INTERNATIONAL STANDARD

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

Part 16: Vehicle speed monitoring

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

Partie 16: Monitorage de la vitesse des véhicules

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Foreword

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

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

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

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

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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

This first edition cancels and replaces ISO/TS 15638-16:2013.

ISO 15638 consists of the following parts, under the general title, *Intelligent transport systems — Framework for cooperative telematics applications for regulated 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*

— *Part 7: Other applications*

— *Part 8: Vehicle access management*

— *Part 9: Remote electronic tachograph monitoring (RTM)*

— *Part 10: Emergency messaging system/eCall (EMS)*

— *Part 11: Driver work records*

— *Part 12: Vehicle mass monitoring*

— *Part 14: Vehicle access control*

— *Part 15: Vehicle location monitoring*

— *Part 16: Vehicle speed monitoring*

— *Part 17: Consignment and location monitoring*

— *Part 18: ADR (Dangerous Goods) transport monitoring (ADR)*

— *Part 19: Vehicle parking facilities (VPF)*

The following parts are under preparation:

— *Part 4: System security requirements*

— *Part 13: 'Mass' information for jurisdictional control and enforcement*

Introduction

Many ITS technologies have been embraced by commercial transport *operators (4.34)* and freight owners, in the areas of fleet management, safety, and security. *Telematics (4.44)* applications have also been developed for governmental use. Such regulatory services in use or being considered vary from *jurisdiction (4.28)* to *jurisdiction*, but include electronic on-board recorders, digital *tachograph (4.43)*, on-board *mass (4.32)* monitoring, *'mass' data for regulatory control and management (4.33)*, vehicle *access (4.1) methods*, *hazardous goods* tracking and e-call. Additional applications with a regulatory impact being developed include, fatigue management, speed monitoring and heavy vehicle penalties imposed based on location, distance, and time.

In such an emerging environment of regulatory and *commercial applications (4.14)*, it is timely to consider an overall *architecture (4.10)* (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 (4.42)* of new applications that build upon the functionality of a generic specification platform. This International Standard is required to describe and define the *framework (4.22)* 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 (4.28)*.

This International Standard addresses and defines the *framework (4.22)* for a range of cooperative *telematics (4.44)* applications for *regulated vehicles (4.38)*, such as *access methods (4.2)*, driver *f*atigue management, speed monitoring, on-board *mass (4.32)* monitoring, *mass' data for regulatory control and management (4.33)*. The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative provision of services to *regulated vehicles (4.38)*, using an on-board ITS platform. The *framework* is based on a (multiple) *service provider (4.40)* oriented approach with provisions for the *approval (4.7)* and *auditing (4.11)* of *service providers*.

This International Standard will

— provide the basis for future development of cooperative ITS *telematics (4.44)* applications for *regulated vehicles (4.38)*. Many elements to accomplish this are already available. Existing relevant standards will be referenced, and the *specifications (4.42)* 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 vehicles (4.38)*,

— a business *architecture (4.10)* based on a (multiple) *service provider (4.40)* oriented approach, and

— address legal and regulatory aspects for the *approval (4.7)* and *auditing (4.11)* of *service providers.*

This International Standard is timely as many governments (Europe, North America, Asia and Australia/New Zealand) are considering the use of *telematics (4.44)* 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 ISO 15638 provides *specifications (4.42)* for vehicle speed monitoring.

NOTE The definition of what comprises a 'regulated' vehicle is regarded as an issue for national decision, and can vary from *jurisdiction (4.28)* to *jurisdiction*. This International Standard does not impose any requirements on nations in respect of how they define a *regulated vehicle (4.38)*.

NOTE The definition of what comprises a 'regulated' service is regarded as an issue for national decision, and can vary from *jurisdiction (4.28)* to *jurisdiction*. This International Standard does not impose any requirements on nations in respect of which services for *regulated vehicles (4.38) jurisdictions* 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 cooperative telematics applications for regulated vehicles (TARV) —

Part 16:
Vehicle speed monitoring

1 Scope

This part of ISO 15638 addresses the provision of *'vehicle speed monitoring'* and specifies the form and content of such data required to support such systems, and *access methods (4.2)* to that data.

The scope of this part of ISO 15638 is to provide *specifications (4.42)* for common communications and data exchange aspects of the *application service (4.4)* vehicle speed monitoring that a *regulator (4.28)* can elect to require or support as an option, including

a) high level definition of the service that a *service provider (4.40)* has to provide (The service definition describes common service elements but does not define the detail of how such an *application service (4.4)* is instantiated, nor the acceptable value ranges of the data concepts defined),

b) means to realize the service, and

c) application data, naming content, and quality that an *IVS (4.25)* has to deliver.

The definition of what comprises a 'regulated' service is regarded as an issue for National decision, and can vary from *jurisdiction (4.28)* to *jurisdiction*. This International Standard does not impose any requirements on nations in respect of which services for *regulated vehicles jurisdictions* will require, or support as an option, but provides standardised sets of requirements descriptions for identified services to enable consistent and cost efficient implementations where instantiated.

This International Standard has been developed for use in the context of regulated commercial freight vehicles [hereinafter referred to as 'regulated vehicles' *(4.38)*]. However, there is nothing to prevent a jurisdiction extending or adapting the scope to include other types of regulated vehicles, as it deems appropriate.

2 Conformance

Requirements to demonstrate conformance to any of the general provisions or specific *application services (4.4)* described in this part of ISO 15638 shall be within the regulations imposed by the *jurisdiction (4.28)* where they are instantiated. Conformance requirements to meet the provisions of this International Standard are therefore deemed to be under the control of, and to the specification of, the *jurisdiction* where the *application service*(s) is/are instantiated.

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

3 Normative references

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

ISO 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 15638–4,[1)] *Intelligent transport systems — Framework for cooperative telematics applications for regulated 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 15638–6, *Intelligent transport systems — Framework for collaborative Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 6: Regulated applications*

ISO 15638–8, *Intelligent transport systems — Framework for cooperative telematics applications for regulated vehicles (TARV) — Part 8: Vehicle access management*

ISO 15638–11, *Intelligent transport systems — Framework for cooperative telematics applications for regulated vehicles (TARV) — Part 11: Driver work records*

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
access
admittance, entry, permit to use the road network and/or associated infrastructure (bridges, tunnels, etc.)

4.2
access methods
procedures and protocols to provision and retrieve data

4.3
app
small (usually) *Java™*[2)] applets, organized as software bundles, that support *application services (4.4)* by keeping the *data pantry (4.18)* provisioned with up to date data

4.4
application service
service provided by a *service provider (4.40)* enabled by accessing data from the *IVS (4.25)* of a *regulated vehicle (4.38)* through a wireless communications network

4.5
application service provider
ASP
party that provides an application service *(4.4)*

1) To be published.

2) This information is given for the convenience of users of this document and does not constitute an endorsement by ISO.

4.6
app library
separately secure area of memory in *IVS (4.25)* where apps are stored

[SOURCE: with different access controls to *data pantry (4.18)*]

4.7
approval
formal affirmation that an applicant has satisfied all the requirements for appointment as an *application service provider (4.5)* or that an application service delivers the required service levels

4.8
approval agreement
written agreement made between an *approval authority (regulatory)(4.9)* and a *service provider(4.40)*

Note 1 to entry: An app*roval authority (regulatory) (4.9)* approval agreement recognizes the fact that a *service provider (4.40),* having satisfied the *approval authority's* requirements for appointment as a **s***ervice provider,* is appointed in that capacity, and sets out the legal obligations of the parties with respect to the on-going role of the *service provider.*

4.9
approval authority
regulatory
organization (usually independent) which conducts *approval (4.7)* and ongoing *audit (4.11)* for *service providers (4.40)* on behalf of a *jurisdiction (4.28)*

4.10
architecture
formalized description of the design of the structure of *TARV* and its *framework (4.22)*

4.11
audit/auditing
review of a party's capacity to meet, or continue to meet, the initial and ongoing *approval agreements (4.8)* as a *service provider (4.40)*

4.12
basic vehicle data
data that shall be maintained/provided by all *IVS (4.25)*, regardless of *jurisdiction (4.28)*

4.13
communications access for land mobiles
CALM
layered solution that enables continuous or quasi continuous communications between vehicles and the infrastructure or between vehicles, using such (multiple) wireless telecommunications media that are available in any particular location, and which have the ability to migrate to a different available media where required and where media selection is at the discretion of *user (4.45)* determined parameters by using International Standards based on ISO 21217 and ISO 21210 that provide a common platform for a number of standardised media using *ITS-stations (4.27)* to provide wireless support for applications, such that the application is independent of any particular wireless medium

4.14
commercial application(s)
ITS applications in *regulated vehicles (4.38)* for commercial (non-regulated) purposes

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

4.15
consignment
shipment of goods/cargo to a destination

4.16
cooperative ITS
C-ITS
ITS applications for both regulatory and commercial purposes that require the exchange of data between uncontracted parties using multiple *ITS-stations (4.27)* communicating with each other and sharing data with other parties with whom they have no direct contractual relationship to provide one or more *ITS services (4.26)*

4.17
core data
basic vehicle data (4.12) plus any additional data required to provide an implemented *regulated application service (4.37)*

4.18
data pantry
secure area of memory in *IVS (4.25)* where data values are stored

[SOURCE: with different access controls to *app library (4.6)*]

4.19
driver
person driving the *regulated vehicle* at any specific point in time

4.20
driver work records
DWR
collection, collation, and transfer of *driver (4.19)* work and rest hours data from an *in-vehicle system (4.25)* to an *application service provider (4.5)*

4.21
facilities
layer that sits on top of the communication stack and helps to provide data interoperability and reuse, and to manage applications and enable dynamic real time loading of new applications

4.22
framework
particular set of beliefs, ideas referred to in order to describe a scenario or solve a problem

4.23
global navigation satellite system
GNSS
comprises several networks of satellites that transmit radio signals containing time and distance data that can be picked up by a receiver, allowing the user to identify the location of its receiver anywhere around the globe

4.24
global positioning system
GPS
instantiation of *GNSS (4.23)* controlled by the US Department of Defense

4.25
in-vehicle system
IVS
ITS-station (4.27) and connected equipment on board a vehicle

4.26
ITS service
communication functionality offered by an *ITS-station (4.27)* to an *ITS-station* application

4.27
ITS-station
ITS-s
entity in a communication network, comprised of application, *facilities (4.21)*, networking and access layer components specified in ISO 21217 that operate within a bounded secure management domain

4.28
jurisdiction
regulator
government, road, or traffic authority which owns the r*egulatory applications (4.36)*

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

4.29
Kalman filter
set of mathematical equations that implement a predictor-corrector type estimator that is optimal in the sense that it minimizes the estimated error covariance

4.30
local data tree
LDT
frequently updated data concept stored in the on on-board *data pantry (4.18)* containing a collection of data values deemed essential for either a) *TARV regulated application service (4.37)*, or b) *cooperative intelligent transport systems (4.16)*

4.31
map
spatial dataset that defines the road system

4.32
mass
mass of a given heavy vehicle as measured by equipment affixed to the *regulated vehicle (4.38)*

4.33
'Mass' information for jurisdictional control and enforcement
MICE/MRC
collection, collation, and transfer of vehicle *mass (4.32)* data from an *in-vehicle system (4.25)* to an application service provider *(4.5)* to enable, or as part of a system of, imposing control and enforcement measures for *access(4.1)* to/use of specific roads/gates/bridges/tunnels/gates, etc. based on the mass of the regulated vehicle *(4.38)*

4.34
operator
fleet manager of a *regulated vehicle*

4.35
prime service provider
service provider (4.40) who is the first contractor to provide *regulated application services (4.37)* to the *regulated vehicle (4.38),* or a nominated successor on termination of that initial contract; the *prime service provider (4.35)*' is also responsible to maintain the installed *IVS (4.25)*; if the *IVS* was not installed during the manufacture of the vehicle the *prime service provider (4.35)* is also responsible to install and commission the *IVS (4.25)*

4.36
regulated application
regulatory application
application arrangement using TARV utilised by *jurisdictions (4.28)* for granting certain categories of commercial vehicles rights to operate in regulated circumstances subject to certain conditions, or indeed to permit a vehicle to operate within the *jurisdiction*; can be mandatory or voluntary at the discretion of the *jurisdiction*

4.37
regulated application service
TARV application service to meet the requirements of a regulated application that is mandated by a regulation imposed by a *jurisdiction (4.28),* or is an option supported by a *jurisdiction*

4.38
regulated commercial freight vehicle
regulated vehicle
vehicle that is subject to regulations determined by the *jurisdiction (4.28)* as to its use on the road system of the *jurisdiction* in regulated circumstances, subject to certain conditions, and in compliance with specific regulations for that class of regulated vehicle; at the option of *jurisdictions*; this might require the provision of information through *TARV* or provide the option to do so

4.39
remote tachograph monitoring
RTM
collection, collation, and transfer of data from an on-board electronic *tachograph (4.43)* system to an *application service provider (4.5)*

4.40
service provider
party which is approved by an approval *authority (regulatory) (4.9)* as suitable to provide regulated or commercial ITS *application services (4.4)*

4.41
session
wireless communication exchange between the *ITS-station (4.27)* of an *IVS (4.25)* and the *ITS-station* of its *application service provider (4.5)* to achieve data update, data provision, upload apps, or otherwise manage the provision of the *application service (4.4),* or a wireless communication provision of data to the *ITS-station* of an *IVS (4.25)* from any other *ITS-station*

4.42
specification
explicit and detailed description of the nature and functional requirements and minimum performance of equipment, service, or a combination of both

4.43
tachograph
sender unit mounted to a vehicle gearbox, a tachograph head and a digital driver card, which records the *regulated vehicle (4.38)* speed and the times at which it was driven and aspects of the *driver's (4.19)* activity selected from a choice of modes

4.44
telematics
use of wireless media to obtain and transmit (data) from a distant source

4.45
user
individual or party that enrols in and operates within a regulated or *commercial application (4.14) service (4.4)*

EXAMPLE *Driver (4.19),* transport *operator (4.34),* freight owner, etc.

