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

Part 12: Vehicle mass monitoring

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

Partie 12: Monitorage de la masse des véhicules

Reference number
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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 15638-12:2013.

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" approval 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 and monitoring (VAM)*

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

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

— *Part 11: Driver work records (work and rest hours compliance) (DWR)*

— *Part 12: Vehicle mass monitoring (VMM)*

— *Part 14: Vehicle access control (VAC)*

— *Part 15: Vehicle location monitoring (VLM)*

— *Part 16: Vehicle speed monitoring (VSM)*

— *Part 17: Consignment and location monitoring (CLM)*

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

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

The following documents 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* (4.35) and freight owners, in the areas of fleet management, safety, and security. *Telematics* (4.47) applications have also been developed for governmental use. Such regulatory services in use or being considered vary from *jurisdiction* (4.29) to *jurisdiction* (4.29), but include electronic on-board recorders, digital *remote tachograph monitoring* (4.41), on-board *mass* (4.33) monitoring, "mass" data for regulatory control and management, vehicle *access* (4.1) methods, hazardous goods, and tracking and *e-call* (4.20). Additional applications with a regulatory impact being developed include, fatigue management, speed monitoring, and heavy vehicle penalties and levies imposed.

In such an emerging environment of regulatory and *commercial applications* (4.13), it is timely to consider an overall *architecture* (4.9) (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* (4.44) of new applications that build upon the functionality of a generic *specification* (4.44) platform. A suite of International Standards deliverables is required to describe and define the *framework* (4.23) 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* (4.30).

This suite of International Standards addresses and defines the *framework* (4.23) for a range of cooperative *telematics* (4.47) applications for *regulated commercial freight vehicles* (4.39) [such as, *access methods* (4.1), *driver* (4.18) fatigue management, speed monitoring, on-board mass, "mass" data for regulatory control, and management]. The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative provision of services to *regulated commercial freight vehicles* (4.40), using an on-board ITS platform. The *framework* (4.23) is based on a (multiple) *service provider* (4.42) oriented approach with provisions for the *approval* (4.6) and *auditing* (4.10) of *service providers* (4.42).

This suite of International Standards deliverables will

— provide the basis for future development of cooperative *telematics* (4.47) applications for *regulated vehicles* (4.40). Many elements to accomplish this are already available. Existing relevant International Standards will be referenced, and the *specifications* (4.44) will use existing International Standards [such as *CALM* (4.12)] wherever practicable,

— allow for a powerful platform for highly cost-effective delivery of a range of *telematics* (4.47) applications for *regulated vehicles* (4.40),

— provide a business *architecture* (4.9) based on a (multiple) *service provider* (4.42) oriented approach, and

— address legal and regulatory aspects for the *approval* (4.6) and *auditing* (4.10) of *service providers* (4.42).

This suite of International Standards deliverables is timely as many governments (Europe, North America, Asia, and Australia/New Zealand) are considering the use of *telematics* (4.47) 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* (4.44) for *vehicle* "*mass*" *monitoring* (4.52).

NOTE 1 The definition of what comprises a "*regulated*" *vehicle* (4.40) is regarded as an issue for national decision, and can vary from *jurisdiction* (4.29) to *jurisdiction* (4.29). This suite of International Standards deliverables does not impose any requirements on nations in respect of how they define a *regulated vehicle* (4.40).

NOTE 2 The definition of what comprises a “regulated” service is regarded as an issue for national decision, and can vary from *jurisdiction* (4.29) to *jurisdiction* (4.29). This suite of International Standards deliverables does not impose any requirements on nations in respect of which services for *regulated vehicles* (4.40) *jurisdictions* (4.29) will require, or support as an option, but will provide standardized 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 12: Vehicle mass monitoring

1 Scope

This part of ISO 15638 addresses the provision of *vehicle mass monitoring* (VMM) (4.52) and specifies the form and content of such data required to support such systems, and *access methods* (4.1) to that data.

The scope of this part of ISO 15638 is to provide *specifications* (4.44) for common communications and data exchange aspects of the *application service* (4.3) *VMM* (4.53) that a *regulator* (4.30) can elect to require or support as an option, including the following

a) high level definition of the service that a *service provider* (4.42) has to provide, (The service definition describes common service elements; but does not define the detail of how such an *application service* (4.3) is instantiated, not 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* (4.26) has to deliver.

The definition of what comprises a "regulated" service is regarded as an issue for national decision, and can vary from *jurisdiction* (4.29) to *jurisdiction* (4.29). This International Standard does not impose any requirements on nations in respect of which services for *regulated commercial freight vehicles* (4.40) *jurisdictions* (4.29) will require, or support as an option, but provides standardized sets of requirements descriptions for identified services to enable consistent and cost-efficient implementations where instantiated.

ISO 15638 has been developed for use in the context of *regulated commercial freight vehicles* (4.40) (hereinafter, referred to as "*regulated vehicles*" (4.40). There is nothing, however, to prevent a *jurisdiction* (4.29) extending or adapting the scope to include other types of *regulated vehicles* (4.40), as it deems appropriate.

2 Conformance

Requirements to demonstrate conformance to any of the general provisions or specific *application services* (4.3) described in this part of ISO 15638 shall be within the regulations imposed by the *jurisdiction* (4.29) 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* (4.44) of, the *jurisdiction* (4.29) where the *application service(s)* (4.3) 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, the results can be used, where appropriate, 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 15638–1:2012, *Intelligent transport systems — Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 1: Framework and architecture*

ISO 15638–2:2013, *Intelligent transport systems — Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 2: Common platform parameters using CALM*

ISO 15638–3:2013, *Intelligent transport systems — Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 3: Operating requirements, "Approval Authority" approval procedures, and enforcement provisions for the providers of regulated services*

ISO 15638–5:2013, *Intelligent transport systems — Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 5: Generic vehicle information*

ISO 15638–6:2014, *Intelligent transport systems — Telematics Applications for Regulated commercial freight Vehicles (TARV) — Part 6: Regulated applications*

4 Terms and definitions

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

4.1
access methods
procedures and protocols to provision and retrieve data

4.2
app
small (usually) Java™[1)] applets, organized as software bundles, that support *application services* (4.3) by keeping the *data pantry* (4.17) provisioned with up-to-date data

4.3
application service
service provided by a *service provider* (4.42) enabled by accessing data from the *in-vehicle system* (IVS) (4.26) of a *regulated vehicle* (4.40) via a wireless communications network

4.4
application service provider (ASP)
party that provides an *application service* (4.3)

4.5
app library
separated secure area of memory in *IVS* (4.26) where apps are stored, with different access controls to *data pantry* (4.17)

4.6
approval
formal affirmation that an applicant has satisfied all the requirements for appointment as an *application service provider* (4.4) or that an *application service* (4.3) delivers the required service levels

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

4.7
approval agreement
written agreement made between an *approval authority (regulatory)* (4.8) and a *service provider* (4.42)

Note 1 to entry: An *approval authority (regulatory)* (4.8)*approval agreement* recognizes the fact that a *service provider* (4.42), having satisfied the *approval authority's* requirements for appointment as a *service provider* (4.42), 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* (4.42).

4.8
approval authority (regulatory)
organization (usually independent) which conducts *approval* (4.6) and on-going *audit* (4.10) of *service providers* (4.42) on behalf of a *jurisdiction* (4.29)

4.9
architecture
formalized description of the design of the structure of TARV and its *framework* (4.23)

4.10
audit/auditing
review of a party's capacity to meet, or continue to meet, the initial and on-going *approval agreements* (4.7) as a *service provider* (4.42)

4.11
basic vehicle data
data that shall be maintained/provided by all *IVS* (4.26) regardless of *jurisdiction* (4.29)

4.12
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* (4.48).

Note 1 to entry: It determines parameters by using a suite of International Standards based on ISO 21217 [*CALM* (4.12) architecture (4.9)] and ISO 21210 [*CALM* (4.12) networking] that provide a common platform for a number of standardized media using *ITS-stations* (4.28) to provide wireless support for applications, such that the application is independent of any particular wireless medium.

4.13
commercial application(s)
ITS applications in *regulated vehicles* (4.40) for commercial (non-regulated) purposes

EXAMPLE asset tracking, vehicle and engine monitoring, cargo security, *driver* (4.18) management, etc.

