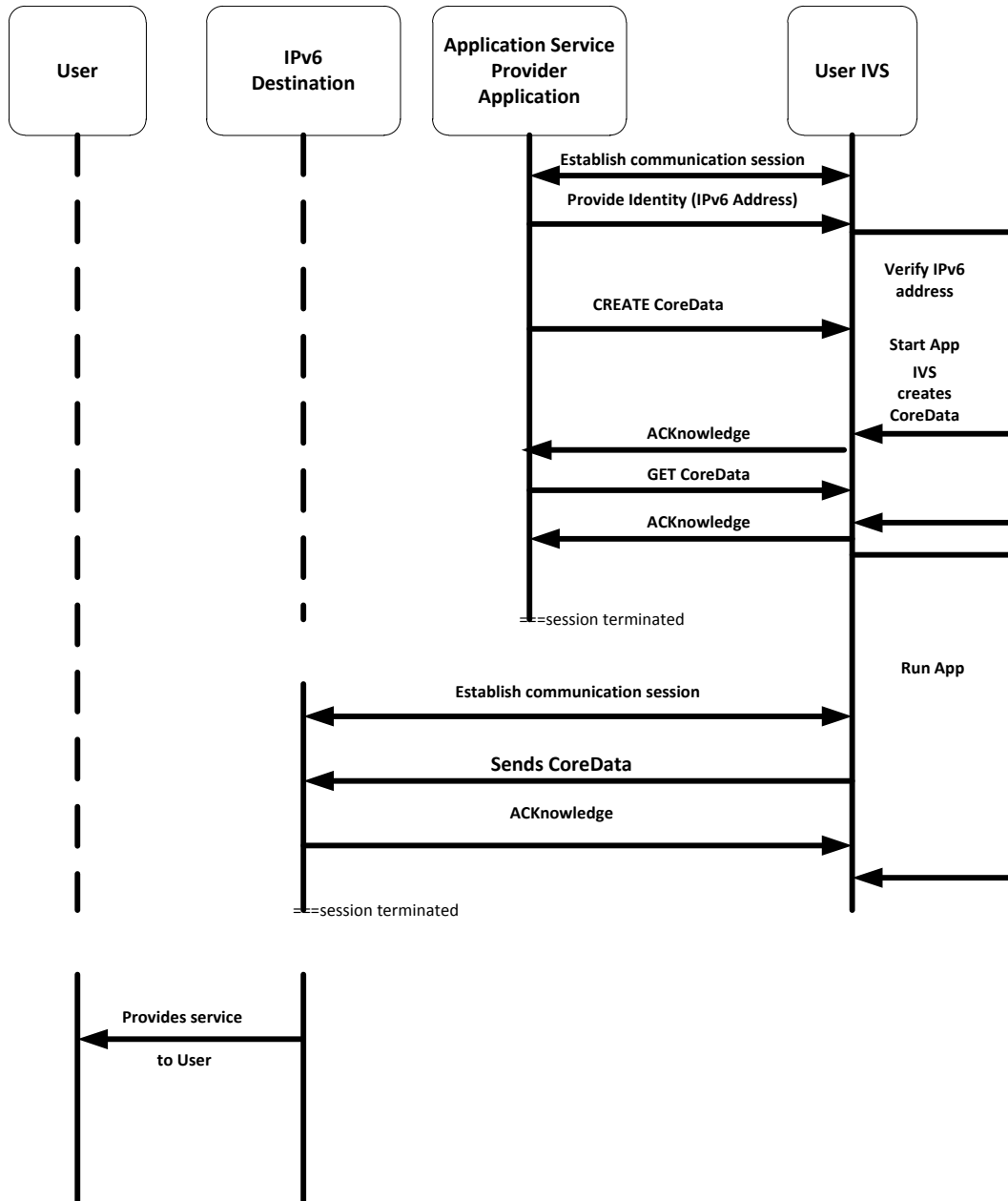
Figure 11 — Communications sequences to obtain *CoreData*

Most of the *application services [4.1]* defined in this part of ISO 15638 require data in addition to the *basic vehicle data [4.4]*, and therefore, before the data can be obtained, the data pantry has to be updated. Figure 8 below shows a hypothetical example of *CoreData*.

NOTE   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 authorised to access.

In this event the application operating system shall:

a) Establish the communication link in accordance with ISO 15638-2 (TARV -Common platform parameters using *CALM*), and

b) Shall issue the command 'CREATE *CoreData*'.

c) The *IVS* then populates the *CoreData* data concept with data as instructed by the on-board 'app'

d) The *IVS* sends an acknowledgement that the command has been received and the communication session is closed.

e) The *IVS* then sends the *CoreData* to the predertermined IPv6 address contained in the content of the *CoreData*.

f) The receiving IPv6 address sends an ACKnowledgement.

g) Once the *IVS* receives the ACKnowledgement) that *TARV LDT* is successfully received by the destination address, the session shall be closed. (See Figure 6).

NOTE   Core application data [4.7] includes the TARV LDT data.

Once the *IVS* receives an acknowledgement (ACK) that the *CoreData* [4.7] is successfully received by the enquirer, the session shall be closed. (See Figure 7).