4.46
vehicle access control
VAC
control of *regulated vehicles* ingress to and egress from controlled areas and associated penalties and levies

4.47
vehicle access management
VAM
monitoring and management of *regulated vehicle*s approaching or within sensitive and controlled areas

4.48
vehicle location monitoring
VLM
collection, collation, and transfer of vehicle location data from an *in-vehicle system (4.25)* to an *application service provider (4.5)*

4.49
vehicle mass monitoring
VMM
collection, collation, and transfer of vehicle mass (4.32) data from an *in-vehicle system (4.25)* to an *application service provider (4.5)*

4.50
vehicle parking facility
VPF
system for booking and *access (4.1)* to and egress from a vehicle parking facility (VPF)

4.51
vehicle speed monitoring
VSM
collection, collation, and transfer of vehicle speed data from an *in-vehicle system (4.25)* to an *application service provider (4.5)*

5 Symbols and abbreviated terms

AA	*approval authority (regulatory) (4.9)*
ANPR	automatic number plate recognition
App	*applet* (JAVA™ application or similar) *(4.3)*
ASP	*application service provider (4.5)*
CALM	*communications access for land mobiles (4.13)*
C-ITS	*cooperative intelligent transport systems (4.16)*
DLR	driving licence reader
Dr	*driver (4.19)*
DRD	driver records device
DWR	*driver work records (4.20)*
eDL	electronic *driver (4.19)* licence
EMS	*emergency message system (4.38)*
GNSS	*global navigation satellite system (4.23)*
H&S	health and safety

a) This information is given for the convenienve of users of this document and does not constitute an endorsement by ISO.

ID	Identity
IP	internet protocol
ITS-S	*ITS-station (4.27)*
IVS	*In-vehicle system (4.25)*
J	*jurisdiction (4.28)*
Java™a	object oriented open source operating language developed by SUN systems
LDT	*local data tree (4.30)*
MICE	*'Mass' information for jurisdictional control and enforcement (4.33)*
Op	*operator (4.34)*
PPS	precise positioning service (NAVSTAR)
PSP	*prime service provider (4.35)*
RFID	radio frequency identification device
RTM	*remote tachograph monitoring (4.39)*
SE	service element
SPF	secure parking facility
SPS	standard positioning service (NAVSTAR)
TARV	*telematics* (4.44) applications for *regulated vehicles* (4.38)
UTC	coordinated universal time
VAC	*vehicle access control (4.46)*
VAM	*vehicle access management (4.47)*
VLM	*vehicle location monitoring (4.48)*
VMM	*vehicle mass monitoring (4.49)*
VSM	*vehicle speed monitoring (4.51)*
VSP	*vehicle secure parking (4.50)*
VDSM	vehicle/*driver* speed monitoring
VDSMI	vehicle/*driver* speed monitoring infringement
VSMI	*vehicle speed monitoring* (4.51) infringement

a) This information is given for the convenienve of users of this document and does not constitute an endorsement by ISO.

6 General overview and framework requirements

ISO 15638-1 provided a *framework (4.22)* and *architecture (4.10)* for *TARV*. It provided a general description of the roles of the actors in *TARV* and their relationships.

To understand clearly the *TARV* framework, *architecture (4.10)* and detail and *specification (4.42)* of the roles of the actors involved, the reader is referred to ISO 15638-1.

ISO 15638-6 provides the core requirements for all regulated applications. To understand clearly the general context in to which the provision of this application service, the reader is referred to ISO 15638-6.

In order to be compliant with this part of ISO 15638, the overall architecture employed shall comply to ISO 15638-1.

In order to be compliant with this part of ISO 15638, the communications employed shall comply to ISO 15638-2.

In order to be compliant with this part of ISO 15638, the operating requirements employed shall comply to ISO 15638-3.

In order to be compliant with this part of ISO 15638, the security employed shall comply to ISO 15638-4:2014[3)].

In order to be compliant with this part of ISO 15638, the basic vehicle data shall comply to ISO 15638-5.

In order to be compliant with this part of ISO 15638, the generic conditions for this application service shall comply to ISO 15638-6.

This International Standard 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.

7 Requirements for services using generic vehicle data

The means by which the access commands for generic vehicle information specified in ISO 15638-5 can be used to provide all or part of the data required in order to support a *regulated application service (4.37)* shall be as defined in ISO 15638-6.

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

8.1 General

Application services shall be conducted as defined in ISO 15638-6.

8.2 Quality of service requirements

This part of ISO 15638 contains no general requirements concerning quality of service. Such aspects shall be determined by a *jurisdiction (4.28)* as part of its *specification (4.42)* for any particular *regulated application service (4.37).* However, where a specified *regulated application service (4.37)* has specific Quality of service requirements essential to maintain interoperability, these aspects shall be as specified in Clause 10.

8.3 Test requirements

This part of ISO 15638 contains no general requirements concerning test requirements. Such aspects shall be determined by a *jurisdiction (4.28)* as part of its *specification (4.42)* for any particular *regulated application service (4.37),* and issued as a formal test requirements *specification (4.42)* document. However, where a specified *regulated application service (4.37)* has specific test requirements essential to maintain interoperability, these aspects shall be as specified in Clause 10 relating to this *regulated application service,* or in a separate standards deliverable referenced within that clause. And where

3) To be published.

multiple *jurisdictions* recognize a benefit to common test procedures for a specific *regulated application service,* this shall be the subject of a separate standards deliverable.

8.4 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 can be potentially or actually compromised by any instantiation based on this International Standard, the contracting parties shall make such risk explicitly known to the implementing *jurisdiction (4.28)* and shall abide by the privacy laws and regulations of the implementing *jurisdiction* and shall mark up or label any contracts specifically and explicitly drawing attention to any loss of privacy and precautions taken to protect privacy. Attention is drawn to ISO/TR 12859 in this respect.

9 Common features of regulated TARV application services

9.1 General

The details of the instantiation of *regulated application service (4.37)* are as designed by the application service system to meet the requirements of a particular *jurisdiction (4.28)* and are not defined herein. ISO 15638-6 specifies the generic roles and responsibilities of actors in the systems, and instantiations that claim compliance with this part of ISO 15638 shall also be compliant with the requirements of ISO 15638-6.

The means by which data are provisioned into the *data pantry (4.18)*, and the means to obtain the *TARV LDT (4.30)* and *core data (4.17)* are described in ISO 15638-6, Clause 8.

In order to minimize demand on the *IVS (4.25)* (which it is assumed will be performing multiple *application services (4.4)* simultaneously, as well as supporting general safety related cooperative vehicle systems), and because national requirements and system offerings will differ, a 'cloud' approach has been taken in defining *TARV regulated application services (4.37)*.

The *TARV* approach is for the on-board *app (4.3)* supporting the application service to collect and collate the relevant data, and at intervals determined by the *app,* or on demand from the *application service provider (4.5) (ASP),* pass that data to the *ASP.* All of the actual application service processing shall occur in the mainframe system of the *ASP* (in the 'cloud').

For further information see ISO 15638-6, Clause 9.

At a conceptual level, The *TARV* system is therefore essentially simple, as shown in Figure 1. The process is similar to that for CoreData, but data are supplied to a different on-board file in the *data pantry (4.18)*.

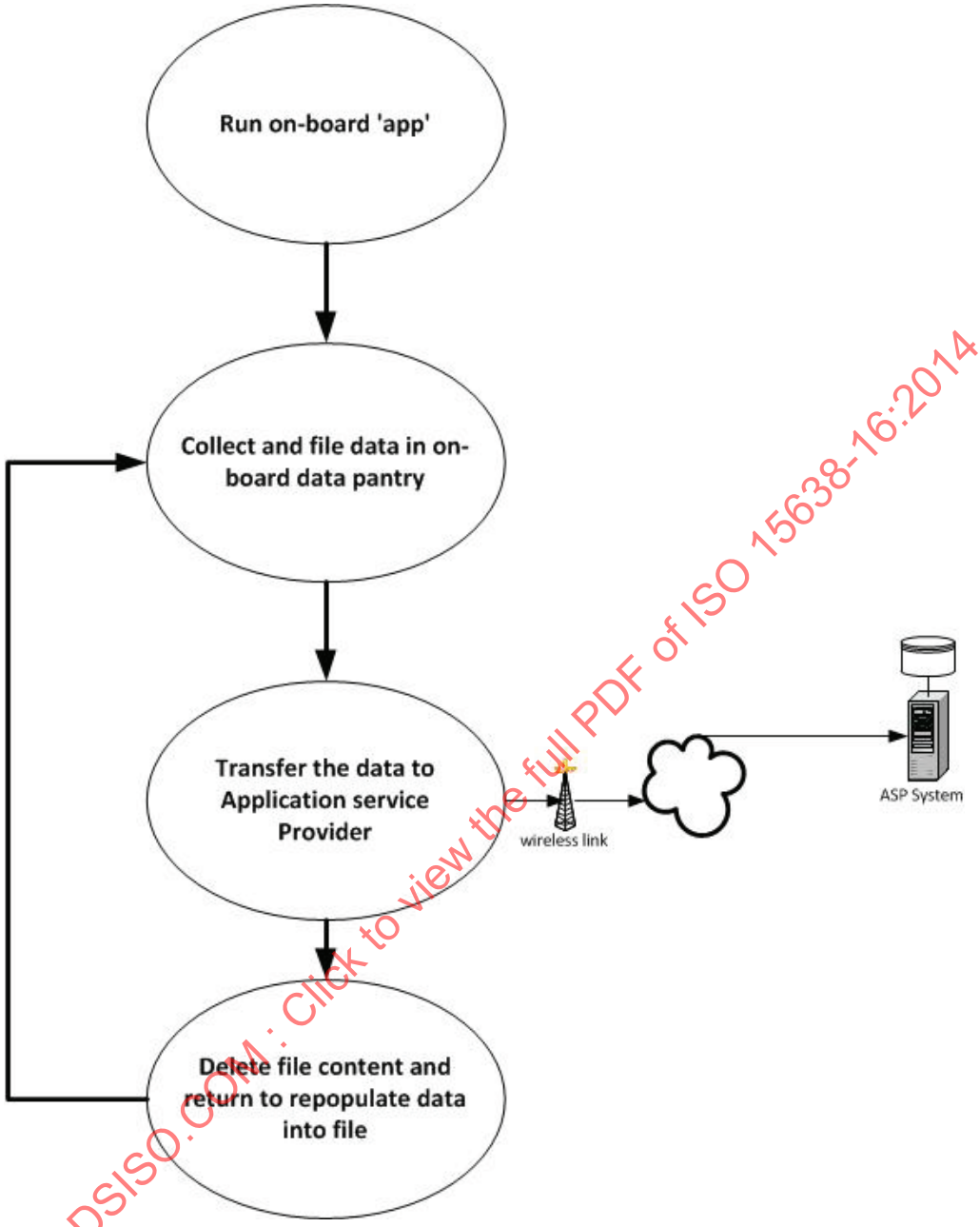

Figure 1 — TARV-regulated application service on-board procedure

At a common generic functional level for this application service, the process can be seen as shown in Figure 2, however the connected equipment might/might not be required in all cases.

9.2 Common role of the jurisdiction, approval authority, service provider and user

The common role of the jurisdiction, approval authority, application service provider and user shall be as defined in ISO 15638-6.

9.3 Common characteristics for instantiations of regulated application services

The common characteristics for instantiations of regulated application services shall be as defined in ISO 15638-6.

9.4 Common sequence of operations for regulated application services

The common sequence of operations for regulated application services shall be as defined in ISO 15638-6.

9.5 Quality of service

Generic quality of service provisions for *application services (4.4)* shall be as defined in ISO 15638-6.

9.6 Information security

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

9.7 Data naming content and quality

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

Variations specific to the vehicle speed monitoring *application service (4.4)* shall be as defined below.

9.8 Software engineering quality systems

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

9.9 Quality monitoring station

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

9.10 Audits

Audits shall be as defined in ISO 15638-6.

9.11 Data access control policy

To protect the data and information held by the *application service provider (4.5),* each provider shall adopt a risk based data access control policy for employees of the provider.