4.14
consignment
shipment of goods/cargo to a destination

4.15
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* (4.28), 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* (4.27)

4.16
core data
basic vehicle data (4.11) plus any additional data required to provide an implemented *regulated application service* (4.39)

4.17
data pantry
secure area of memory in *IVS* (4.26) where data values are stored, with different access control to data to *app library* (4.5)

4.18
driver
person driving the *regulated vehicle* (4.40) at any specific point in time

4.19
driver work records
DWR
collection, collation, and transfer of *driver*'s (4.18) work and rest hours data from an *in-vehicle system* (4.26) to an *application service provider* (4.4)

4.20
eCall
specialized instantiation of an *emergency message system* (EMS) (4.21) that provides incident messaging and communication with a public service assistance point via priority wireless telephone communications using its emergency call capabilities

4.21
emergency message system
EMS
collection, collation, and transfer of emergency message data from an *in-vehicle system* (4.26) to an *application service provider* (4.4)

4.22
facilities
layer that sits on top of the communication stack and helps in providing data interoperability and reuse, and in managing applications and enabling dynamic real time loading of new applications

4.23
framework
particular set of beliefs, ideas referred to in order to describe a scenario or solve a problem

4.24
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* (4.48) to identify the location of its receiver anywhere around the globe

4.25
global positioning system
GPS
instantiation of *GNSS* (4.24) controlled by the US Department of Defense

4.26
in-vehicle system
IVS
ITS-station (4.28) and connected equipment on board a vehicle

4.27
ITS service
communication functionality offered by an *ITS-station* (4.28) to an *ITS-station* (4.28) application

4.28
ITS-station
ITS-s
entity in a communication network, comprised of application, *facilities* (4.22), networking, and access layer components specified in ISO 21217 that operate within a bounded secure management domain

4.29
jurisdiction
government, road, or traffic authority which owns the *regulatory applications* (4.38)

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

4.30
jurisdiction regulator
regulator
agent of the *jurisdiction* (4.29) appointed to regulate and manage TARV within the domain of the *jurisdiction* (4.29); might or might not be the *approval authority* (*regulatory*) (4.8)

4.31
local data tree
LDT
frequently updated data concept stored in the on-board *data pantry* (4.17) containing a collection of data values deemed essential for either a) TARV *regulated application service* (4.39), or b) *cooperative intelligent transport systems* (4.15)

4.32
map
spatial dataset that defines the road system

4.33
mass
mass of a given heavy vehicle as measured by equipment affixed to the *regulated vehicle* (4.40)

4.34
mass information for jurisdictional control and enforcement
MICE/MRC
collection, collation, and transfer of vehicle *mass* (4.33) data from an *in-vehicle system* (4.26) to an *application service provider* (4.4) to enable data provision to *jurisdictions* (4.29) for the control and management of equipped vehicles based on the mass of the *regulated vehicle* (4.40), or use of such data to enable compliance with the provisions of regulations

4.35
operator
fleet manager of a *regulated vehicle* (4.40)

4.36
prime mover
heavy-duty commercial vehicle tractor unit which serves as a method of moving trailers (most often semi-trailers) by coupling to the trailer using some sort of mechanical lock system, usually a fifth wheel coupling; tractor units can couple to different types of trailers

4.37
prime service provider
service provider (4.42) who is the first contractor to provide *regulated application services* (4.39) to the *regulated vehicle* (4.40), or a nominated successor on termination of that initial contract

Note 1 to entry: The *prime service provider* is also responsible for maintaining the installed *IVS* (4.26). If the *IVS* (4.26) was not installed during the manufacture of the vehicle, the *prime service provider* is also responsible for the installation and commissioning of the *IVS* (4.26).

4.38
regulated/regulatory application
application arrangement using TARV utilized by *jurisdictions* (4.29) 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* (4.29)

Note 1 to entry: It can be mandatory or voluntary at the discretion of the *jurisdiction* (4.29).

4.39
regulated application service
TARV *application service* (4.3) to meet the requirements of a *regulated application* (4.38) that is mandated by a regulation imposed by a *jurisdiction* (4.29), or is an option supported by a *jurisdiction* (4.29)

4.40
regulated commercial freight vehicle/regulated vehicle
vehicle that is subject to regulations determined by the *jurisdiction* (4.29) as to its use on the road system of the *jurisdiction* (4.29) in regulated circumstances, subject to certain conditions, and in compliance with specific regulations for that class of *regulated vehicle* (4.40); at the option of *jurisdictions* (4.29)

Note 1 to entry: This can require the provision of information via TARV or provide the option to do so.

4.41
remote tachograph monitoring
RTM
collection, collation, and transfer of data from an on-board electronic *tachograph* (4.45) system to an *application service provider* (4.4)

4.42
service provider
party which is approved by an *approval authority (regulatory)* (4.8) as suitable to provide regulated or commercial ITS *application services* (4.3)

4.43
session
wireless communication exchange between the *ITS-station* (4.28) of an *IVS* (4.26) and the *ITS-station* of its *application service provider* (4.4) to achieve data update, data provision, upload apps, or otherwise manage the provision of the *application service* (4.3), or a wireless communication provision of data to the *ITS-station* (4.28) of an *IVS* (4.26) from any other *ITS-station* (4.28)

4.44
specification
explicit and detailed description of the nature and functional requirements and minimum performance of equipment, service, or a combination of both

4.45
tachograph
sender unit mounted to a vehicle gearbox, a *tachograph* head, and a digital *driver* (4.18) card which records the *regulated vehicle* (4.40) speed and the times at which it was driven and aspects of the *driver's* (4.18) activity selected from a choice of modes

4.46
tamper/tampering
conduct towards *IVS* (4.26) or a *service provider's* (4.42) system which is intended to prevent the *IVS* or the *service provider's* (4.42) system from functioning correctly

4.47
telematics
use of wireless media to obtain and transmit (data) from a distant source

4.48
user
individual or party that enrols in and operates within a regulated or *commercial application* (4.13)*service* (4.3)

EXAMPLE *driver* (4.18), transport *operator* (4.35), freight owner, etc.

4.49
vehicle access control (VAC)
control of *regulated vehicles* (4.40) ingress to and egress from controlled areas and associated regulatory control and management

4.50
vehicle access management
VAM
monitoring and management of *regulated vehicles* (4.40) approaching or within sensitive and controlled areas

4.51
vehicle location monitoring
VLM
collection, collation, and transfer of vehicle location data from an *IVS* (4.26) to an *application service provider* (4.4)

4.52
vehicle mass monitoring
VMM
collection, collation, and transfer of vehicle *mass* (4.33) data from an *IVS* (4.26) to an *application service provider* (4.4)

4.53
vehicle parking facility
VPF
system for booking and *access* (4.1) to and egress from a *vehicle parking facility*

4.54
vehicle speed monitoring
VSM
collection, collation, and transfer of vehicle speed data from an *IVS* (4.26) to an *application service provider* (4.4)

5 Symbols (and abbreviated terms)

AA *approval authority (regulatory)* (4.8)

ADR *Accord Européen relative au transport international des marchandises Dangereuses par Route* (4.6) (dangerous goods)

app *applet* (JAVA™a) application or similar) (4.2)

AS *application service* (4.3)

ASP *application service provider* (4.4)

CALM *communications access for land mobiles* (4.12)

C-ITS *cooperative intelligent transport systems* (4.15)

Dr *driver* (4.18)

GCM gross combination *mass* (4.33)

GNSS *global navigation satellite system* (4.24)

Hz hertz

ID identity

IP internet protocol

ITS-S *ITS-station* (4.28)

IVS *in-vehicle system* (4.26)

J *jurisdiction* (4.29)

Java™[a] object-oriented open-source operating language developed by SUN systems

LDT *local data tree* (4.31)

MMC *mass* (4.33) monitoring component

Op *operator* (4.35)

PSP *prime service provider* (4.37)

SE service element

TARV *telematics* (4.47) applications for *regulated commercial freight vehicles* (4.40)

UTC coordinated universal time

VMM *vehicle mass monitoring* (4.52)

VMMU vehicle mass monitoring unit

VMMU-ID vehicle mass monitoring unit identity/identification

WORM write once read many times

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

6 General overview and framework requirements

ISO 15638-1 provides a *framework* (4.23) and *architecture* (4.9) for TARV. It provides a general description of the roles of the actors in TARV and their relationships.

To understand clearly the TARV *framework* (4.23), *architecture* (4.9) and detail, and *specification* (4.44) of the roles of the actors involved, refer to ISO 15638-1.

ISO 15638-6 provides the core requirements for all *regulated applications* (4.38). To understand clearly the general context in to which the provision of this application service, refer to ISO 15638-6.

In order to be compliant with this part of ISO 15638, the overall *architecture* (4.9) employed shall comply with ISO 15638-1.

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

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

In order to be compliant with this part of ISO 15638, the security employed shall comply with ISO 15638-4:—[2)].

In order to be compliant with this part of ISO 15638, the *basic vehicle data* (4.11) shall comply with ISO 15638-5.