Example

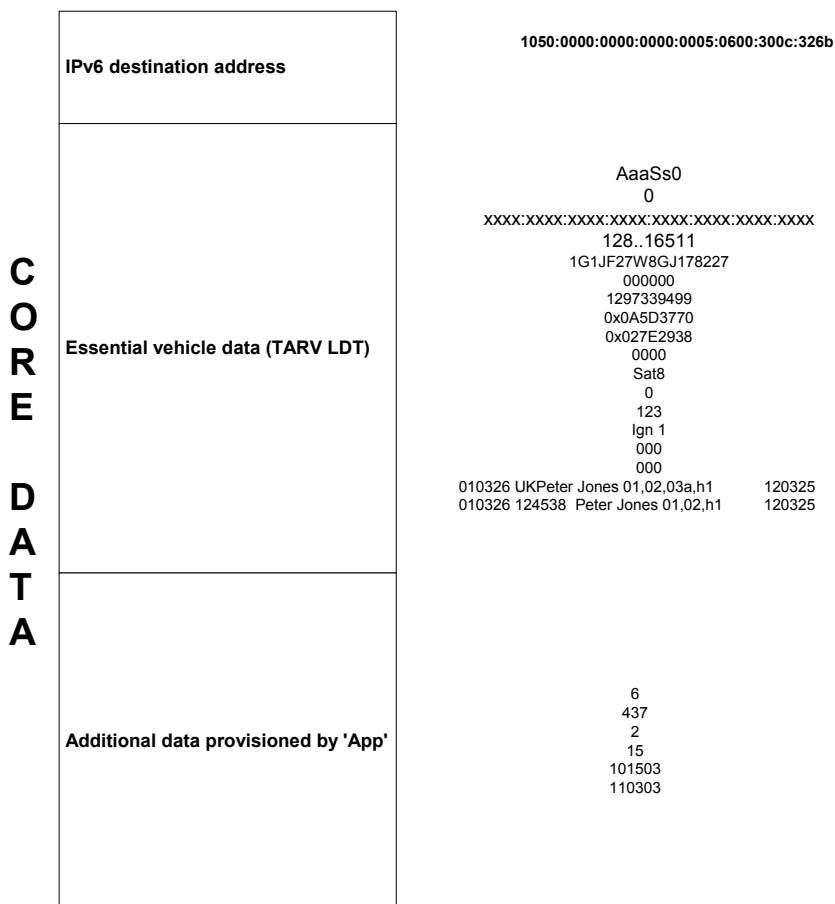|	
IPv6 destination address	**1050:0000:0000:0000:0005:0600:300c:326b**
C O R E D A T A — **Essential vehicle data (TARV LDT)**	AaaSs0 0 xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx 128..16511 1G1JF27W8GJ178227 000000 1297339499 0x0A5D3770 0x027E2938 0000 Sat8 0 123 Ign 1 000 000 010326 UKPeter Jones 01,02,03a,h1 120325 010326 124538 Peter Jones 01,02,h1 120325
Additional data provisioned by 'App'	6 437 2 15 101503 110303

Figure 12 — Core application data *(CoreData)*

9.5   Application specific sequences of operations

A sequence of operations shall be developed and specified for each of the commercial (unregulatory) *application service [4.1]* specifications.

9.6   Format of applications service requirements definitions

The requirements for any *application service [4.1]* shall be specified in the format defined in Annex A (Normative).

10 Declaration of patents and intellectual property

This part of ISO 15638 contains no known patents or intellectual property other than that which is implicit in the media standards referenced herein and in ISO 15638-2. While the *CALM* standards themselves are free of patents and intellectual property, *CALM* in many cases relies on the use of public networks and IPR exists in many of the public network media standards. The reader is referred to those standards for the implication of any patents and intellectual property.

Application services [4.1] specified within ISO 15638-6 and ISO 15638-7 contain no direct patents nor intellectual property other than the copyright of ISO. However, national, regional or local *instantiations (4.8)* of any the applications services defined in ISO 15638-6 and this part of ISO 15638, or of the generic vehicle information defined in this ISO 15638-5, the security requirements contained in ISO 15638-4, or the requirements of ISO 15638-3, may have additional requirements which may have patent or intellectual property implications. The reader is referred to the regulation regime of the *jurisdiction [4.9]* and its regulations for *instantiation [4.8]* in this respect.

Annex A
(normative)

Format of applications service requirements definitions

...

ApplicationTitle (Application title Acronym[if any])

1 *ApplicationTitle* service description and scope

1.1 ApplicationTitle use case

1.2 Description of ApplicationTitle application service

2 Concept of operations for ApplicationTitle

2.1 General

2.2 Statement of the goals and objectives of the APPLICATIONTITLE system

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

2.4 Organisations, activities, and interactions among participants and stakeholders

2.5 Clear statement of responsibilities and authorities delegated

2.6 Equipment required for system

2.7 Operational processes for the system

2.8 Role of the jurisdiction

2.9 Role of the prime service provider

2.10 Role of the application service provider

2.11 Role of the user

2.12 Generic characteristics for all instantiations of the TARV ApplicationTitle application service

3 Sequence of operations for ApplicationTitle

...

4 ApplicationTitle service elements

4.1 APPLICATIONTITLE service element SE 1: Establish 'ApplicationTitle' regulations, requirements, and approval arrangements

4.2 APPLICATIONTITLE SE2: Request system approval

4.3 APPLICATIONTITLE SE3: User (operator) contracts with prime service provider

4.4 APPLICATIONTITLE SE4: User contracts with application service provider

4.5 APPLICATIONTITLE SE5: application service provider uploads software into the TARV equipped vehicles of the operator.

4.6 APPLICATIONTITLE SE6: The driver identification and authentication method for the IVS

4.7 APPLICATIONTITLE SE7 et sequitur: definitions for specific on-board routines required for the Application/service

4.n APPLICATIONTITLE SE12: End of session

5 ApplicationTitle Data naming content and quality

6 ApplicationTitle application service specific provisions for quality of service

6.1 Software engineering quality system

6.2 Audits

6.3 Information security

6.4 Access control policy

6.5 APPLICATIONTITLE quality monitoring station

7 ApplicationTitle application service specific provisions for test requirements

8 ApplicationTitle application specific rules for the approval of IVSs and 'Service Providers'

...

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