9.12 Approval of IVSs and service providers

Generic provisions for the *approval (4.7)* of *IVSs* and *service providers (4.40)* shall be as specified in ISO 15638-. Detailed provisions for specific *regulated applications (4.36)* shall be as specified by the regime of the *jurisdiction (4.28).*

10 TARV vehicle speed monitoring (*VSM*)

10.1 TARV VSM service description and scope

10.1.1 TARV VSM use case

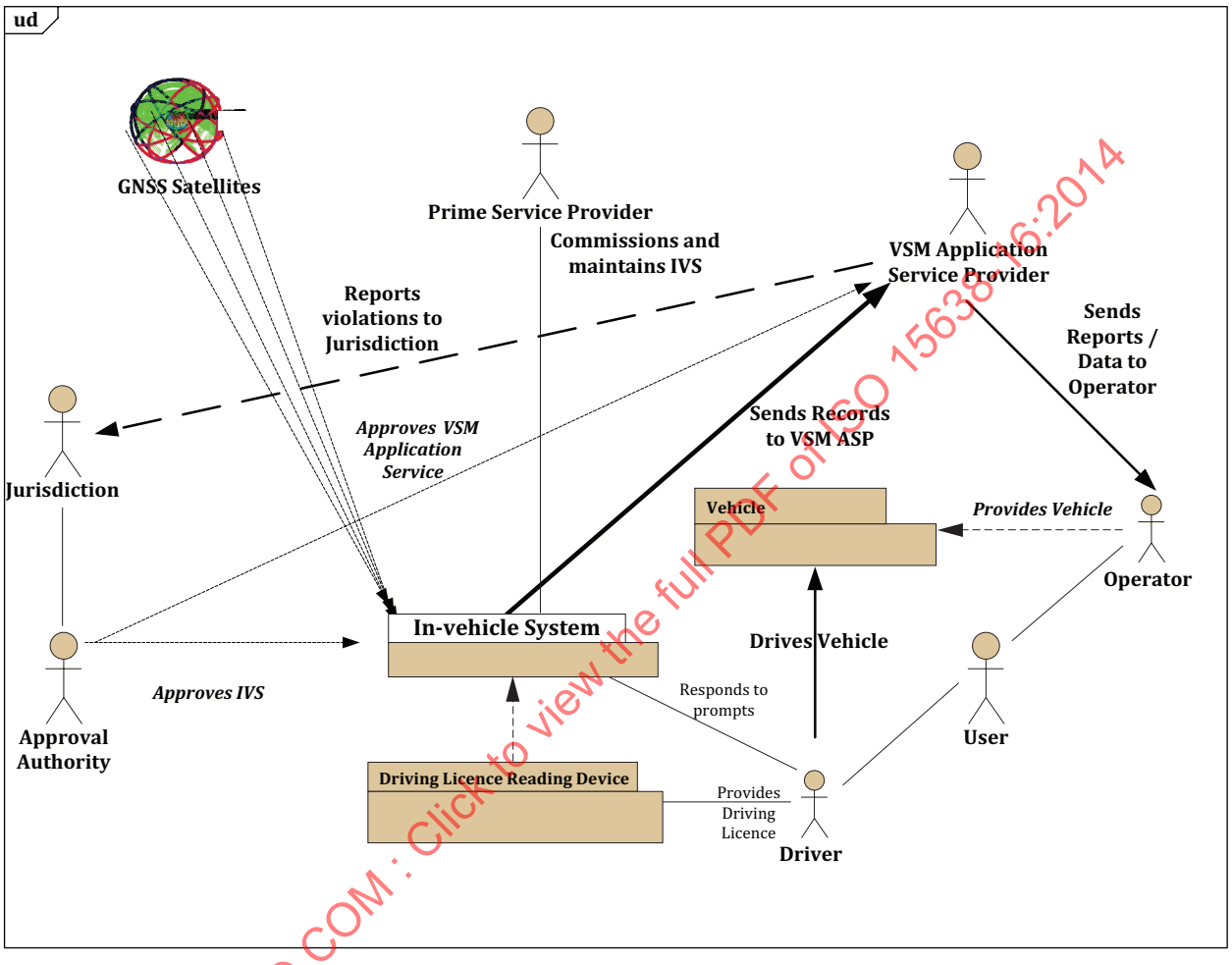

Figure 2 — TARV vehicle speed monitoring (TARV VSM) use case

Figure 2 provides an illustration of a *TARV vehicle speed monitoring (4.51)* system. This application service is described in 10.1.2, 10.1.3, and 10.2 below.

10.1.2 Description of TARV VSM regulated application service

The *TARV vehicle speed monitoring (4.51)* application service centres on the *IVS (4.25)*. The *IVS* generates vehicle speed periodically while the *regulated vehicle (4.38)* is turned-on and moving. Vehicle speed is generated independently by the *IVS*'s *GNSS (4.23)* receiver. The functions of the stakeholder 'players' in the *vehicle speed monitoring* system are similar to those described earlier for the *vehicle access management* (4.47) *application service (4.4)* defined in ISO 15638-8.

10.1.3 Description of TARV 'vehicle speed monitoring' (TARV VSM) application service

The *TARV vehicle speed monitoring (4.51)* (*TARV VSM*) application service can exhibit itself in a number of different forms in different *jurisdictions (4.28)*. For some it can be an issue of mandatory compliance, in others health and safety, and in yet others only a support for fleet management and supervision of *drivers (4.19)* by vehicle *operators (4.34)*. It might or might not involve compliance actions. It can be mandatory as an electronically provided service in some *jurisdictions*, in others providing this information can

be manual or electronic, in which event this service definition applies only to the electronic provision through *TARV*. Within other *jurisdictions*, it can just be an option for good practice. In each case the use case shown in Figure 2 will vary slightly and is therefore an example, not a requirement. It is likely to be named differently according to its origin and the regulatory environment in which it is instantiated. '*Vehicle speed monitoring (4.51)*', 'Vehicle speed compliance', 'HGV speed monitoring', 'Speed violation enforcement' etc. being other typical example names for this type of *application service (4.4).*

The exact nature and form of the requirements and reports will vary from instantiation to instantiation, and such detail is not standardised in this part of ISO 15638. This part of ISO 15638 specifies the basic *architecture (4.10)* and information needed to support this type of application service using *TARV*, so that the *in-vehicle system (4.25)* can satisfy the requirements of any likely instantiation by a different *jurisdiction (4.28)/application service provider (4.5)*, or so that the *regulated vehicle (4.38)* and equipment can support the different requirements of different *jurisdictions* when the *regulated vehicle (4.38)* and *driver (4.19)* are operating within their domain.

Figure 2 above shows an example use case appropriate where reports are required by the *jurisdiction (4.28)* and where compliance is also monitored such that transgression can result in an offence/prosecution, perhaps the most comprehensive example of the *TARV VSM application service (4.4)*.

10.2 Concept of operations for TARV VSM

10.2.1 General

Vehicle speed monitoring (4.51) is an application service that has the following three options:

a) Monitoring the speed of the *regulated vehicle (4.38)* for regulatory purposes;

b) Monitoring the speeds driven by the *driver (4.19)/regulated vehicle* combination for regulatory purposes;

c) Monitoring the speed of the *regulated vehicle* for fleet operation management purposes.

The objectives, and therefore the requirements, for each of these three facets differ to some extent.

The VSM specifications defined herein shall be based on measuring device(s) that have been approved by the Jurisdiction (or its appointed agent) before beginning of the application service and shall regularly maintained and certified in accordance with regulations determined by the home jurisdiction where the vehicle is registered.

Monitoring the *regulated vehicle (4.38)* for regulatory purposes provides an automated version of more traditional speed enforcement systems which are designed to identify an instance of contravention and provide the evidence of such contravention to the *jurisdiction (4.28).* Identification of the *driver (4.19)* is a subsequent issue in traditional speed contravention enforcement systems. *VSM (4.51)* instantiations using *TARV* can follow the traditional methods of identifying the *driver,* or, as described below, can use on-board identification of the *driver* where driving licence reading devices are available and connected to the *IVS (4.25)*. This facet can also include monitoring the *operator's (4.34)* observance of special arrangements for particular restrictions on particular *consignments (4.15)* and configurations.

Monitoring the speeds driven by an identified *driver (4.19)/regulated vehicle (4.38)* combination for regulatory purposes has similar objectives but with the capability to also automatically identify the *driver* in control of the *regulated vehicle (4.38)* at the time of the contravention. This instantiation of the *TARV VSM* application service requires that the *IVS (4.25)* of the *regulated vehicle (4.38)* has the capability to input the authenticated identity of the *driver (4.19).* It is therefore most likely to be possible where other systems, such as '*driver work records*' *(4.20)* (See ISO 15638-11), which require on-board identification of the *driver,* are also required within the regime of the *jurisdiction (4.28).*

Monitoring the speed of the *regulated vehicle (4.38)* for fleet operation management purposes does not involve the *jurisdiction (4.28)* and is simply the provision of information for fleet management systems.

Regulated, and especially heavy goods vehicles usually have regulatory speed limits that are lower than the 'national speed limit' regulations for all classes of vehicles. Regulated vehicles *(4.38)* often have further regulatory limitations on speed due to their class, weight, configuration, shape, size, or load.

Using traditional means, where a regulator seeks to enforce in the event of a violation, an enforcement officer or fixed camera records the violation, and records the registration number of the *regulated vehicle (4.38)*. The *jurisdiction (4.28)* then issue a violation ticket to the owner of the *regulated vehicle (4.38)*, but it is the *driver (4.19)* who is normally held responsible for the violation, and so his details are supplied by the owner to the *jurisdiction* and the *driver* is subsequently prosecuted.

An important variation to this process has been introduced with the advent of 'average speed' camera systems. Here a camera records the location and time of a vehicle at location point (a) at a specific point in time, and a second camera records the location and time of a vehicle at location point (b) at a specific point in time, and potentially a third camera records the location and time of a vehicle at location point (c), and so on. The clocks associated with the monitoring points are synchronised. The distance between the locations of the cameras is fixed. And so by calculating the time taken to travel from point (a) to point (b) [or (c) or (d) etc.] the average speed of the *regulated vehicle (4.38)* can be calculated. Number plate recognition (*ANPR*) techniques are normally used as part of these systems. Average speed violation' events are normally achieved by software systems which can deal with high volumes of traffic.

NOTE However it should be noted that systems based solely on automatic number plate recognition are very susceptible to number plate cloning and false number plates.

In respect of *TARV vehicle speed monitoring (4.51)*, and its potential use for enforcement of violations by regulated vehicles *(4.38)*, the introduction of 'average speed' violation systems is significant, because, while the source of capturing the records of locations is different, the speed of the *regulated vehicle (4.38)* is also calculated by an algorithm. (Fixed point speed cameras frequently also work by capturing multiple images over a few metres and calculating the distance). This means that in most *jurisdictions (4.28)*, the existing regulations can be used for speed violation enforcement using *TARV*, or that the changes to regulations required should be minor.

TARV vehicle speed monitoring (4.51) operates in the same way as speed is calculated by most *GNSS (4.23)* systems. *GNSS (4.23)* calculates speed by dividing distance by time taken to cover this distance.

A simplified explanation is that location (a) is recorded in *GNSS (4.23)* memory, and some predetermined fractions of a second later, location (b) is recorded in *GNSS* memory, the distance from (a) to (b) calculated and the average speed calculated, or location (a*)* is recorded in memory, and after the *regulated vehicle (4.38)* has travelled a predetermined distance, location (b) is recorded, and the speed calculated .

NOTE The actual methodology used by *GNSS (4.23)* systems, while using these principles, is somewhat more complicated. And there are two navigation computation techniques: least squares resolution and *Kalman filter (4.29)*. Position is measured by resolving the instantaneous differences in propagation times among signals from the different satellites. A minimum of three satellites in view is required for accuracy. Most *GPS (4.24)* receivers calculate the speed using algorithms in the *Kalman filter*. Mostly by a combination of movement per unit time and computing the doppler shift in the pseudo range signals from the satellites. The speed is smoothed and not instantaneous speed. Reporting of position is based on a combination of current position computations blended with speed and heading added to the previous position. *Kalman Filtering* is a powerful tool in providing an uncertainty-weighted best estimate of current position based on current measurement, history, prediction accuracy, and confidence levels.

The *Kalman filter (4.29)* is essentially a set of mathematical equations that implement a predictor-corrector type estimator that is optimal in the sense that it minimizes the estimated error covariance—when some presumed conditions are met.

The *Kalman filter (4.29)* addresses the general problem of trying to estimate the state $x \in \Re^n$ of a discrete-time controlled process that is governed by the linear stochastic difference equation

$$x_k = Ax_{k-1} + Bu_k + w_{k-1}\,,$$

(1)

with a measurement $z \in \Re^m$

that is

$$z_k = H\,x_k + v_k\,.$$

The random variables w_k and v_k represent the process and measurement noise (respectively). They are assumed to be independent (of each other),white, and with normal probability distributions

$p(w) \sim N(0, Q)$,

$p(v) \sim N(0, R)$.

In practice, the *process noise coverage Q* and *measurement noise coverage R* matrices might change with each time step or measurement, however here they are assumed to be constant.

The $n \times n$ matrix A in the difference equation relates the state at the previous time step $k - 1$ to the state of the current step k, in the absence of either a driving function or process noise.

The reader interested in more detail of the *Kalman filter (4.29)* is referred to http://www.cs.unc.edu/~welch/kalman

GNSS (4.23) receivers typically calculate velocity by measuring the frequency shift (Doppler shift) of the GPS D-band carrier(s). Velocity accuracy can be scenario dependent, (multipath, obstructed sky view from the location of the receiving antenna, mountains, city canyons, etc.) but 0,2 m/sec per axis (95 %) is achievable for *PPS* (precise positioning service(NAVSTAR)) and *SPS* (standard positioning service (NAVSTAR)) velocity accuracy is the same as *PPS* when SA is off.

Using *TARV* for *vehicle speed monitoring (4.51)* is achieved by installing and running an *app (4.3)* in the on board data library to utilize the *GNSS (4.23)* capability of the on-board *IVS (4.25)* to create a file (named `VDSM/VDSMI`) containing relevant data and to provide that data to the application from time to time through wireless communications in accordance with the instructions of the *app,* to meet the requirements of the application service as defined by the *application service provider (4.5).*

10.2.2 Statement of the goals and objectives of the TARV VSM system

10.2.2.1 Monitoring the speed of the regulated vehicle for regulatory purposes

The objective of the *VSM (4.51) application service (4.4)* is to provide evidence to prove compliance to the regime of the *jurisdiction (4.28),* or in the event of contravention to provide evidence to support enforcement. Principal provision of the *application service* is provided by the landside application system, and the on-board application is a means of feeding data to that landside system, and can on occasions receive data from the landside based application service system.