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

This International Standard has been developed for use in the context of *regulated commercial freight vehicles* (4.40). There is nothing, however, to prevent a *jurisdiction* (4.29) extending or adapting the scope to include other types of *regulated vehicles* (4.40), 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* (4.39) as defined in ISO 15638-6.

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

8.1 General

Application services should 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* (4.29) as part of its *specification* (4.44) for any particular *regulated application service* (4.39). However, where a specified *regulated application service* (4.39) has specific Q of S 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* (4.29) as part of its *specification* (4.44) for any particular *regulated application service* (4.39), and issued as a formal test requirements *specification* (4.44) document. However, where a specified *regulated application service* (4.39) has specific test requirements essential to maintain interoperability, these aspects shall be as specified in Clause 10 relating to this *regulated application service* (4.39), or in a separate standards deliverable referenced within that Clause. Where multiple *jurisdictions* (4.29) recognize a benefit to common test procedures for a specific *regulated application service* (4.39), 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 part of ISO 15638, the contracting parties shall make such risk explicitly known to the implementing *jurisdiction* (4.29) and shall abide by the privacy laws and regulations of the implementing *jurisdiction* (4.29) 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.

2) To be published.

9 Common features of regulated TARV application services

9.1 General

The details of the instantiation of *regulated application service* (4.39) are as designed by the application service system to meet the requirements of a particular *jurisdiction* (4.29) 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* (4.17) and the means to obtain the *TARV LDT* (4.31) and *core data* (4.16) are described in of ISO 15638-6, Clause 8.

In order to minimize demand on the *IVS* (4.26) (which it is assumed will be performing multiple *application services* (4.3) simultaneously, as well as supporting general safety related cooperative vehicle systems), and because national requirements and system offerings will differ, a "cloud" approach has been taken in defining TARV *regulated application services* (4.39).

The TARV approach is for the on-board *app* (4.2) supporting the application service to collect and collate the relevant data, and at intervals determined by the *app* (4.2), or on demand from the *application service provider* (ASP) (4.4), 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 of 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 is supplied to a different on-board file in the *data pantry* (4.17).

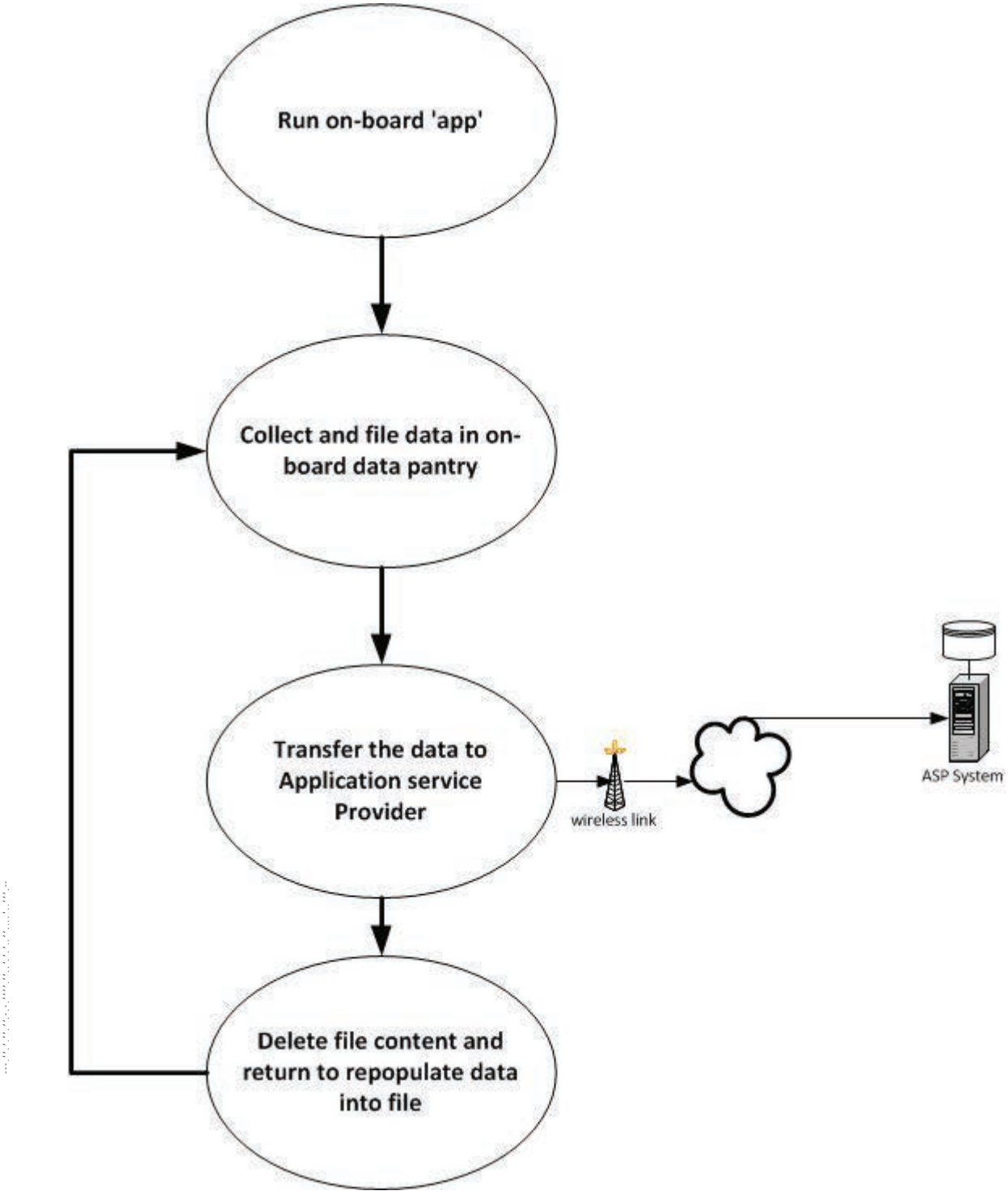

Figure 1 — TARV-regulated application service on-board procedure

At a common generic functional level for this application service, the process can be seen as shown in Figure 2 below, however, the connected equipment might or 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* (4.29), *approval authority* (4.8), *application service provider* (4.4), and *user* (4.48) 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* (4.39) 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* (4.39) shall be as defined in ISO 15638-6.

9.5 Quality of service

Generic quality of service provisions for *application services* (4.3) 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 "mass" monitoring *application service* (4.3) 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 Access control to data policy

To protect the data and information held by the *application service provider* (4.4), 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* (4.6) of IVSs and *service providers* (4.42) shall be as specified in ISO 15638-3 (TARV – Operating requirements, *approval* (4.6) procedures, and enforcement provisions for the providers of regulated services). Detailed provisions for specific *regulated applications* (4.38) shall be as specified by the regime of the *jurisdiction* (4.29).

10 Vehicle mass monitoring (VMM)

10.1 TARV VMM service description and scope

10.1.1 TARV VMM use case

On-board *mass* (4.33) measurement refers to a means of measuring the *mass* of a given heavy vehicle with equipment affixed to the *regulated vehicle* (4.40).