10.2.2.2 Monitoring the speeds driven by the driver/vehicle combination for regulatory purposes

The objective of this *VSM (4.51) application service (4.4)* is to provide evidence to prove compliance to the regime of the *jurisdiction (4.28),* or in the event of contravention to provide evidence to support enforcement, and to identify the *driver (4.19)* at the time of the contravention.

10.2.2.3 Monitoring the speed of the regulated vehicle for fleet operation management purposes

The objective of this *VSM (4.51) application service (4.4)* is simply to make data available to fleet management systems of the *application service provider (4.5).*

10.2.3 Strategies, tactics, policies, and constraints affecting the TARV VSM system

The principle issues are those of acceptance, particularly in the case of enforcement. No *operator (4.34)* is likely to choose to equip his vehicle in order that it increases the probability that his organization and his *drivers (4.19)* can be prosecuted. *TARV VSM* is therefore only likely to be instantiated where the *jurisdiction (4.28)* has persuaded the public to accept that *regulated vehicles (4.38)* are a special class of vehicle where it is in the strong public interest to ensure that they do not violate speed restrictions that are imposed on them, or for commercial purposes that do not involve the regulator.

In respect of enforcement, the *jurisdiction (4.28)* might have to adapt traffic regulations to accommodate the *TARV* method of collecting data.

In all probability, *TARV VSM* is only likely to be instantiated as one of a series of measures controlling *regulated vehicles (4.38)*.

The issue of identifying the *driver (4.19)* also requires strategic choice which is left to the *jurisdiction (4.28)* and the *application service provider (4.5).* Option (a) in 10.2.1 does not require the *driver (4.19)* to be identified in the *regulated vehicle (4.38)*. Option (b), and in most cases option (c) do require identification of the *driver (4.19)* by the on-board *TARV VSM app (4.3).* The means of providing such identification is not defined in this part of ISO 15638, but can be a smart card drivers licence, *RFID* device, barcode, touch memory or similar device. Most conveniently, if a d*river's work records (4.20)* application service is also in operation as specified in ISO 15638-11, could utilize the *DRD* (Drivers Records Device) used for that service.

A strategic decision has to be made as to whether an on-board *map (4.31)* of speed limits is held within the *IVS (4.25)*, [*vehicle speed monitoring (4.51)* infringement (*VSMI*)] or whether the matching of vehicle speed to the speed limit for that class of vehicle at that location is carried out by the software of the *application service (4.4),* once that data has been forwarded by the *IVS* to the *VSM (4.51)* application service through wireless communications.

This strategy choice is fundamental to how the *VSM*/*VSMI* system operates.

Digital *maps (4.31)* most frequently incorporate information concerning the speed limit for all classes of vehicle, and so it is possible to store such *maps (4.31)* in the memory of the *IVS (4.25)*, which has two significant advantages. Firstly it enables the *app (4.3)* running on the *IVS* to advise the *driver (4.19)* of the speed limit at any geographical point and time, and also to advise the *driver* in the event that the *driver* violates the speed limit.

However, *regulated vehicles (4.38)* of a particular class can be subject to additional speed restrictions, which are unlikely to be on such digital *maps (4.31)*. If this is a general restriction that can be equated to the general regulations (for example where normal vehicles are subject to a 90kph limit *regulated vehicles* are restricted to 70 kph), this can be easily accommodated by simple software in the on-board *VSM app (4.3).*

Where the configuration of a vehicle (number of axles, number of trailers, width, height, weight, etc.) invokes a restriction that is also constant in all situations, this can also be easily accommodated by the on-board *VSM app (4.3).*

However, in the case of *regulated vehicles (4.38)*, some of these restrictions can be transient (for example number of trailers, height of load, width of load, length of load, weight of load, nature of load) and different speed restrictions can apply. It would often be difficult in these circumstances to develop a suitable on-board *app (4.3)* to take account of this.

Finally, the *IVS (4.25)* is a device of limited capability, and will be expected to be multi-tasking with other *TARV apps (4.3)* and also conducting non-*TARV* cooperative vehicle system *apps* at the same time. It is therefore important that the *IVS* is not overloaded by a complicated *VSM (4.52) app (4.3).*

This part of ISO 15638 specifies the data needed for all of these possibilities, but it does not design the *application service (4.4).* That is left to the *jurisdiction (4.28),* the *application service provider (4.5),* and *approval authority (regulatory) (4.9).*

The provisions of this part of ISO 15638 makes *specifications (4.42)* for each of these options, but the choice of options remains with the *jurisdiction (4.28)* and *application service provider (4.5),* and are out of the scope of this part of ISO 15638.

10.2.4 Organisations, activities, and interactions among participants and stakeholders for TARV VSM

It should be noted that an entity can perform multiple roles and in doing so takes on the responsibility to perform the functions described under those roles.

Table 1 provides a list of the actors involved, their activities and interactions.

Table 1 — TARV VSM actors, activities and interactions

ACTOR	ROLE	ACTIVITIES	INTERACTIONS
Jurisdiction (J) (*4.28*)	Sets requirements for mandatory and supported *VSM (4.51)*	Publishes *specifications* (*4.42*)	ALL
		Obtains regulations	ALL: Establish regime and regulations PSP: Register ASP: Register, receive reports Op: Vehicle Registration Dr: Licence, Employment, *H&S*
		Appoints *Approval Authority* where appropriate	AA: Contract. Instruct . Receive reports
		Monitors reports	
		Instigates enforcement	ALL: Process enforcement
Approval authority (AA) (*4.9*)	Implements *jurisdiction* policy at equipment and service approval level	Approves *IVS* (*4.25*), application service(*4.4*) instantiations	PSP: Approve *IVS* ASP: Approve *application service* Dr: Approve licence reader
		Conducts Quality of service maintenance to instruction of *jurisdiction*	
Prime service provider (PSP) (*4.35*)	Responsibility for *IVS*	Installs and/or commissions *IVS*	AA: *Can Apply to approve IVS and reader* Op; *Installation*
	Responsibility for driving licence reader	Maintains *IVS* and reader	Op: *Maintain IVS and reader*
		Can provide driving licence reading device	
Application service provider (ASP) (*4.5*)	Provides *VSM application services*	Develops instantiation of *VSM application service*	AA: Applies for approval of Service
		Contracts with *users (4.45)*	Op: Contracts
		Provides *VSM application service* to *users* and *jurisdiction*	Op: Provides service Dr: Can provide service J: Provides service/reports re violations

Table 1 *(continued)*

ACTOR	ROLE	ACTIVITIES	INTERACTIONS
operator (Op) (4.34)	Provides regulated vehicle (4.38)	'Employs'/contracts *drivers (4.19)*	Dr: Employs/Contracts
	Uses *regulated vehicle* for commerce and logistics	Operates *regulated vehicle*	J: Registers *regulated vehicle* PSP: Contracts, receives service *ASP*: Contracts, receives service
		Receives reports from *ASP*	
Driver (Dr) (4.19)	Drives regulated vehicle to instruction of operator (4.34)		
		Provides driving licence to IVS	IVS: Provides data
		Drives *regulated vehicle*	Op: to instructions

10.2.5 Clear statement of responsibilities and authorities delegated for TARV VSM

10.2.5.1 The *jurisdiction (4.28)* shall be responsible for the regime and regulations.

10.2.5.2 The *jurisdiction* (4.28) shall employ an *approval authority (regulatory)* (4.9) or otherwise provide its function.

10.2.5.3 The *jurisdiction (4.28)* shall provide means for enforcement (where required) to meet the requirements of the regime of the *jurisdiction (4.28)*.

10.2.5.4 The *prime service provider (4.35)* shall install/commission the *IVS (4.25)* and maintain the *IVS*.

10.2.5.5 The *prime service provider (4.35)* shall install/commission a driving licence reading device and maintain the ancillary reading device [for *driver (4.19)* licence detail] where required by the *jurisdiction (4.28)* or *application service (4.4) specification (4.42)*.

10.2.5.6 The *application service provider* (4.5) (ASP) shall develop the TARV *VSM* (4.51) application service (4.4) or use a TARV VSM application service system provided by the *jurisdiction* (4.28).

10.2.5.7 The *application service provider* (4.5) shall obtain any required approval (4.7) of its TARV *VSM* (4.51) application service (4.4) from *approval authority (regulatory)* (4.9).

10.2.5.8 The *application service provider (4.5)* shall contract with the *user (4.46)* (normally the *regulated vehicle (4.38) operator (4.34)* but in some instantiations also with the driver).

10.5.5.9 The *application service provider* (4.5) shall be responsible to provide the TARV *VSM* (4.51) application service (4.4) to *jurisdiction* (4.28), *operator* (4.34) and *driver* (4.19) as specified in its service offering.

10.2.5.10 The *operator (4.34)* shall be responsible to provide the *regulated vehicle (4.38)*.

10.2.5.11 The *operator (4.34)* shall be responsible to abide by requirements of the regime re *VSM*.

10.2.5.12 The *operator* (4.34) shall be responsible to pay fees required by *jurisdiction* (4.28), *prime service provider* (4.35) and *application service provider* (4.5).

10.2.5.13 The *driver (4.19)* shall be responsible to follow instructions, including the use of driving licence reader.

10.2.6 Equipment required for TARV VSM

10.2.6.1 TARV IVS

10.2.6.1.1 The system shall be designed to work using *TARV IVS (4.25)* as defined in this International Standard.

10.2.6.1.2 Where the *TARV VSM (4.51) application service (4.4)* requires the *driver (4.19)* to identify provide his driving licence data, the *IVS (4.25)* shall be equipped with/connected to a means to read such data, the *IVS* shall be capable of receiving, confirming receipt, of interface connection to a driving licence reading device (*DRD*, smart card, *RFID* device, bar code reader etc.)

10.2.6.1.3 The *prime service provider (4.35)/application service provider (4.5)* shall provide to the *approval authority (regulatory) (4.9)*, evidence of compliance from an appropriate body to demonstrate the suitability for use in vehicles for the *IVS (4.25)* and all associated components

10.2.6.1.4 It shall not be possible for collected or stored *vehicle speed monitoring (4.51)* data or *vehicle speed monitoring* in any software or non-volatile memory within the *IVS (4.25)* to be accessible or capable of being manipulated by any person, device or system, other than that authorized by the *application service provider (4.5).*

10.2.6.2 TARV VSM/VSMI 'app'

10.2.6.2.1 The *TARV VSM/VSMI app (4.3)* running on the *IVS (4.25)* records the *regulated vehicle (4.38)* speed at intervals determined by the approved application service system *specification (4.42)* and files that data in its memory of the *IVS*

10.2.6.2.2 The *TARV VSM/VSMI app (4.3)* running on the *IVS (4.25)* can automatically provide information to assist the *driver (4.19)* in observance of speed restrictions but is not necessarily required to do so unless this is a requirement of the *jurisdiction (4.28).*

10.2.6.2.3 If the *IVS (4.25)* is equipped with a digital *map (4.31)* of speed restrictions, the *IVS* shall alert the *driver (4.19)* of any violations

10.2.6.2.4 At intervals determined by the approved application service system *specification (4.42)*, the *TARV VSM/VSMI app (4.3)* shall send the *VSM* data held in the memory of the *IVS (4.25)* to the *TARV VSM/VSMI* system of the *application service provider (4.5)* through its most appropriate wireless communications interface

10.2.6.2.5 Once the *TARV VSM/VSMI* system of the *application service provider (4.5)* has acknowledged successful receipt of the data the `VDSM/VDSMI` file shall be deleted from the memory of the *IVS (4.25)* unless the *user (4.45)* or *application service provider* requires it for other purposes

10.2.6.2.6 It shall not be possible for collected or stored *vehicle speed monitoring (4.51)* data or *vehicle speed monitoring* in any software or non-volatile memory within the *IVS (4.25)* to be accessible or capable of being manipulated by any person, device, or system (including any self-declaration device), other than that authorized by the *application service provider (4.5).*

10.2.6.3 Driving licence reading device

10.2.1 described the following three modes of *vehicle speed monitoring (4.51).*

a) Monitoring the speed of the *regulated vehicle (4.38)* for regulatory purposes.

b) Monitoring the speeds driven by the *driver (4.19)*/*regulated vehicle* combination for regulatory purposes.

c) Monitoring the speed of the *regulated vehicle* for fleet operation management purposes.

In the case of a), all that is required automatically within the *TARV VSM* application is identification of the *regulated vehicle (4.38)*, its location, direction of travel, and speed. The means of ascertaining the detail of the *driver (4.19)* to prosecute, as with current manual systems, occurs through the administrative process established by the *jurisdiction (4.28)* (most commonly telling the *regulated vehicle* keeper that the *regulated vehicle* has committed an offence and requiring declaration of the *driver* details). In this event, no driving licence reading device is required by the *TARV VSM* application.

Modes (b) and (c) require the identification of the *driver (4.19),* and this is achieved by a driving licence reading device to provide the *driver* licence number combined with a *jurisdiction (4.28)*/country ID as an unambiguous solution.

The issue of identifying the *driver (4.19)* also requires strategic choice which is left to the *jurisdiction (4.28)* and the *application service provider (4.5)* [and is not specified in this part of ISO 15638]. Option (a) in 10.2.1 does not require the *driver* to be identified in the *regulated vehicle (4.38)*. Option (b), and in most cases option (c) do require identification of the *driver* by the on-board *VSM (4.51) app (4.3).* The means of providing such identification is not defined in this part of ISO 15638, but can be a smart card drivers licence, *RFID* device, barcode, touch memory or similar device. Most conveniently, if a *drivers work records (4.20)* application service is also in operation as specified in ISO 15638-11, the *IVS (4.25)* could utilize the *DRD* (Drivers Records Device) used for that service.

A vehicle can have two or more *drivers (4.19)* on-board, and so it is a requirement that the driving licence reading equipment/application service system shall be able to determine who is driving at the time of the violation, but the means to achieve this is not specified in this issue of this part of ISO 15638.

10.2.6.4 On-board map

Where an on-board *map (4.31)* is specified to provide part of the *TARV VSM (4.51) application service (4.4),* it shall be obtained from a recognized provider of *maps (4.31)*, and shall have a means of, and system for, regular updating.

If using velocity measurement against the map velocities, the velocities in the map should defined by the jurisdiction before beginning and be regularly maintained in accordance with maintenance procedures determined by the *jurisdiction (4.28)*.

10.2.7 Operational processes for the TARV VSM system

As defined in Clause 9.

For detail of the operational processes, see 10.3 [sequence of operations for *vehicle speed monitoring (4.51)*] and Figure 3.

10.2.8 Role of the jurisdiction for TARV VSM

As defined in 9.2, 10.2.4, and 10.2.5.

10.2.9 Role **of the** TARV VSM prime service provider

As defined in 9.2, 10.2.4, and 10.2.5.

10.2.10 Role of the TARV VSM application service provider

As defined in 9.2, 10.2.4, and 10.2.5.

10.2.11 Role of the TARV VSM user

As defined in 9.2, 10.2.4, and 10.2.5.

10.2.11.1 Role of the operator (*4.34*)

The *operator (4.34)* of the *regulated vehicle (4.38)* shall be responsible to advise and request action from the *application service provider (4.5)* in the event that the *driver (4.19)* advises him of a potential or actual system malfunction and shall make the *regulated vehicle* reasonably accessible to the *application service provider* in order that they can rectify the problem.

If required, and according to the regime of the *jurisdiction (4.28)*, the *operator (4.34)* shall identify the *driver (4.19)* of the *regulated vehicle (4.38)* at a particular point of time, to the *jurisdiction* or its agents.

10.2.12 Generic characteristics for all instantiations of the TARV VSM application service

10.2.12.1 A *vehicle speed monitoring (4.51)* application service is approved; it utilizes a *TARV IVS (4.25)* which communicates to the *prime service provider (4.35)/application service provider (4.5)* and can have the ability to insert a means to provide *driver (4.19)* licence details.

10.2.12.2 The *application service provider* (4.5) shall load a 'TARV VSM/VSMI App' into the IVS (4.25) of the *operator's* (4.34) vehicles.

10.2.12.3 The 'TARV VSM/VSMI app (4.4)' shall run whenever the *regulated vehicle* (4.38) is operating

10.2.12.4 The '*TARV VSM/VSMI app (4.4)*' shall record the data specified herein in the *data pantry (4.18)* memory of the *IVS (4.25).*

10.2.12.5 The *application service provider* (4.5) shall design/install/operate its *vehicle speed monitoring (4.51)* system as approved by the *approval authority (regulatory) (4.9).*

10.2.12.6 The *IVS (4.25)* shall provide its *TARV VSM/VSMI* data to the *application service provider (4.5)* using the *TARV IVS* wireless link at least once every 24 h.

10.2.12.7 Every transfer shall include framing data that identifies its sequential order, IVS ID, version number of *IVS (4.25)* and version number of the *TARV VSM/VSMI app (4.3).*

10.2.12.8 The system shall acknowledge receipt of the data through the *TARV IVS (4.25)* wireless link. Once the data has been acknowledged it shall be deleted from the *IVS* memory unless the *operator (4.34)* or *ASP (4.5)* chooses to retain it in the *IVS* memory for other openly declared purposes with the assent of the user.

10.2.12.9 The *application service (4.4)* system shall retain and back up the *TARV VSM/VSMI* data to the requirements of the *jurisdiction (4.28).*

10.2.12.10 The *application service provider (4.5)* shall provide reports to the *jurisdiction (4.28)* or its agents as specified and required by the *jurisdiction* when approving the product.

Where required by the *application service (4.4) specification (4.42)* approved by the *approval authority (regulatory) (4.9)*, the *driver (4.19)* provides their identification to the system at commencement of a '*session (4.41)*' using the identification and *authentication* method provided by the *application service*

provider (4.5). When the *regulated vehicle (4.38)* ignition is turned off, the system shall automatically close the '*session*'. Each time the *regulated vehicle* ignition is turned on, the *driver (4.19)* shall be required to identify and authenticate themselves.

If *drivers (4.19)* change without turning the engine off, the new *driver* shall identify himself by the means provided by the *application service provider (4.5).*

Where required by the application service *specification* (4.42) approved by the *approval authority (regulatory) (4.9)*, the *application service provider* (4.5) shall provide the *driver* (4.19) (i.e. driver specific) with their identification and authentication method for the IVS (4.25). The method of identification and authentication can be unique to each application service provider.

10.2.12.11 Electronic records are generated periodically by the *IVS (4.25)* when the *regulated vehicle (4.38)* is moving. The electronic record contains accurate time and location data as defined herein. These *TARV VSM/VSMI* records are generated automatically during the '*session (4.41)*' and also stored in the *IVS*.

10.2.12.12 TARV VSM/VSMI records generated by the IVS (4.25) are sent to the *application service provider* (4.5). The application service provider transmits the TARV VSM/VSMI records to the regulated vehicle (4.38) *operator* (4.34), and in the event of contravention, to the jurisdiction (4.28), in accordance with the regime of the jurisdiction.

10.3 Sequence of operations for TARV VSM

10.3.1 General

The business process and sequence of operations is shown in Figure 3.

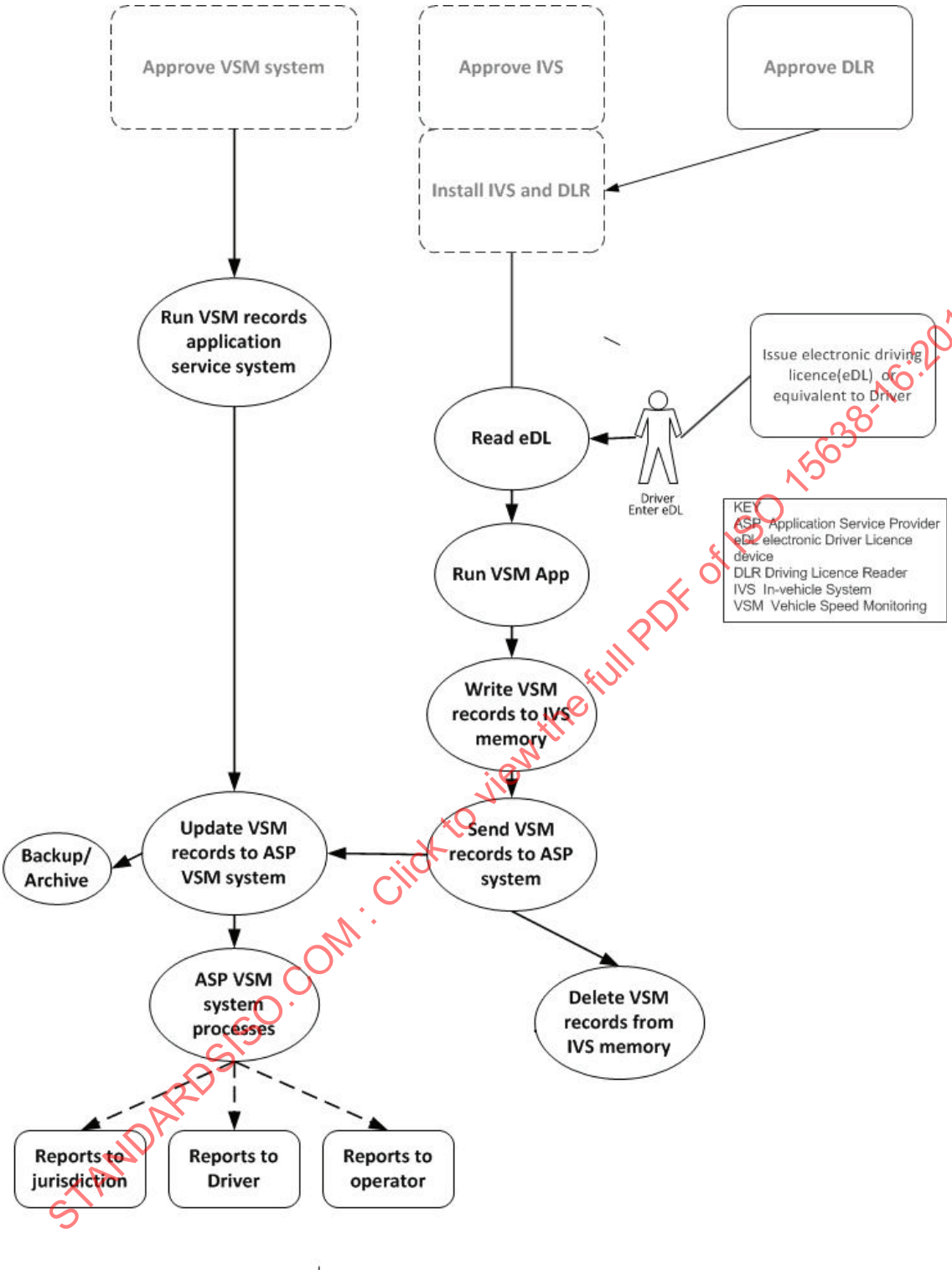

Figure 3 — TARV VSM business process and procedure

10.4 TARV VSM service elements

10.4.1 TARV VSM service element (SE) 1: Establish 'Vehicle speed monitoring' regulations, requirements, and approval arrangements

The *jurisdiction (4.28)* shall be responsible to define its requirements for its variant of the *vehicle speed monitoring (4.51) application service (4.4)*, obtain any legislation and/or regulations, and define the

procedure for an *application service provider (4.5)* to gain approval for its instantiation of the *TARV VSM application service.*

10.4.2 TARV VSM SE2: Request system approval

The *application service provider (4.5)* shall seek approval for its instantiation of the *vehicle speed monitoring (4.51) application service (4.4)* from the *approval authority (regulatory) (4.9)* in accordance with the regime established by the *jurisdiction (4.28).*

10.4.3 TARV VSM SE3: User (operator) contracts with prime service provider

It is a prerequisite for any potential vehicle *operator (4.34)* opting or being required to sign up for the *TARV VSM application service (4.4)* that its *regulated vehicles (4.38)* are *TARV* equipped with a *TARV* compliant *IVS (4.25)* at point of manufacture or installed by a *prime service provider (4.35)*, and that there is a maintenance contract with a *prime service provider* for that equipment. (See ISO 15638-1 *TARV* framework and architecture).

10.4.4 TARV VSM SE4: User (operator) equips vehicle with a device to read the driver licence (DLR)

Where the *TARV VSM (4.51) application service (4.4)* is to also identify the *driver (4.19)* (*VDSM*), it is a prerequisite for any potential vehicle *operator (4.34)* opting or being required to sign up for the *VDSM application service (4.4)* that its *regulated vehicles (4.38)* are fitted with a driving licence reading (*DLR*) device connected to the *IVS (4.25)*. This can be an eDriving licence reader or in *jurisdictions (4.28)* where there is no eDriving licence, a device to read a simulated eDriving licence (*eDL*). And it is a requirement that all *drivers (4.19)* shall be provided with a compatible device containing their driving licence details, and that in use, this device remains inserted into or connected to the *DLR* while the *driver* is in control of the *regulated vehicle (4.38)*, or are provided with other means to enter and verify their driver licence details.

10.4.5 TARV VSM SE5: User contracts with application service provider

The user (4.45) [*operator* (4.34)] shall contract with an *application service provider (4.5)* who offers an approved TARV *VSM* (4.51) *application service* (4.4) to provide the TARV VSM application service to nominated vehicles.

10.4.6 TARV VSM SE6: application service provider uploads software into the TARV equipped vehicles of the operator

The *application service provider (4.5)* shall upload and commission the on-board *VSM app (4.3)* software into the *TARV* equipped vehicles of the *operator (4.34)*.

10.4.7 TARV VSM SE7: The driver obtains an electronic drivers licence device (eDL)

Where *driver (4.19)* identification is required by the *TARV VSM application service (4.4)* approved by the *approval authority (regulatory) (4.9)*, in order to be able to use a *TARV VDSM* system, the *driver (4.19)* shall obtain a driver records device in accordance with procedures issued by the *jurisdiction (4.28)*, or be provided with a device from the *prime service provider (4.35)* through the *regulated vehicle (4.38) operator (4.34)*, that contains the details of his/her driving licence and can be read by the driving licence reader fitted to the *IVS (4.25)* of the *regulated vehicle*. The procedures specified by the *jurisdiction* shall include procedures to populate the *eDL* or its equivalent (but these procedures and requirements are a choice of the *jurisdiction* and are not specified in this part of ISO 15638).

10.4.8 TARV VSM SE8: Driver use of vehicle routines

Where *driver (4.19)* identification is required by the *TARV VSM application service (4.4)* approved by the *approval authority (regulatory) (4.9)*, when taking control of the *regulated vehicle (4.38)*, the *driver* shall

introduce (connect) the *eDL* device to the *IVS (4.25)* which shall read and store relevant elements of his/her driving licence details. This act shall cause the on-board *VSM/VSMI app (4.3)* to run.