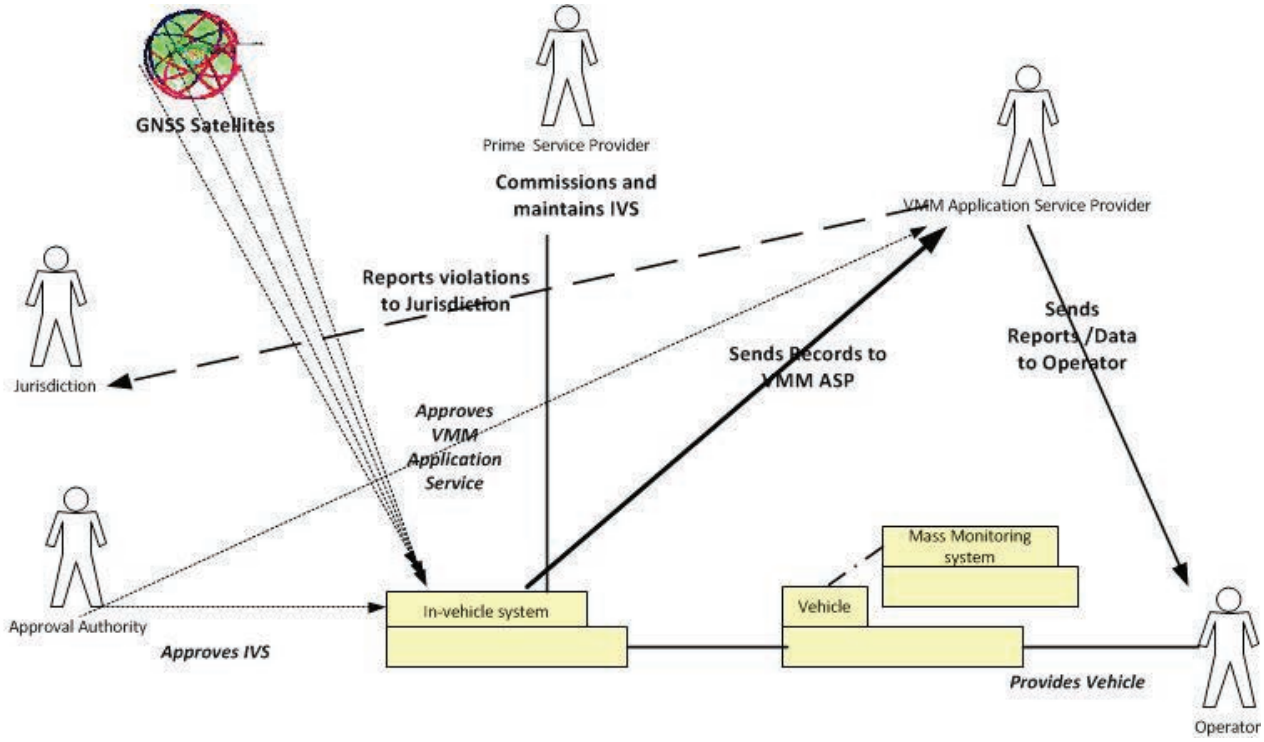

Figure 2 — Vehicle mass monitoring use case

Figure 2 provides an illustration of a TARV *vehicle mass monitoring* (4.52) system. This *application service* (4.3) is described in 10.1.2 and 10.1.3 below.

10.1.2 Description of TARV VMM regulated application service

On-board *mass* (4.33), technology can be used as a means of managing the risk of overloading (non-compliance with "*mass*" limits). Overloading can increase the cost of road infrastructure maintenance by increasing the rate of wear and damage to pavements and bridges.

Overloading of heavy vehicles also has the potential to reduce road safety levels. There are two mechanisms by which the following can occur.

— Heavy vehicle stability is an important factor in minimizing the risk of rollover. As heavy vehicle mass increases, the stability tends to decrease. Grossly overloaded heavy vehicles are often at a greater increased risk of rollover.

— Heavy vehicle braking performance is reduced as mass increases (causing them to take longer to stop).

The additional costs imposed by overloaded vehicles are subsidized by the majority of compliant-heavy vehicle transport sector.

Reduced confidence in mass compliance might over-limit the extent of road network access for higher productivity vehicles.

A demonstrated ability to verify the mass of each load is a cornerstone of the *vehicle mass monitoring* (4.52). The equipment affixed to the *regulated vehicle* (4.40) should be calibrated before initiation of the service and regularly maintained and checked (see 10.2.7 and 10.4.4).

The TARV *vehicle mass monitoring* (4.52) system centres on the *IVS* (4.26) and information provided to it from on-board, advising, and updating on the load status. Vehicle location is generated by the *IVS*'s *GNSS* (4.24) receiver as part of the TARV *basic vehicle data* (4.11), as specified in ISO 15638-5. Vehicle *mass* (4.33) is measured as defined herein. The functions of the stakeholder "actors" in the *vehicle*

mass monitoring (4.52) system are similar to those described for the *vehicle location monitoring* (4.51) application defined in ISO 15638-15, and could be considered a use case variant of the *vehicle consignment* and *location monitoring* defined in ISO 15638-17. However, whereas in those *specifications* (4.44), load data are generated by one of the means (specified in ISO 26683-1 and ISO 26683-2), this "*vehicle mass monitoring"* (4.52) *application service* (4.3) *specification* (4.44) obtains its mass calculations by a specific form of measurement through equipment especially installed for this purpose.

Figure 2 provides an illustration of a *vehicle mass monitoring* (4.52) system. This *application service* (4.3) is described in 10.1.3 and 10.2 below.

10.1.3 Description of TARV "vehicle mass monitoring" (TARV VMM) application service

The TARV *vehicle mass monitoring* (4.52) (TARV VMM) application service can exhibit itself in a number of different forms in different *jurisdictions* (4.29). For some, it can be an issue of mandatory compliance, some will permit heavier load carrying for mass monitored vehicles, others only providing support data for commercial fleet management. It might or might not involve compliance actions. Individual instantiations use cases will vary slightly and the landside application service is not specified herein. This *application service* (4.3) is likely to be named differently according to its origin and the regulatory environment in which it is instantiated. "*Vehicle mass monitoring*" (4.52), "vehicle load compliance", being typical example names for this type of *application service* (4.3).

The exact nature and form of the requirements and reports will vary from instantiation to instantiation, and such detail is not standardized in this part of ISO 15638. As with most TARV applications, the principal host application is provided landside by an *application service provider* (4.4) system. The function of *in-vehicle system* (4.26) is to provide data to service the application using a wireless link between the *regulated vehicle* (4.40) and the roadside. This part of ISO 15638 specifies the basic *architecture* (4.9) and information needed to support this type of application service using TARV, so that the *in-vehicle system* (4.26) can satisfy the requirements of any likely instantiation in respect of providing or receiving data as required by *application service providers* (4.4)and *jurisdictions* (4.29) when the *regulated vehicles* (4.40) and *driver* (4.18) are operating within their domain so that an off-board application can provide the full *application service* to its client system. TARV VMM can also be used to support non-jurisdictional *commercial applications* (4.13) of a similar nature.

The difference between this *VMM application service* and the *vehicle location monitoring* (4.51) *application service* defined in ISO 15638-15, is that this *application service* additionally provides dynamic information about the load, as well as the location of the *regulated vehicles* (4.40), but it does not provide the same level of *driver* (4.18) monitoring. See also ISO 15638-11 TARV *driver work records* (4.19).

Figure 2 shows an example of use case-appropriate where reports are required by the *jurisdiction* (4.29) and where compliance is also monitored, such that transgression can result in an offence/prosecution, perhaps the most comprehensive use case example of the TARV VMM *application service* (4.3).

10.2 Concept of operations for TARV VMM

10.2.1 General

Vehicle mass monitoring (4.52) is an *application service* (4.3) that has two options.

a) Monitoring the *mass* (4.33) of the *regulated vehicle* (4.40) for regulatory purposes.

b) Monitoring the mass of the *regulated vehicle* (4.40) for fleet operation management purposes.

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

Monitoring the *regulated vehicle* (4.40) and the movement of a load for regulatory purposes provides an automated version of more traditional location enforcement system, or infrastructure based weigh-in-motion systems, which are designed to identify an instance of contravention and provide the evidence of such contravention to the *jurisdiction* (4.29). Identification of the *driver* (4.18) is not specified in this

application, but if required can be simultaneously provided through the simultaneous operation of the TARV *VLM* (4.51) application described in ISO 15638-15.

Monitoring the location of the *regulated vehicle* (4.40) for fleet operation management purposes does not involve the *jurisdiction* (4.29) and is simply the provision of information for fleet management systems.

Regulated vehicles (4.40) often have regulatory limitations on route due to their class, weight, configuration, shape, and size. Journeys can have restrictions in respect of route, weight, type of load, etc. Some categories of *regulated vehicles* (4.40) are only permitted to travel on pre-specified and approved routes, and some routes have weight restrictions or load substance restrictions.

Some *jurisdictions* (4.29), for some circumstances, require a record of the actual route used when carrying specific loads. Using traditional means, where a *regulator* (4.30) 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* (4.40). The *jurisdiction* (4.29) then issue a violation ticket to the owner of the *regulated vehicle* (4.40), but it is the *driver* (4.18) who is responsible for the violation, and so his details are supplied by the owner to the *jurisdiction* (4.29) and the *driver* (4.18) is subsequently, prosecuted.

TARV *vehicle mass monitoring* (4.52) uses *GNSS* (4.24) systems [such as *GPS* (4.25)] to establish the *regulated vehicle* (4.40) position, combined with load information which is provided dynamically by devices installed in the *regulated vehicle* (4.40).

TARV for *vehicle mass monitoring* (4.52) is achieved by installing and running an *app* (4.2) in the on-board data library to create a file (named VMM) containing relevant data and to provide that data to the application from time to time via wireless communications, in accordance with the instructions of the *app* (4.2), to meet the requirements of the *application service* (4.3) as defined by the *application service provider* (4.4).

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

10.2.2.1 Monitoring the mass of the regulated vehicle for regulatory purposes

The objective is to provide evidence to prove compliance to the regime of the *jurisdiction* (4.29), in respect of the journey or route combined with *mass* (4.33) data, or in the event of contravention to provide evidence to support enforcement.

10.2.2.2 Monitoring the mass of the regulated vehicle for fleet operation management purposes

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

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

The principle issues are those of acceptance, particularly in the case of enforcement. No *operator* (4.35) is likely to choose to equip his vehicle in order that it increases the probability that his organization and his *drivers* (4.18) can be prosecuted. As with the TARV *VLM* (4.52) application defined in ISO 15638-15, TARV *VMM* (4.52) is therefore, only likely to be instantiated where the *jurisdiction* (4.29) has persuaded the public to accept that *regulated vehicles* (4.40) are a special class of vehicle where it is in the strong public interest to ensure that they do not violate location/route/load restrictions that are imposed on them, or for commercial purposes not involving the *regulator* (4.30).

In respect of enforcement, the *jurisdiction* (4.29) might have to adapt traffic regulations to accommodate the TARV method of collecting data.

In all probability, TARV *VMM* (4.52) is only likely to be instantiated as one of a series of measures controlling *regulated vehicles* (4.40), or for commercial management purposes.

The *IVS* (4.26) is a device of limited capability, and will be expected to be multi-tasking with other TARV "apps" and also conducting non-TARV cooperative vehicle system apps at the same time. It is therefore important that the *IVS* (4.26) is not overloaded by a complicated TARV *VMM* (4.52) *app* (4.2).

This part of ISO 15638 specifies the data needed for these possibilities, but it does not design the *application service* (4.3). That is left to the *jurisdiction* (4.29), the *application service provider* (4.4), and *approval authority (regulatory)* (4.8). The principal application service provision will take place, landside, in the system of the *application service provider* (4.4). The function of the on-board TARV *VMM* (4.52) system is to provide data to that system via a wireless link, and can, on occasions, receive data back from the principal application service system.

A principal differentiating feature of the TARV *VMM* (4.52) *application service* (4.3) is the dynamic provision of *mass* (4.33) data about its loading. Using the TARV *VMM* application, the *regulated vehicle* can send its TARV *VMM* data either

a) on request from the *driver* (4.18),

b) at regular intervals as determined by the system,

c) when particular thresholds trigger the system to send the data, or

d) on demand from the roadside.

10.2.4 Organizations, activities, and interactions among participants and stakeholders for TARV VMM

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 VMM actors activities and interactions

ACTOR	ROLE	ACTIVITIES	INTERACTIONS
Jurisdiction (J) (4.29)	Sets requirements for mandatory and supported *VMM* (4.52)	Publishes *specifications* (4.44)	ALL
		Obtains regulations	ALL: Establish regime and regulations PSP: Register ASP: Register, receive reports Op: *Regulated vehicle* (4.40) registration
		Appoints *approval authority* (4.8)	AA: Contract. Instruct. Receive reports
		Monitors reports	
		Instigates enforcement	ALL: Process enforcement
Approval authority (AA) (4.8)	Implements *jurisdiction* (4.29) policy at equipment and service approval level	Approves *IVS* (4.26), application service instantiations	PSP: Approve *IVS* (4.26) ASP: Approve *application service* (4.3)
		Conducts Q of S maintenance to instruction of *jurisdiction* (4.29)	

Table 1 *(continued)*

ACTOR	ROLE	ACTIVITIES	INTERACTIONS
Prime service provider (PSP) (4.37)	Responsibility for *IVS* (4.26)	Installs and/or commissions *IVS* (4.26)	AA: Can apply to approve *IVS* (4.26)/*tachograph* (4.45)/reader/load sensing equipment Op; Installation
		Maintains *IVS* (4.26) and reader	Op: Maintain *IVS* (4.26) and reader
		Equips vehicle and/or trailers with load recording equipment	Op: Maintains load recording equipment
Application service provider (ASP) (4.4)	Provides *VMM application services* (4.3)	Develops instantiation of *VMM application service* (4.3)	AA: Applies for *approval* (4.6) of service
		Contracts with *users* (4.48)	Op: Contracts
		Provides *VMM application service* (4.3) to *users* (4.48) and *jurisdiction* (4.29)	Op: Provides service Dr: Can provide service J: Provides service/reports re violations
Operator (Op) (4.35)	Provides *regulated vehicle* (4.40)	"Employs"/contracts *drivers* (4.18)	Dr: Employs/contracts
	Uses *regulated vehicle* (4.40) for commerce and logistics	Operates *regulated vehicle* (4.40)	J: Registers *regulated vehicle* (4.40) PSP: Contracts, receives service ASP: Contracts, receives service
		Receives reports from *ASP* (4.4)	
Driver (Dr) (4.18)	Drives *regulated vehicle* (4.40) to instruction of *operator* (4.35)	Drives *regulated vehicle* (4.40)	Op: To instructions

10.2.5 Clear statement of responsibilities and authorities delegated for TARV VMM

10.2.5.1 The *jurisdiction* (4.29) shall be responsible for the regime and regulations.

10.2.5.2 The *jurisdiction* (4.29) shall employ an *approval authority (regulatory)* (4.8) or otherwise, provide its function.

10.2.5.3 The *jurisdiction* (4.29) shall provide means for enforcement (where required) to meet the requirements of the regime of the *jurisdiction* (4.29).

10.2.5.4 The *prime service provider* (4.37) (PSP) shall install/commission *IVS* (4.26) and maintain *IVS* (4.26).

10.2.5.5 The *prime service provider* (4.37) shall install/commission a mass monitoring component (MMC) connected to *mass* (4.33) sensors; MMC equipment shall be robustly connected to the respective *prime mover* (4.36)/rigid truck to be monitored under the TARV *VMM* system

10.2.5.6 The *application service provider* (ASP) (4.4) shall develop the TARV *VMM application service* (4.3) or use a TARV *VMM application service* (4.3) provided by *jurisdiction* (4.29).

10.2.5.7 The *ASP* (4.4) shall obtain any required *approval* (4.6) of its TARV *VMM* service from an *approval authority (regulatory)* (4.8).

10.2.5.8 The *ASP* (4.4) shall contract with the *user* (4.48) [normally *operator* (4.35) but in some instantiations also with *driver* (4.18)].

10.2.5.9 The *ASP* (4.4) shall be responsible to provide the *application service* (4.3) to the *jurisdiction* (4.29), *operator* (4.35), and *driver* (4.18) as specified in its service offering.

10.2.5.10 The *operator* (4.35) shall be responsible to provide the *regulated vehicle* (4.40).

10.2.5.11 The *operator* (4.35) shall be responsible to abide by requirements of regime re TARV VMM.

10.2.5.12 The *operator* (4.35) shall be responsible to pay fees required by *jurisdiction* (4.29), *prime service provider* (4.37), and *application service provider* (4.4).

10.2.5.13 The *driver* (4.18) shall be responsible to follow instructions.

10.2.6 Equipment required for TARV VMM

10.2.6.1 TARV IVS

10.2.6.1.1 The system shall be designed to work using TARV *IVS* (4.26) as defined in this International Standard.

10.2.6.1.2 The *prime service provider* (4.37)/*application service provider* (4.4) shall provide to the *approval authority (regulatory)* (4.8), evidence of compliance from an appropriate body to demonstrate the suitability for use in vehicles for the *IVS* (4.26) and all associated components

10.2.6.1.3 It shall not be possible for collected or stored *vehicle mass monitoring* (4.52) data or *vehicle mass monitoring* (4.52) in any software or non-volatile memory within the *IVS* (4.26) to be accessible or capable of being manipulated by any person, device or system, other than that authorized by the *application service provider* (4.4).

10.2.6.2 VMM Unit(s) (VMMU)

10.2.6.2.1 A *vehicle mass monitoring* (4.52) unit (VMMU) shall consist of a mass monitoring component (MMC) connected to mass sensors.

10.2.6.2.2 A VMMU shall be robustly connected to the respective *prime mover* (4.36)/rigid truck to be monitored under the *VMM*.

10.2.6.2.3 Each VMMU in the *VMM application service provider's* (4.4) system shall have a unique alphanumeric identification number to uniquely identify the VMMU (VMMU-ID).

10.2.6.2.4 The VMMU-ID shall be stored in the non-volatile VMMU memory. The number shall be resistant to alteration by all parties except for the *application service provider* (4.4).

10.2.6.2.5 The VMMU-ID shall be visibly etched on the outside casing of the VMMU to allow for manual identification in a manner such that it cannot be modified or removed.

10.2.6.2.6 The VMMU-ID shall not be able to be set or altered by any person other than the VMM *application service provider* (4.4) or the *prime service provider* (4.37) in agreement with the *application service provider* (4.4), or otherwise *tampered* (4.46) with.