Where *driver (4.19)* identification is required by the *TARV VSM application service (4.4)* approved by the *approval authority (regulatory) (4.9)*, the *eDL* device shall remain inserted or connected to the *DLR* while the *driver* is in control of the *regulated vehicle (4.38)* and the *driver* shall eject or disconnect the device when he/she turns the ignition off or hands control of the *regulated vehicle* to any other person whatsoever.

Where *driver (4.19)* identification is required by the *TARV VSM application service (4.4)* approved by the *approval authority (regulatory) (4.9)*, when the *driver (4.19)* turns off the ignition or hands control of the *regulated vehicle (4.38)* to any other person whatsoever, he/she shall remove (i.e. 'eject') his/her *eDL* device from the *regulated vehicle*.

Jurisdictions can specify other means to enter driver identification data that meet the objectives of the above clauses and produce the required data to an accuracy acceptable to the jurisdiction.

10.4.9 TARV VSM SE9: Time series recording of vehicle speed

In the event that the system is designed to record the *regulated vehicle (4.38)* speed at defined time intervals, when the *eDL* is read, the on-board *VSM app (4.3)* shall create a file, type: *VDSM* [Vehicle / Driver/Speed monitoring file [VDSM file] within this *specification (4.42)*], named

<VDSM><YYMMDDhhmm><vehicle registration number><*drivers*licencenumber>

At the appropriate time intervals the *VSM app (4.3)* in the *IVS (4.25)* shall update the VDSM file with the following data

<IVS ID>,
<VehicleSpeed>,
<VehicleSpeed>,
<VehicleSpeed>,
<VehicleSpeed>
etc.

Vehicle speed shall be calculated as specified in ISO 15638-5, 9.2.4.

NOTE ISO 15638-5, Clause 9.2.4 definition of speed includes location, *UTC* time and direction of travel

Vehicle direction of travel shall be calculated as specified in ISO 15638-5, 8.3.12

At time intervals determined by the on-board *VSM app (4.3)*, the *IVS (4.25)* shall send the file to the *VSM application service provider (4.5)* system through a wireless communication supported by the *IVS* and *application service provider* system

On successful receipt of the VDSM file the *application service provider (4.5)* system shall send an ACKnowledgement <VSX> to the *IVS (4.25)*. On receipt of the ACKnowledgement <VSX>, the *IVS (4.25)* shall clear the data held within the VDSM file and start to repopulate the VDSM file with data at the predetermined time intervals.

If an ACKnowledgement is not received within 30 s of sending the data the *VSM app (4.3)* shall attempt to resend the data and shall continue to do so at intervals determined by the *specification (4.42)* of the *TARV VSM application service (4.4)* approved by the *approval authority (regulatory) (4.9)* until the data has been successfully sent and ACKnowledged.

Whenever the *driver (4.19)* removes his *eDL* device, the on-board *app (4.3)* shall append a record <Time><END> to the VDSM file and the *IVS (4.25)* shall send the file to the *VSM application service provider (4.5)* system through a wireless communication supported by the *IVS* and *application service provider (4.5)* system.

On successful receipt of the VDSM file containing the end data <Time><END> the *application service provider (4.5)* system shall send an ACKnowledgement <VDX> to the *IVS (4.25)*, and unless otherwise instructed by the *specification (4.42)* of the *application service (4.4)* approved by the *approval authority (regulatory) (4.9)*, on receipt of the ACKnowledgement <VDX>, the IVS shall delete the VDSM file from its memory; and the *VSM app (4.3)* shall terminate.

Because of the titling regime defined above, each VDSM file is uniquely identifiable by the host *VSM application service (4.4)* when it is received.

In the case of time series recording of vehicle speed, the manner in which the *application service (4.4)* uses the information captured and forwarded to it by the *IVS (4.25)* (VDSM files) to determine speed violations, and the method of reporting to the *jurisdiction (4.28)* and *operator (4.34)* is outside of the scope of this part of ISO 15638 shall be the subject of definition by the *jurisdiction* and/or the *application service provider (4.5)*.

10.4.10 TARV VSM SE10: Map matched recording of vehicle speed infringement (VSMI)

In the event that the system is designed to record the *regulated vehicle (4.38)* speed by *map (4.31)* matched comparison of allowed speed and actual speed, when the *eDL* is read, the on-board *VSMI app (4.3)* shall create a file named

<YYMMDDhhmm>INF<vehicle registration number><*drivers*licencenumber>
[referred to as the vehicle/driver/speed monitoring infringement file (VDSMI file) within this *specification (4.42)*]

At intervals determined by the VSMI app (4.3) of the VSMI *application service* (4.4) approved by the *approval authority (regulatory)* (4.9), the VSMI app shall

a) calculate vehicle location as specified in ISO 15638-5, 8.3.11,

b) calculate vehicle direction of travel as specified in ISO 15638-5, 8.3.12,

c) calculate time as *UTC* time as specified in ISO 15638-5, 8.3.10,

d) check location/direction/time of day against the *map (4.31)* held in the memory of the *IVS (4.25)* and shall ascertain the speed limit for the appropriate class of *regulated vehicle (4.38)* at this location, and

e) calculate vehicle speed as specified in ISO 15638-5, 9.2.4.

In the event that vehicle speed exceeds permitted speed by a given percentage [to be determined by the *jurisdiction (4.28)*] shall create an infringement record comprising

<Time><VehicleSpeed><*TARV LDT*>
And shall repeat this process at an interval determined by the regulation of the jurisdiction.

NOTE Three times at intervals of two seconds is proposed as a benchmark guide.

The on-board *VSMI app (4.3)* running in the *IVS (4.25)* shall then send the file to the *VSMI application service provider (4.5)* system through a wireless communication supported by the *IVS* and *application service provider* system.

On successful receipt of the VDSMI file the *application service provider (4.5)* system shall send an ACKnowledgement <VIX> to the *IVS (4.25)*. On receipt of the ACKnowledgement <VIX>, the *IVS* shall delete the VDSMI file and create a new VDSMI file in accordance with the provisions of this subclause as defined above.

If an ACKnowledgement is not received within 30 s of sending the data the *VSMI app (4.3)* shall attempt to resend the data and shall continue to do so at intervals determined by the *specification (4.42)* of the *VSMI application service (4.4)* approved by the *approval authority (regulatory) (4.9)* until the data has been successfully sent and ACKnowledged.

Whenever the *driver (4.19)* removes his *eDL* device, the on-board *app (4.3)* shall ascertain that all due messages have been sent and acknowledged, and if not shall send updated information to the *application service (4.4),* once acknowledged *it* shall then delete the VDSMI file.

Because of the titling regime defined above, each VDSMI file is uniquely identifiable by the host *VSM application service (4.4)* when it is received.

In the case of VDSMI, the manner in which the *application service (4.4)* uses the information captured and forwarded to it by the *IVS (4.25)* (VDSMI files) to determine speed violations, and the method of reporting to the *jurisdiction (4.28)* and *operator (4.34)* is outside of the scope of this part of ISO 15638 shall be the subject of definition by the *jurisdiction* and the *application service provider (4.5).*

10.4.11 TARV VSM SE11: 'Interrogated' request for vehicle speed monitoring data

10.4.11.1 An interrogating ITS-station shall request specific data as determined in ISO 15638-6, 7.1 and 8.1.2.

10.4.11.2 In the event that the IVS of a vehicle receives a wireless interrogation requesting the VDSM or VSMI data, the interrogator shall also provide at the time of the request, a unique 8 byte reference number (URef), and a destination IPv6 address (ReqDest) where it requests the data to be sent.

10.4.11.3 On receipt of the request, the IVS shall acknowledge the request with the appropriate ACKnowledgement defined in ISO 15638-6, 8.3.5 <S> , which acknowledges that a request for VDSM or VSMI data has been received.

10.4.11.4 The IVS shall then close the communication session.

10.4.11.5 The IVS shall then open a new communication session using an available and appropriate CALM wireless medium.

10.4.11.6 The IVS shall then send the VDSM or VSMI data file (as defined in 10.4.10) to a predetermined destination IPv6 (internet) address that has previously been stored in the memory of the data pantry by its ASP, together with the URef and ReqDest provided by the interrogator.

10.4.11.7 On successful receipt of the data, the recipient at the predetermined destination IPv6 address shall send an acknowledgement <VDX> or <VIX> to the IVS.

10.4.11.8 On receipt of the acknowledgement <VDX> or <VIX>, the IVS shall close its communication session.

10.4.11.9 The ASP shall be responsible to verify that the interrogation is legitimate, appropriate and from an accepted source, and having verified this, shall be responsible to send the data to the interrogator requested IPv6 address. The means and detail of how this is achieved is outside the scope of this part of ISO 15638.

10.4.12 TARV VSM SE12: End of session

At the end of the driving *session (4.41)* when the *driver (4.19)* removes his *eDL* device, or the ignition of the *regulated vehicle (4.38)* is switched to OFF, on receipt of this information, the *IVS (4.25)* shall ensure whenever possible that the *application service provider (4.5)* system is updated through a wireless connection from the *IVS*.

If it is not possible for the *IVS (4.25)* to update the *application service provider (4.5)* system at this point in time, the *IVS* shall update the *application service provider* system at the earliest opportunity (for example when the *regulated vehicle (4.38)* ignition is next switched on).

10.5 Generic TARV VDSM data naming, content and quality

The process to obtain *basic vehicle data (4.12)* [*TARV LDT (4.30)*] data content shall be as defined in 8.3 of ISO 15638-6 and ISO 15638-5.

The electronic records declared and stored by the *IVS (4.25)* shall be authenticated, have integrity and be secure from interception or corruption.

The formal data content of a *TARV VDSM* record shall be as shown in Table 2.

Table 2 — Formal data content of a VDSM record

FILE TYPE		Format of file name	Notes/Source
VDSM	Mandatory	<*VDSM*><YYMMDD><hhmmss><vehicleregistrationnumber><*drivers*licence number> Example *VDSM* 110316 070603 KV76WRR WILLI502139RK9MA85 As: *VDSM*110316 070603KV76WRR WILLI502139RK9MA85	10.4.9 [Vehicle /Driver/Speed monitoring file (*VDSM* file)]

Number	Data concept name	Use	Format	Notes/Source
*VSM*001	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5
*VSM*002	Vehicle speed	Mandatory	S(serial number) timestamp k/m speed location Example s0123 110316 k 530x0A5D3770 0x027E2938 > 0123	Calculated as specified in ISO 15638-5, 9.2.4.
*VDSM*003	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5 as terminator to indicate end of data

In the event that data are sent in response to an interrogation requesting data, the following data shall be appended:

Number	Data concept name	Use	Format	Notes/Source
*VDSM*004	URef	Mandatory	AN (8)	An 8 byte reference provided by the interrogator requesting the data. The alphanumeric or binary content of which is unspecified by ISO 15638, but is intended to be used by the interrogator to provide a unique reference to its request for data
*VDSM*005	ReqDest	Mandatory	35 Bytes	Requested Destination IPv6 address for the data to be sent as: scheme://domain:port/path?query_string#fragment_id i.e.: The scheme name (commonly called protocol), followed by:// then, depending on scheme, a domain name (alternatively, IP address): a port number, and / the path of the resource to be fetched or the program to be run. If the scheme name is http, the 'http://' is assumed e.g: www.example.com/path/to/name https://example.com/47.35868 telnet://192.0.2.16:80/

The formal data content of a VDSMI record shall be as shown in Table 3.

Table 3 — Formal data content of a VDSMI record

FILE TYPE		Format of filename	Notes/Source

Table 3 *(continued)*

VDSMI	Manda-tory	<VSDMI><YYMMDDhhmmss>INF<vehicle registrationnumber><drivers (4.19) licencenumber> Example VDSMI 110316 070603 INF KV76WRR WILLI502139RK9MA85 As VDSMI110316070603INFKV76WRR WILLI502139RK9MA85		10.4.9 (Vehicle /Driver/Speed monitoring file [*VDSM* file])
Number	Data concept name	Use	Format	Notes/Source
VDSMI001	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5
VDSMII002	Vehicle speed	Mandatory	S(serial number*)* timestamp k/m speed location Example s0123 110316 k 530x0A5D3770 0x027E2938 > 0123	Calculated as specified in ISO 15638-5, Clause 9.2.4.
VDSMI003	TARV LDT	Mandatory	Compound data construct Example AaaSs*0 1* xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx 128..16511 SCD GB 1 KV76WRR 51 1G1JF27W8GJ178227 000000 1297339499 0x0A5D3770 0x027E2938 0000 Sat8 *0*123 Ign1 m m 010326 UKPeter Jones 01,02,03a,h1 120325 010326 124538 Peter Jones 01,02,h1 120325 ISO 17262, CS9 data ISO 26683-2 data if present AS: AaaSs1*0* xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx 128..16511SCDGB1KV76WRR511G1JF27W8GJ178227000000012973394990x0A5D37700x027E29380000Sat8*0*123Ign1mm010326UKPeterJones01,02,03a,h1120325010326 124538PeterJones01,02,h1120325 < ISO 17262, CS9*data* > < ISO 26683-2 *data if present* >	as specified in ISO 15638-5, Clauses 8.1.4, 8.3 and 8.4
VDSMI001	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5 as end of file terminator
In the event that data are sent in response to an interrogation requesting data, the following data shall be appended:				
Number	Data concept name	Use	Format	Notes/Source
VDSMI004	URef	Mandatory	AN (8)	An 8 byte reference provided by the interrogator requesting the data. The alphanumeric or binary content of which is unspecified by ISO 15638, but is intended to be used by the interrogator to provide a unique reference to its request for data
VDSMI005	ReqDest	Mandatory	35 Bytes	Requested Destination IPv6 address for the data to be sent as: scheme://domain:port/path?query_string#fragment_id i.e.: The scheme name (commonly called protocol), followed by:// then, depending on scheme, a domain name (alternatively, IP address): a port number, and / the path of the resource to be fetched or the program to be run. If the scheme name is http, the 'http://' is assumed e.g: www.example.com/path/to/name https://example.com/47.35868 telnet://192.0.2.16:80/

10.6 TARV VSM application service specific provisions for quality of service

The integrity of the data are important, and other sensors as well as parameters can then be required based on the approaches and techniques used to provide assurance of the quality of the data. The generic quality of service provisions that are specified in 10.4 are defined in ISO 15638-6 and ISO 15638-5.