10.2.6.2.7 The vulnerability of a VMMU to physical *tampering* (4.46) shall be minimised by securing the *VMMU* to the *regulated vehicle* (4.40) and ensuring that any unauthorised removal or opening of the *VMMU* is detected. This shall be achieved through the use of security seals, which detect unauthorized detachment or access upon subsequent manual inspection.

10.2.6.2.8 Removal or opening of the VMMU shall be possible only by breaking the security seal(s) and the security seal(s) shall be such that if broken, they cannot be reinstated. The VMMU shall be placed in a position that facilitates inspection of the integrity of the security seal(s).

10.2.6.2.9 The security seal(s) shall clearly display signs of any unauthorized access, either visually and/or physically.

10.2.6.2.10 "Axle Group Identifiers" shall be used to identify individual axle groups and hence the combination of the *regulated vehicle* (4.40). Each "Axle Group ID" shall uniquely identify an axle group, and the same types of axle groups shall have the same alphanumeric prefix of length three (Table 2). For example, prefixes PS1, PD2, T43, and T23 shall indicate a standard B-double.

Table 2 — Axle Group ID prefixes

Axle group type	Number of axles	Axle Group ID prefix
Rigid Steer	1	RS1
Rigid Steer	2	RS2
Rigid Drive	1	RD1
Rigid Drive	2	RD2
Rigid Drive	3	RD3
Prime mover (4.36) Steer	1	PS1
Prime mover (4.36) Drive	1	PD1
Prime mover (4.36) Drive	2	PD2
Prime mover (4.36) Drive	3	PD3
Dolly	1	DO1
Dolly	2	DO2
Dolly	3	DO3
Pig Trailer	1	PT1
Pig Trailer	2	PT2
Pig Trailer	3	PT3
Trailer 20 foot	1	T21
Trailer 20 foot	2	T22
Trailer 20 foot	3	T23
Trailer 20 foot	4	T24
Trailer 40 foot	1	T41
Trailer 40 foot	2	T42

Table 2 *(continued)*

Axle group type	Number of axles	Axle Group ID prefix
Trailer 40 foot	3	T43
Trailer 40 foot	4	T44
Special	(to be determined)	SPE

10.2.6.2.11 The Axle Group ID shall be stored in non-volatile programmable read-only memory of the VMMU.

10.2.6.2.12 It shall not be possible to alter the Axle Group ID in non-programmable read-only memory without making the VMMU permanently inoperable.

10.2.6.2.13 The *application service provider* (4.4) system shall be capable of providing comment where it believes that input from a VMMU can have been incorrect or faulty.

10.2.6.2.14 The *VMM application service provider* (4.4) shall provide evidence to the its home *jurisdiction* (4.29) , and have evidence available for any *jurisdiction* (4.29) through which the *regulated vehicle* (4.40) can operate that the equipment installed in the *regulated vehicle* (4.40) for the VMM application.

10.2.6.2.14.1 The VMMU shall comply with all of the performance requirements in this *specification* (4.44) when subjected to the vibration specified in the standard or regulation of its *jurisdiction* (4.29) of registration, in respect of vibration relevant for the class of vehicle.

10.2.6.2.14.2 The VMMU shall comply with all of the performance requirements in this *specification* (4.44) when subjected to the vibration specified in the standard or regulation of its *jurisdiction* (4.29) of registration, in respect of impact relevant for the class of vehicle.

10.2.6.2.14.3 The VMMU shall comply with all of the performance requirements in this *specification* (4.44) when subjected to the vibration specified in the standard or regulation of its *jurisdiction* (4.29) of registration, in respect of temperature and humidity relevant for the class of vehicle.

10.2.6.2.14.4 The VMMU shall comply with all of the performance requirements in this *specification* (4.44) when subjected to the vibration specified in the standard or regulation of its *jurisdiction* (4.29) of registration, in respect of electro-magnetic compatibility relevant for the class of vehicle.

10.2.6.2.14.5 VMMU components exposed to the elements shall comply with the dust and water ingress protection requirements as defined in International Standard IEC 60529-2004 “Degrees of Protection Provided by Enclosures (IP Code), IP Code: IP66, Table 7, Item 6” and shall comply to related relevant International Standards in its *jurisdiction* (4.29) of registration.

10.2.6.2.14.6 VMMU components mounted in the cabin shall comply with the dust and water ingress protection requirements of IP44, Table 7, Item 4, 10.4 and Table 8, Item 4 and 10.2.4 as defined in IEC 60529:2004, IEC 60529-2004 “Degrees of Protection Provided by Enclosures (IP Code)”.

10.2.6.2.14.7 The VMMU shall be tolerant to radio frequency and electrical interference as defined in 2004/104/EC, 6.7 and 6.8 with functional status “A”, Table 1.

10.2.6.2.14.8 Electromagnetic emissions from the VMMU shall not exceed the limits in2004/104/EC, 6.9 using the pulse amplitude levels for either 12 V or 24 V systems as appropriate, Table 2.

10.2.6.2.14.9 Electromagnetic emission from the VMMU shall not exceed the limits in AS/NZS CISPR 22:2006, “Information technology equipment — Radio disturbance characteristics — Limits and methods of measurement, Class B, Table 6”.

10.2.6.2.14.10 The *VMMU security* seals shall remain intact when exposed to the tests specified in 10.2.6.2.14 above.

10.2.6.2.15 VMMU data and time data

10.2.6.2.15.1 The VMMU shall collect and store date and time data in UTC format.

10.2.6.2.15.2 The date and time shall be stored with a resolution of 1 s.

10.2.6.2.15.3 The VMMU shall have an internal clock that operates independently of the supporting external power supply.

10.2.6.2.15.4 In the event the external power supply fails or shuts down, the VMMU internal clock shall operate for a period of at least 28 d.

10.2.6.2.15.5 The accuracy of the VMMU internal clock shall be such that it does not deviate by more than 1 s from the UTC date and time over any 28-d period when using *GNSS* (4.24) signals.

10.2.6.2.15.6 The accuracy of the VMMU internal clock shall be such that it does not deviate by more than 10 s per day from the UTC date and time over any 28-d period when not using *GNSS* (4.24) signal.

10.2.6.2.16 VMMU Data record storage capability and power supply

The VMMU shall be capable of storing at least 20 000 *mass* (4.33), alarm, SD records and MQRA (combined), 60 MQRB, 50 calibration records, either in its internal memory or the memory of the *TARV IVS* (4.26).

If the volume of data collected and generated prior to transfer to the *VMM application service provider* (4.4) system exceeds the data storage capacity of the VMMU, new data shall not overwrite stored data.

In the event that the external power supply supporting the VMMU fails or shuts down, the VMMU shall be capable of

a) retaining stored data for at least 28 d, and

b) monitoring the status of the ignition and other independent movement sensor for at least seven days.

10.2.6.2.17 VMMU documentation

The VMMU and all components, cabling, and their interfaces shall be fully documented and a copy of the documentation made available to the home *jurisdiction* (4.29) in which the *regulated vehicle* (4.40) is registered.

10.2.6.3 Mass sensors capabilities and data

10.2.6.3.1 *Mass* (4.33) sensors shall be capable of measuring up to 150 % of the maximum capacity of the axle group.

10.2.6.3.2 A limit switch shall be installed to restrict the turntable location so that the accuracy of *mass* (4.33) measurements in the on-board equipment is maintained

NOTE On heavy vehicles that comprise of a *prime mover* (4.36) and at least one trailer, the load distribution among axle groups can be significantly changed by shifting the location of a turntable. Shifting the location of a turntable can also affect the accuracy of *mass* measurements in the on-board equipment.

10.2.6.3.3 The MMC of the VMMU shall collect and store *mass* (4.33) quality data for each axle group and gross combination mass (GCM) for the *regulated vehicle* (4.40).

10.2.6.3.4 The axle group *mass* (4.33) calculated by the MMC shall not deviate by more than 500 kg from the absolute axle group mass for 95 % of the observations, when the *regulated vehicle* (4.40) is stationary.

10.2.6.3.5 The GCM calculated by the MMC shall not deviate by more than the amount specified in Table 3 for the corresponding axle group configuration, from the absolute GCM for 95 % of the observations, when the *regulated vehicle* (4.40) is stationary.

10.2.6.3.6 The resolution of the stored *mass* (4.33) data calculated by the MMC shall be to 10 kg or better.

Table 3 — GCM accuracies for different vehicle types

Axle configuration	Tolerance	Rounded tolerance
Rigid 11	4,71 %	5 %
Rigid 12	3,14 %	3 %
Rigid 22	2,57 %	3 %
Rigid 23	2,28 %	2 %
Semi trailer 111	3,36 %	4 %
Semi trailer 122	2,22 %	2 %
Semi trailer 123	2,04 %	2 %
B double 1233	1,60 %	2 %
Others	To be determined by *jurisdiction* (4.29)	

10.2.6.3.7 *Mass* (4.33) quality data shall be used to indicate the health of *mass* data. There are two types of mass quality data: mass quality record A (MQRA) data and mass quality record B (MQRB) data.

The generation of both MQRA and MQRB data requires a dynamic *mass* measurement frequency of at least 30 Hz (30 times in a second).

Tampering (4.46) with the MMC in a VMMU can be detected through the analysis of a heavy vehicle's vibration frequencies.

MQRA data shall be generated and stored every 30 s, and shall include a derivative from the dynamic *mass* measurements (it could be for example the 30 s running average of dynamic mass measurements), which can be used to detect possible violation of VMMU operation procedures.

MQRB data contains the full dynamic *mass* measurement in 30 s blocks, and can be used to detect other types of *tamper* (4.46) events such as *tampering* (4.46) with calibration.

10.2.6.3.8 Different amounts of MQRB data will be required to achieve different levels of confidence in the *tamper* (4.46) detection process. Furthermore, for a longer trip, the frequency of MQRB generation can, at the discretion of the *jurisdiction* (4.29) can be reduced provided that the amount of MQRB data is sufficient to produce a confident result. Because of its potential demands on memory, MQRB shall only be generated, stored, and transmitted when required.

10.2.6.3.9 The *mass* (4.33) measurement component of the VMMU shall collect *mass* data continuously at a minimum rate of 30 Hz for each axle group and GCM for the *regulated vehicle* (4.40). The VMMU shall generate MQRA and MQRB data.

10.2.6.3.10 The *mass* (4.33) measurement component of the VMMU shall store the continuously collected mass data of MQRA at all times, and MQRB data when instructed by the *application service provider* (4.4). If a *jurisdiction* (4.29) requires MQRB data for a specific journey, it shall instruct the *application service provider* (4.4) to arrange to harvest the MQRB data for that journey. This can be so instructed either before a journey commences, or commenced during the journey.

10.2.6.3.11 MQRA shall not deviate by more than 750 kg from the absolute axle group *mass* (4.33) and GCM for 95 % of the observations when the *regulated vehicle* (4.40) is in operation.

10.2.6.3.12 The MMC of the VMMU shall be able to generate MQRB in 30 s blocks.

10.2.6.3.13 The frequency of MQRB generation shall be determined by the home *jurisdiction* (4.29) in which the *regulated vehicle* (4.40) is registered.

10.2.6.3.14 In order to accurately report the *mass* (4.33) information about a heavy vehicle, the MMC of a VMMU shall be properly calibrated on a per axle group basis, with a FULL and an EMPTY values. Further, a set of calibration procedures, determined by the home *jurisdiction* (4.29) in which the *regulated vehicle* (4.40) is registered shall be strictly followed to achieve the best results for *mass* measurements.

10.2.6.3.15 Calibrating the VMMU shall be restricted to personnel authorized by the *jurisdiction* (4.29), and the calibration data shall at least include the *mass* (4.33) values used for calibration as well as identification of the calibration personnel.

10.2.6.3.16 The VMMU shall record and store calibration and re-calibration data for each axle group of the *regulated vehicle* (4.40).

10.2.6.3.17 Installed *mass* (4.33) sensors and all components, cabling and their interfaces shall be fully documented and a copy of the documentation made available to the home *jurisdiction* (4.29) in which the *regulated vehicle* (4.40) is registered.

10.2.6.4 TARV VMM "app"

10.2.6.4.1 The TARV *VMM app* (4.2) running on the *IVS* (4.26) shall operate when the *regulated vehicle* (4.40) is operating and shall record the vehicle *mass* (4.33) at intervals as determined below and shall file that data in its memory of the *IVS* (4.26) in a file of type VMM, and named as determined herein.

10.2.6.4.2 A vehicle shall be considered to be in operation when the VMMU's supporting external power supply is connected to the VMMU and the ignition status is ON.

10.2.6.4.3 At intervals determined by the approved *application service* (4.3) system *specification* (4.44) or on request from the *application service provider* (4.4), so long as a suitable wireless interface is available, the on-board *IVS* (4.26) shall transmit the contents of the *VMM* file containing the MQRA data (defined below) held in the memory of the *IVS* (4.26) to the *VMM* system of the *application service provider* (4.4) via its most appropriate wireless communications interface.

In the event that a wireless interface is not available to the *IVS* (4.26) at the required point in time, the *IVS* (4.26) shall transmit the data at the earliest opportunity.

The host system shall acknowledge successful receipt of the data by sending the ACKnowledgement "VMX"

10.2.6.4.4 Once the VMM system of the *application service provider* (4.4) has acknowledged successful receipt of the data with the VMX ACK, the data held in the VMM file shall be deleted from the memory of the *IVS* (4.26) unless the *user* (4.48) or *application service provider* (4.4) requires it for other purposes.

10.2.6.5 Mass Records — MQRA

10.2.6.5.1 The system shall provide the function for the *driver* (4.18) to declare the *mass* (4.33) records

10.2.6.5.2 The VMMU shall generate *mass* (4.33) records from the data collected by the VMMU, and store mass records that detail the mass and position data for the *regulated vehicle* (4.40) being monitored

10.2.6.5.3 A "*mass* (4.33) record" can be recorded at a location decided by the *jurisdiction* (4.29) or the *driver* (4.18).

NOTE In operation, the point of loading is often not the best place for taking an accurate VMM measurement. A driver can decide to take the measurement later during the trip, on a level ground and with brakes off.

10.2.6.5.4 A "mass record" shall consist of the following data:

a) record number;

b) TARV *LDT* (4.31) data as created by "CREATECoreData" and retrieved by "GETCoreData" as specified in ISO 15638-5;

c) axle group IDs;

d) axle group configuration;

e) axle group masses (AGMs);

f) gross combination mass (GCM).

10.2.6.5.5 Vehicle position (latitude/longitude) shall be blank/void if the VMMU used zero satellites, or was unable to determine vehicle position.

10.2.6.5.6 The VMMU shall continuously generate and store "Mass Quality Records A" (MQRA) at least once every 30 s when the *regulated vehicle* (4.40) is in operation. A vehicle is considered to be in operation when the external power supply to the VMMU is connected and the ignition status in ON.

10.2.6.5.7 A MQRA has the same content requirements as a *mass* (4.33) record as defined in 10.2.6.5.4, and shall be generated and stored every 30 s at the 0th and 30th second of every minute (UTC format) ±0,2 s. The purpose of fixing the MQRA generation time is to facilitate any future trailer interoperability.

10.2.6.5.8 There shall be an accuracy requirement (±750 kg) for the *mass* (4.33) data within an MQRA. The *VMM application service provider* (4.4) shall implement an algorithm to calculate AGMs and GCM for the *regulated vehicle* (4.40). The algorithm could be the mean or median of dynamic mass measurements over a period of time, or anything else that the *VMM application service provider* (4.4) considers as more suitable.

10.2.6.6 Mass Records — MQRB

10.2.6.6.1 The VMMU shall be capable to continuously generate and store "Mass Quality Records B" (MQRB*)* every 30 s when the *regulated vehicle* (4.40) is in operation

10.2.6.6.2 MQRB shall comprise full dynamic *mass* (4.33) measurements over 30 s blocks. They capture the body bounce and axle hop frequencies of the *regulated vehicle* (4.40), and can be used to verify the mass data in "mass records" and MQRA. The body bounce frequency is fundamentally related to the vehicle mass and the suspension characteristics, and independent of the magnitude of the mass measurement

10.2.6.6.3 The body bounce frequency shall be given by the equation $f = \sqrt{(k/m)}$, where

f is the body bounce frequency;

k is a fixed value for a particular suspension;

m is the *mass* (4.33) imposed on the suspension.

NOTE By analysing the body bounce frequencies, it is possible to estimate the *mass* for any axle groups. This provides an independent assessment for the reliability of mass data reported by mass records and MQRA. It was also found that the axle-hop frequencies fall within a "healthy" band when the VMMU was in normal operations and outside that band when the VMMU was *tampered* (4.46) with. A *tampering* (4.46) indicator can then be developed to detect possible *tamper* (4.46) events. The inputs to a *tampering* (4.46) indicator are the axle-hop frequencies extracted from MQRB.

Typically, the body bounce and axle-hop frequencies of a heavy vehicle are around 2 Hz and 12 Hz respectively. According to the Nyquist rate, a minimum sampling frequency of 24 Hz (twice as fast as the axle-hop frequency 12 Hz) is required to capture both the body bounce and axle-hop frequencies. The *specification* (4.44) has considered a safety margin and decided a minimum sampling frequency of 30 Hz for *mass* measurements for MQRB.