Instantiation specific requirements shall be part of the regulation of the *jurisdiction (4.28).* However, in defining such requirements *jurisdictions* shall wherever possible, use performance based or functionally *specifications (4.42)* in order to avoid locking requirements into technologies that will become obsolete.

NOTE Having prescribed integrity and its parameters into an operational system, it is harder to move to other integrity indicators when new technologies come along.

See also Clause 9 for general quality of service requirements.

10.7 TARV VSM application service specific provisions for test requirements

There are no specific provisions for test requirements specified in this version of this International Standard.

10.8 TARV VSM application specific rules for the approval of IVSs and 'Service Providers'

As in 9.12.

11 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 (4.4)* specified within this part of ISO 15638 and ISO 15638-7 contain no direct patents nor intellectual property other than the copyright of ISO. However, national, regional or local instantiations of any the applications services defined in this part of ISO 15638 and ISO 15638-7, or of the generic vehicle information defined in ISO 15638-5, the security requirements contained in ISO 15638-4, or the requirements of ISO 15638-3, can have additional requirements which can have patent or intellectual property implications. The reader is referred to the regulation regime of the *jurisdiction* (4.28) and its regulations for instantiation in this respect.

Annex A
(informative)

ASN.1 Modules for ISO 15638-16 data concepts

A.1 Use of ASN.1

ISO TC204 requires that data concepts defined in ISO TC204 ITS standards deliverables are elaborated in ASN.1 (ISO 14813-6).

ISO 21217 (ITS- CALM -ITS-station communications architecture) and its associated standards require the exchange of data using ASN.1 PER or UPER.

The following example provides a definition for the data concepts used in this Standard.

A.2 ASN.1 modules for ISO 15638-16 (vehicle speed control)

A.2.1 Data concepts defined in ISO 15638-5 and used in this standard (ISO 15638-16)

```
TARVLocalDataTree DEFINITIONS AUTOMATIC TAGS::=
   BEGIN
        LDTData::= SEQUENCE
        {dataFormatVersion      DataFormatVersion,
         messageID              MessageIdentifier,
         primeSPID              PrimeServiceProviderIdentifier,
         applicationSPAddress   ApplicationServiceProviderAddress,
         sessionControlData     SessionControlData OPTIONAL,
         vehicleUniqueID        VehicleUniqueIdentifier OPTIONAL,
         vehicleClassID         VehicleClassIdentification OPTIONAL,
         vin                    VIN,
         propulsionStorageType  PropulsionStorageType,
         time                   TimeAndTimestamp DEFAULT 0,
         location               Location,
         direction              DirectionOfTravel,
         ignition               Ignition,
         movementSensors        OtherMovementSensors,
         driverID               DriverIdentification,
         trailerID              TrailerIdentification OPTIONAL,
         loadData               LoadData
         }

        DataFormatVersion::= VisibleString (SIZE (6))

        MessageIdentifier::= INTEGER

        PrimeServiceProviderIdentifier::= VisibleString (PATTERN "\w#4:\w#4:\w#4:\w#4:\
w#4:\w#4:\w#4:\w#4") -IPv6 address in the format xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx

        ApplicationServiceProviderAddress::= CHOICE {
        content   [0] INTEGER (128..16511), -contained in two octets
        extension [1] OCTET STRING(SIZE (2))
        }

        SessionControlData::= VisibleString

        VehicleUniqueIdentifier::= SEQUENCE {
        countryCode       VisibleString,
        alphabetIndicator VisibleString,
        licPlateNumber    NumericString
        }
```

```
        VehicleClassIdentification::= NumericString (SIZE (2))

        VIN::= VisibleString (SIZE (17))

        PropulsionStorageType::= BIT STRING {
        gasoline (0),
        diesel   (1),
        cng      (2),
        lpg      (3),
        electric (4),
        hydrogen (5)
        } -Enter type value with curly bracket at beginning and end, assignment type will
accept word and binary forms of storage type

        TimeAndTimestamp::= INTEGER

        Location::= SEQUENCE {
                              latitude  VisibleString (SIZE (10)),
                              longitude VisibleString (SIZE (10)),
                              altitude  VisibleString (SIZE (4..5)) DEFAULT "0000",
                              noOfSats  VisibleString (PATTERN "Sat\d+"), -Type value
must be in the format "SatN", where N = the number of satellites present
                              trust     INTEGER {
                                                false (0),
                                                true  (1)
                                                } (0 | 1) -accepts true, false, 0 or 1
                              }

        DirectionOfTravel::= INTEGER (0..360) -degrees clockwise

        Ignition::= VisibleString ("Ign 1" | "Ign 0" | "Ign d") -where 1=on, 0=off,
d=disconnected

        OtherMovementSensors::= SEQUENCE
        {sensorOne VisibleString (PATTERN "\d+\s\Mvt\s[m,n,d]"|"000") DEFAULT "000", -Type
value must be in the format "[SensorNumber] Mvt [m/n/d]", where m=movement, n=no movement,
d=disconnected
        sensorTwo  VisibleString (PATTERN "\d+\s\Mvt\s[m,n,d]"|"000") DEFAULT "000"
        }

        DriverIdentification::= SEQUENCE
        {jurisdictionID    VisibleString (PATTERN "\d#6\s\w+\s\w+\s(\w+,)*\s\d#6"), -
Must be in the format "[IssueDate(yymmdd)] [IssuingJurisdiction] [Driver'sName]
[VehicleClasses(comma separated)] [ExpiryDate(yymmdd)]"
        userAuthorisation VisibleString (PATTERN "\d#6\s\w+\s\w+\s(\w+,)*\s\d#6"|"000000")
DEFAULT "000000" -Same format as jurisdictionID
        }

        TrailerIdentification::= VisibleString

        LoadData::= VisibleString
   END
```

A.2.2 Data concepts defined in ISO 15638-16 (VSM)

```
-Type definition for 15638-16 module
VehicleSpeedMonitoring DEFINITIONS AUTOMATIC TAGS::=
   BEGIN
      IMPORTS LDTData FROM TARVLocalDataTree;

      VSMData::= SEQUENCE
      {vSM001   IVSID,
       vSM002   VehicleSpeedData,
       vSM003   IVSID,
       vDSM004  Uref,
       vDSM005  ReqDes,
       vDSMI001 IVSID,
       vDSMI002 VehicleSpeedData,
       vDSMI003 LDTData,
       vDSMI004 Uref,
       vDSMI005 ReqDes
```

```
    }

    IVSID::= VisibleString (SIZE (9))

    VehicleSpeedData::= SEQUENCE
    {serialNumber VisibleString (PATTERN "s0\d#3"),
     timeStamp    NumericString (SIZE (6)),
     unit         VisibleString ("k"|"m"),
     speed        INTEGER (0..400),
     latitude     VisibleString (SIZE (10)),
     longitude    VisibleString (SIZE (10)),
     direction    INTEGER (0.. 360)
    }

    Uref::= VisibleString (SIZE (8))

    ReqDes::= VisibleString (SIZE (35))

END
```

Annex B
(informative)

Independent testing of the protocols defined in this Part of ISO 15638

B.1 Objectives

To test the validity of TARV standards it is necessary to simulate the TARV transactions. These are of two types:

B.1.1 Instigation

a) The IVS of a vehicle establishes a new communication using one of (and must be tested for each of) several wireless media defined below.

b) The IVS of a vehicle internally triggers a requirement to send a packet of data to a predetermined destination IPv6 (internet) address

c) The vehicle sends the datafile to the predetermined destination IPv6 (internet) address

d) Recipient address sends acknowledgement

e) IVS closes the communication on receipt of acknowledgement

B.1.2 Interrogation

a) The IVS of a vehicle receives a wireless interrogation requesting a packet of data.

b) The IVS of a vehicle is switched on but is not connected

c) The IVS of a vehicle receives a wireless interrogation requesting a packet of data.

d) On receipt, it acknowledges the request (ACK)

e) It closes the communication

f) Opens a new communication session using one of (and must be tested for each of) several wireless media defined below.

g) Sends the datafile to a predetermined destination IPv6 (internet) address

h) Recipient address sends acknowledgement

i) IVS closes the communication on receipt of acknowledgement

These scenarios need to be tested using each of 2G, 3G, WiFi, 5,9GHz (IEEE 802.11) using the same data.

A number of different datafiles (of different length) and acknowledgements need to be sent, which differ according to the application service. Each of the sequences defined below need to be tested.

In respect of 'interrogation' scenarios the ability to receive the interrogation on one medium (esp. 5,9 GHz) and to instigate the subsequent message using a different medium needs to be tested.

B.1.3 Preconditions, assumptions, and simulations

a) The S.U.T. concerns only the communication between the IVS and the application service provider address. No other part of the system specifications are to be tested (they appear in the figures below for context, and because there are copied from the base standards.)

b) CALM and media choice are assumed, and not S.U.T.

c) The vehicle is equipped with wireless communications that enable it to make communications using 2G, 3G, Mesh WiFi, 5,9GHz (IEEE 802.11p).

d) The means to trigger the sending of a message from the vehicle is a function of IVS design, not S.U.T., therefore can be simulated.

e) The destination address is intended to be an IPv6 address, but can be simulated with an IPv4 address as this is an internet issue, not S.U.T.

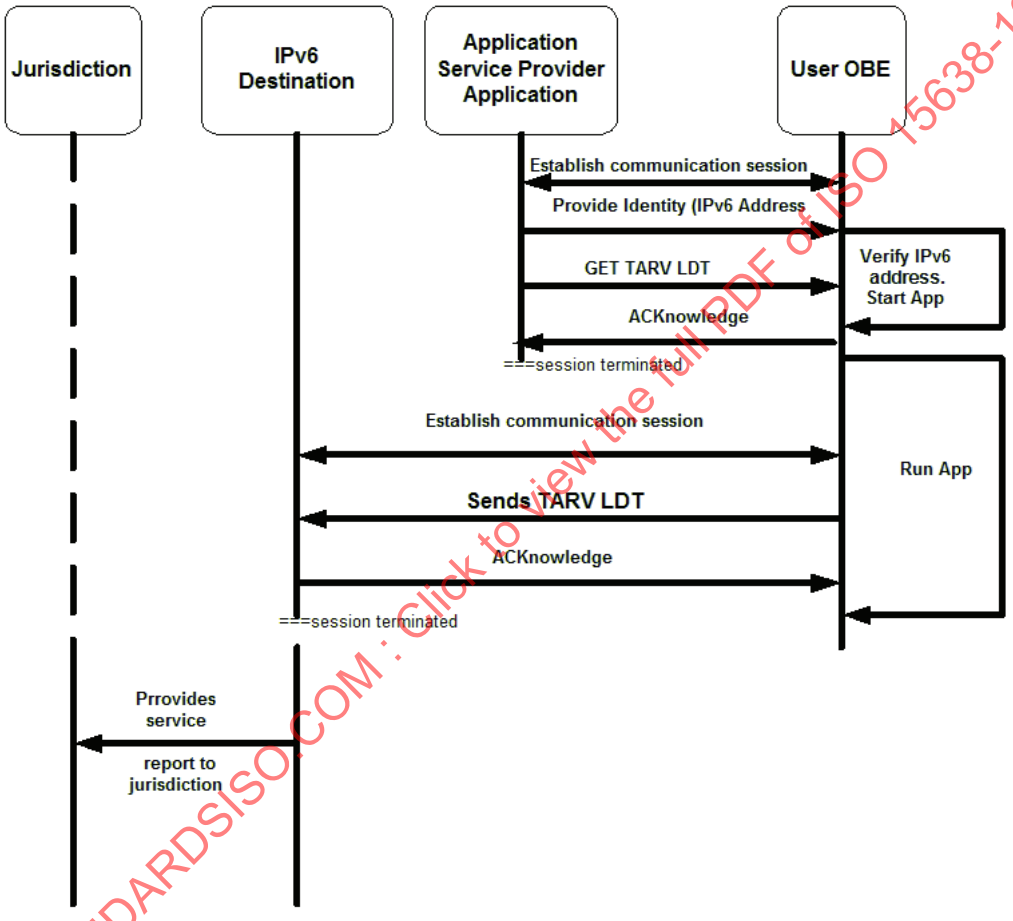

Figure B.1 — Communications sequences to obtain TARV LDT

B.1.4 Application services where the verity of the communication needs to be physically tested

a) VAM vehicle access monitoring

b) RTM remote electronic tachograph monitoring

c) EMS *emergency messaging system*

d) *DWR* *driver work records* (work and rest hours compliance)

e) VMM vehicle mass monitoring

f) MRC ‘mass’ data for regulatory control and management (no test - data as VMM)

g) VAC vehicle access control (no test - data as VAM)

h) VLM vehicle location monitoring

i) VSM vehicle speed monitoring

j) CLM consignment and location monitoring

k) ADR Accord Dangereuses par Route (Dangerous Goods) monitoring

l) VPF vehicle parking facilities

B.2 TEST SCRIPT SERVICE: VSM VEHICLE SPEED MONITORING

TEST 8.1.0.1: VSM– through 2G. Instigated

STEP 8.1.1.1 IVS instigates a communication session using 2G media to predetermined destination IP address

AS API IPv6 address

As AS 00000000 00000000 xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx

Example: PSP 128..16511 1050:0000:0000:0000:0005:0600:300c:326b

Using ‘,’ as a datafield separator.

Table B.1 — Formal data content of a VDSM record

FILE TYPE		Format of file name			Notes/Source
VDSM	Mandatory	<VDSM><YYMMDD><hhmmss><vehicleregistrationnumber><driverslicencenumber> Example *VDSM* 110316 070603 KV76WRR WILLI502139RK9MA85 As: *VDSM*110316 070603KV76WRR WILLI502139RK9MA85			10.4.9 (Vehicle /Driver/Speed monitoring file [*VDSM* file])
Number	Data concept name		Use	Format	Notes/Source
*VSM*001	IVS ID		Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5
*VSM*002	Vehicle speed		Mandatory	S(serial number) timestamp k/m speed location Example s0123 110316 k 530x0A5D3770 0x027E2938 > 0123	Calculated as specified in ISO 15638-5, 9.2.4.
*VDSM*003	IVS ID		Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5 as terminator to indicate end of data

FILENAME: < *VDSM*110316 070603KV76WRR WILLI502139RK9MA85 >

FILE CONTENT: < D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, D0o3M45S >

The formal data content of a VDSMI record shall be as shown in Table B.2.

Table B.2 — Formal data content of a VDSMI record

FILE TYPE		Format of file name		Notes/Source
VDSMI	Manda-tory	<VDSMI><YYMMDDhhmmss>INS<vehicleregistrationnumber><*driverslicencenumber*> Example VDSMI 110316 070603 KV76WRR WILLI502139RK9MA85 As VDSMI 110316070603KV76WRR WILLI502139RK9MA85		10.4.9 (Vehicle /Driver/Speed monitoring file [*VDSM* file])
Number	Data concept name	Use	Format	Notes/Source
VDSMI001	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5
VDSMI002	Vehicle speed	Mandatory	S(serial number*)* timestamp k/m speed location Example s0123 110316 k 530x0A5D3770 0x027E2938 > 0123	Calculated as specified in ISO 15638-5, 9.2.4.
VDSMI003	TARV LDT	Mandatory	Compound data construct Example AaaSs*0 1* xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx 128..16511 SCD.. GB 1 KV76WRR 51 1G1JF27W8GJ178227 000000 1297339499 0x0A5D3770 0x027E2938 0000 Sat8 *0*123 Ign1 m m 010326 UKPeterJones 01,02,03a,h1 120325 010326 124538 Peter Jones 01,02,h1 120325 ISO 17262, CS9 data ISO 26683-2 data if present AS: AaaSs1*0* xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx128..16511 SCD..GB1KV76WRR511G1JF27W8GJ178227000000129733949 90x0A5D37700x027E29380000Sat8*0*123Ign1mm010326UKPeterJones01,02,03a,h1120325010326 124538PeterJones01,02,h1120325 < ISO 17262, CS9*data* > < ISO 26683-2 *data if present* >	as specified in ISO 15638-5, 8.1.4, 8.3 and 8.4
VDSMI004	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5 as end of file terminator

FILENAME: < VDSMI110316070603INFKV76WRR WILLI502139RK9MA85 >

FILE CONTENT: < D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, AaaSs1*0* xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx128..16511 SCDGB1KV76WRR511G1JF27W8GJ178227000000129733949 90x0A5D37700x027E29380000Sat8*0*123Ign1mm010326UKPeterJones01,02,03a,h1120325010326 124538PeterJones01,02,h1120325 < ISO 17262, CS9*data* > < ISO 26683-2 *data if present* > D0o3M45S >

NOTE for TESTER: This test can be performed as a single session sending two files, or as two separate sessions each sending one file.

STEP 8.1.1.2 IVS sends file named < *VDSM*110316 070603KV76WRR WILLI502139RK9MA85 >

< D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, D0o3M45S >

STEP 8.1.1.3 Destination address sends ACK < VSM >

STEP 8.1.1.4 IVS receives ACK < VSM >

STEP 8.1.1.5 IVS closes communication session

STEP 8.1.1.6 IVS instigates a communication session using 2G media to predetermined destination IP address

STEP 8.1.1.7 IVS sends file named < *VDSMI*110316070603INFKV76WRR WILLI502139RK9MA85 >

< D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, AaaSs1*0* xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx128..16511 SCDtbd..GB1KV76WRR511G1JF27W8GJ1782270000001297339499 0x0A5D37700x027E29380000Sat8*0*123Ign1mm010326UKPeterJones01,02,03a,h1120325010326 124538PeterJones01,02,h1120325 < ISO 17262, CS9*data* > < ISO 26683-2 *data if present* > D0o3M45S >

STEP 8.1.1.8 Destination address sends ACK < VSM >

STEP 8.1.1.9 IVS receives ACK < VSM >

STEP 8.1.1.10 IVS closes communication session

CTP 8.1.1 Instigated Vehicle Speed Monitoring using 2G

S.U.T. reference		Instigated send of Vehicle Speed Monitoring using 2G	
CTP/8.1.1			
S.U.T. test objective		The IVS of a vehicle establishes a new communication using one of (and must be tested for each of) several wireless media defined below. The IVS of a vehicle internally triggers a requirement to send a packet of data to a predetermined destination IPv6 (Internet) address. The vehicle sends the datafile to the predetermined destination IPv6 (Internet) address. The ecipient address sends acknowledgement. The IVS closes the communication on receipt of acknowledgement.	
CTP Origin		CSI	
Reference requirement		ISO 15638-16	
Initial Conditions		The S.U.T. concerns only the communication between the IVS and the application service provider address. No other part of the system specifications are to be tested (they appear in the figures below for context, and because there are copied from the base standards). CALM and media choice are assumed and not S.U.T. The vehicle is equipped with wireless communications that enable it to make communications using 2G, 3G, WiFi, 5,9GHz (IEEE 802.11p). The means to trigger the sending of a message from the vehicle is a function of IVS design, not S.U.T., therefore can be simulated. The destination address is intended to be an IPv6 address, but can be simulated with an IPv4 address as this is an internet issue, not S.U.T.	
Stimulus and expected behaviour			
Test point		**Tester action**	**Pass condition**
8.1.1.1	1	IVS instigates a communication session using selected media (2G) to predetermined destination IP address	Session established
8.1.1.2	2	IVS sends file named < *VDSM*110316 070603KV76WRR WILLI502139RK9MA85 > < START > < D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, D0o3M45S > < END >	File sent and arrives correctly at destination

8.1.1.3	3	IVS sends file named < *VDSMI*110316070603INFKV76WRR WILLI502139RK9MA85 > < START > < D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, AaaSs1*0* xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx128..16511 SCDtbd..GB1KV76 WRR511G1JF27W8GJ178227000000129733949 90x0A5D37700x027E293 80000Sat8*0*123Ign1mm010326UKPeterJones01,02,03a,h1120325010326 124538PeterJones01,02,h1120325 < ISO 17262, CS9*data* > < ISO 26683-2 *data if present* > D0o3M45S > < END >	File sent and arrives correctly at destination
8.1.1.4	4	Destination address sends ACK < VSX >	
8.1.1.5	5	IVS receives ACK < VSX >	File received and ACK < VSX > sent
8.1.1.6	6	IVS closes communication session	Communication session closed
			If ALL individual pass conditions listed in this column above have been met THEN CTP PASS ELSE CTP FAIL

TEST RESULT: CTP 8.1.1	**PASS / FAIL**	**Date: 28th June 2102**
Signature/initials 	PASS	 k4, MIRA, Watling St, Nuneaton, Warwick-shire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

CTP 8.1.2 Interrogated Vehicle Speed Monitoring using 2G

S.U.T. reference	Interrogated send of Vehicle Speed Monitoring using 2G
CTP/8.1.2	
S.U.T. test objective	The IVS of a vehicle receives a wireless interrogation requesting a packet of data. The IVS of a vehicle is switched on but is not connected to an active wireless communication session. The IVS of a vehicle receives a 2G wireless interrogation requesting a packet of data. On receipt, it acknowledges the request (ACK) It closes the communication. It opens a new communication session using one of (and must be tested for each of) several wireless media defined below. It sends the datafile to a predetermined destination IPv6 (Internet) address The recipient address sends acknowledgement. The IVS closes the communication on receipt of acknowledgement.
CTP Origin	CEN
Reference requirement	ISO 15638-16

Initial Conditions	The S.U.T. concerns only the communication between the IVS and the application service provider address. No other part of the system specifications are to be tested (they appear in the figures below for context, and because there are copied from the base standards.) CALM and media choice are assumed and not S.U.T. The vehicle is equipped with wireless communications that enable it to make communications using 2G, 3G, WiFi, 5,9GHz (IEEE 802.11p). The means to trigger the sending of a message from the vehicle is a function of IVS design, not S.U.T., therefore can be simulated. The destination address is intended to be an IPv6 address, but can be simulated with an IPv4 address as this is an internet issue, not S.U.T.

Stimulus and expected behaviour

Test point		Tester action	Pass condition
8.1.2.1	1	Session connected (incoming call)	Call in progress
8.1.2.2	2	Caller sends data request command (GPRS, EDGE etc) GET VDSM	Data request sent
8.1.2.3	3	IVS acknowledges request by returning ACKnowledgement <S>	ACK <S> received
8.1.2.4	4	IVS closes communication session	Communication session closed
8.1.2.5	5	IVS instigates a communication session using selected media to predetermined destination IP address	Communication session successfully opened
8.1.2.6	6	IVS sends file named < *VDSM*110316 070603KV76WRR WILLI502139RK9MA85 > < START > < D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, D0o3M45S > < END >	File sent and arrives correctly at destination
8.1.2.7	7	IVS sends file named < *VDSMI*110316070603INFKV76WRR WILLI502139RK9MA85 > < START > < D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, AaaSs1*0* xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx128..16511 SCDtbd..GB1KV76W RR511G1JF27W8GJ178227000000012973394990x0A5D37700x027E293800 00Sat8*0*123Ign1mm010326UKPeterJones01,02,03a,h1120325010326 1245 38PeterJones01,02,h1120325 < ISO 17262, CS9*data* > < ISO 26683-2 *data if present* > D0o3M45S > < END >	File sent and arrives correctly at destination
8.1.2.8	8	Destination address sends ACK < VSX >	
8.1.2.9	9	**IVS receives ACK < VSX >**	**File received and ACK < VSX > sent**
8.1.2.10	10	IVS closes communication session	Communication session closed
			If ALL individual pass conditions listed in this column above have been met THEN CTP PASS ELSE CTP FAIL

TEST RESULT: CTP 8.1.2	**PASS/FAIL**	**Date: 28th June 2102**
Signature/initials 	PASS	innovITS ADVANCE k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

CTP 8.1.3 Interrogated Vehicle Speed Monitoring using 5,9GHz and responding using 2G or 3G

S.U.T. reference	Interrogated Vehicle Speed Monitoring using 5,9 GHz and send of Vehicle Speed Monitoring using 2G or 3G		
CTP/8.1.3			
.			
S.U.T. test objective	The IVS of a vehicle receives a wireless interrogation requesting a packet of data. The IVS of a vehicle is switched on but is not connected to an active wireless communication session. The IVS of a vehicle receives a 5,9GHz (IEEE 802.11p) wireless interrogation requesting a packet of data. On receipt, it acknowledges the request (ACK). It closes the communication. It opens a new communication session using 2G or 3G. It sends the datafile to a predetermined destination IPv6 (Internet) address. The recipient address sends acknowledgement. The IVS closes the communication on receipt of acknowledgement.		
CTP Origin	CEN		
Reference requirement	ISO 15638-16		
Initial Conditions	The S.U.T. concerns only the communication between the IVS and the application service provider address. No other part of the system specifications are to be tested (they appear in the figures below for context, and because there are copied from the base standards.) CALM and media choice are assumed and not S.U.T. The vehicle is equipped with wireless communications that enable it to make communications using 2G, 3G, WiFi, 5,9GHz (IEEE 802.11p). The means to trigger the sending of a message from the vehicle is a function of IVS design, not S.U.T., therefore can be simulated. The destination address is intended to be an IPv6 address, but can be simulated with an IPv4 address as this is an internet issue, not S.U.T..		
Stimulus and expected behaviour			
Test point		**Tester action**	**Pass condition**
8.1.3.1	1	Session connected (incoming call) using 5,9 Ghz (IEEE 802.11p)	Call in progress
8.1.3.2	2	Caller sends data request command GET VDSM	Data request sent
8.1.3.3	3	IVS acknowledges request by returning ACKnowledgement < S >	ACK < S > received
8.1.3.4	4	IVS closes communication session	Communication session closed
8.1.3.5	5	IVS instigates a communication session using 2G or 3G	Communication session successfully opened
8.1.3.6	6	IVS sends file named < *VDSM*110316 070603KV76WRR WILLI502139RK9MA85 > < START > < D0o3M45S, s0123110316k 530x0A5D3770 0x027E2938 > 0123, D0o3M45S > < END >	File sent and arrives correctly at destination