10.2.6.6.4 The VMMU shall be capable to generate MQRB from the data collected by the VMMU, and store MQRB that detail the *mass* (4.33) and position data for the *regulated vehicle* (4.40) being monitored in its memory or in the memory of the *regulated vehicle* (4.40) TARV *IVS* (4.26).

10.2.6.6.5 MQRB shall be generated and stored only when instructed by the *application service provider* (4.4) and shall be generated until the ignition is turned off, or an instruction to stop generating MRQB is received from the *application service provider* (4.4). A *jurisdiction* (4.29) can instruct an *application service provider* (4.4) to enable this facility at any time.

10.2.6.6.6 An MQRB shall consist of at least the following data:

a) record number;

b) 30 s of *mass* (4.33) measurement at a minimum rate of 30 Hz;

c) date/time (*UTC* format) of the start of the MQRB generation;

d) date/time (*UTC* format) of the end of the MQRB generation;

e) order of the axle group for the *regulated vehicle* (4.40) (e.g. steer axle is axle group one);

f) number of axle(s) for this axle group.

10.2.6.6.7 If MQRB is being generated it shall be stored in a file VMMB.

10.2.6.6.8 The contents of file VMMB shall be transmitted to the *application service provider* (4.4) every 5 min while MRQB is being generated. If no practical wireless link is available, data shall be stored for a further 5 min. If it is still not possible to transmit the data, the collection of MQRB shall cease immediately until a fresh instruction is received from the *application service provider* (4.4), and the file shall be transferred to the host application system at the earliest opportunity.

10.2.6.6.9 The host system shall acknowledge successful receipt of the data by sending the ACKnowledgement "MBX".

10.2.6.6.10 Once the *VMM* system of the *application service provider* (4.4) has acknowledged successful receipt of the data with the MBX ACK, the data held in the VMMB file shall be deleted from the memory of the *IVS* (4.26) unless the *user* (4.48) or *application service provider* (4.4) requires it for other purposes.

10.2.6.6.11 It shall not be possible for collected or stored *vehicle mass monitoring* (4.52) data or *vehicle mass monitoring* (4.52) in any software or non-volatile memory within the *IVS* (4.26) to be accessible or capable of being manipulated by any person, device, or system (including via any self-declaration device), other than that authorized by the *application service provider* (4.4).

10.2.6.7 On-board map

Where an on-board *map* (4.32) is specified to provide part of the *VMM application service* (4.3), it shall be obtained from a recognized provider of *maps* (4.32), and shall have a means of, and system for, regular updating.

10.2.7 Calibration of mass sensors

10.2.7.1 General

The calibration of a VMMU has direct impacts to the accuracy of *mass* (4.33) measurements.

Hence, it is important to keep a calibration history so that it provides a source for verifying the possible cause for any VMMU malfunction or *tamper* (4.46) events.

Generally, a calibration process can be performed within a few minutes or can last up to a few hours. Between the start and the end of a calibration process, the VMMU is not able to provide accurate or reliable *mass* (4.33) measurement. Therefore, it is important to determine the period of calibration. Further, a calibration process that is conducted beyond reasonable duration can indicate possible violation of procedures or *tampering* (4.46).

A *mass* (4.33) sensor typically generates an electrical signal (in the order of millivolt) corresponding to a certain pressure value [as a result from a *mass* (4.33) value]. The values of the *mass* (4.33) and electrical signals can be used to compare against the values from previous calibrations, and hence, detect possible *tamper* (4.46) with the calibration data or violation of calibration procedures. The example below illustrates this logic of *tamper* (4.46)/violation detection:

Calibration #1: FULL mass = 20 000 kg, FULL electrical output = 20 mV, EMPTY mass = 10 000 kg, EMPTY electrical output = 12 mV

Calibration factor #1 = (FULL mass – EMPTY mass)/(FULL electrical output – EMPTY electrical output)

= (20 000 – 10 000)/(20 – 12) = 1 250 kg/mV

Calibration #2: FULL mass = 18 000 kg, FULL electrical output = 20 mV, EMPTY mass = 10 000 kg, EMPTY electrical output = 12 mv

Calibration factor #2 = (FULL mass – EMPTY mass)/(FULL electrical output – EMPTY electrical output)

= (18 000 – 10 000)/(20 – 12) = 1 000 kg/mV

Calibration factor #2 is 250 kg/mV less than calibration factor #1, this can indicate some *tamper* (4.46) with the calibration data or improper calibration procedures.

10.2.7.2 Authorized calibrators

An authorized number shall be issued to qualified and trained calibration personnel by the *VMM application service provider* (4.4), and shall be used to identify the person who performs the calibration.

10.2.7.3 Calibration records

The VMMU shall generate and store calibration records whenever the VMMU is calibrated or re-calibrated (refer to B.3.6).

A calibration record shall consist of at least the following data:

a) authorized number;

b) record number;

c) date/time of the start of the calibration record generation (UTC format);

d) date/time of the end of the calibration record generation (UTC format);

e) *mass* (4.33) values used for calibration (kilogram);

f) electrical outputs (in millivolt) associated with the *mass* (4.33) values used for calibration;

g) axle group IDs.

10.2.8 Alarm Records for TARV VMM

10.2.8.1 Alarm events for TARV VMM

The VMMU shall generate and store "alarm records" for each of the following events:

— the external power supply is disconnected from the VMMU;

— the external power supply is reconnected to the VMMU;

— movement is indicated by the ignition while the external power supply is disconnected from the VMMU;

— movement is detected by the other independent movement sensor while the external power supply is disconnected from the VMMU;

— the ignition is disconnected from the VMMU (with and without external power being connected);

— the ignition is reconnected to the VMMU (with and without external power being connected);

— the other independent movement sensor is disconnected from the VMMU (with and without external power being connected);

— the other independent movement sensor is reconnected to the VMMU (with and without external power being connected);

— unauthorized access to data in the VMMU is detected;

— unauthorized access to VMMU software is detected;

— the *GNSS* (4.24) antenna is disconnected from the VMMU (with and without external power being connected);

— the *GNSS* (4.24) antenna is reconnected to the VMMU (with and without external power being connected);

— sliding of the turntable is detected by the limit switch.

10.2.8.2 Alarm record data for TARV VMM

An "alarm record" shall consist of at least the following data:

— record number;

— date/time of generation (UTC format);

— the event that triggered the generation of the "alarm record" as defined in 10.2.8.1 above.

10.2.9 Operational processes for the TARV VMM system

As defined in 9.2.

For detail of the operational processes see 10.3 [sequence of operations for *vehicle mass monitoring* (4.52) and Figure 3].

10.2.10 Role of the jurisdiction for TARV VMM

As defined in 9.2, 10.2.4, and 10.2.5.

10.2.11 Role of the TARV VMM prime service provider

As defined in 9.2, 10.2.4, and 10.2.5.

10.2.12 Role of the TARV VMM application service provider

As defined in 9.2, 10.2.4, and 10.2.5.

10.2.13 Role of the TARV VMM user

As defined in 9.2, 10.2.4, and 10.2.5.

10.2.14 Generic characteristics for all instantiations of the TARV VMM application service

10.2.14.1 Once a *vehicle mass monitoring* (4.52) application service is approved, it utilizes a *TARV IVS* (4.26) which communicates to the *prime service provider* (4.37)/*application service provider* (4.4) and can have the ability to insert a means to provide *driver* (4.18) licence details.

10.2.14.2 The *application service provider* (4.4) shall load a *VMM* (4.52) *app* (4.2) into the *IVS* (4.26) of the *operator's* (4.35) vehicles.

10.2.14.3 The *VMM* (4.52) *app* (4.2) shall run whenever the *regulated vehicle* (4.40) is operating.

10.2.14.4 The *VMM* (4.52) *app* (4.2) shall record the data specified herein in the *IVS* (4.26).

10.2.14.5 The *application service provider* (4.4) shall design/install/operate its *vehicle mass monitoring* (4.52) system as approved by the *approval authority (regulatory)* (4.8).

10.2.14.6 The *IVS* (4.26) shall provide its *VMM* (4.52) data to the *application service provider* (4.4) using the TARV *IVS* (4.26) wireless link at least once every 24 h.

Every transfer shall include framing data that identifies its sequential order, *IVS* (4.26) ID, version number of *IVS* (4.26), and version number of the *VMM* (4.52) *app* (4.2).

The system shall acknowledge receipt of the data via the TARV *IVS* (4.26) wireless link. Once the data has been acknowledged, it shall be deleted from the *IVS* (4.26) memory unless the *operator* (4.35) chooses to retain it in the *IVS* (4.26) memory for other openly declared purposes with the assent of the *user* (4.48).

10.2.14.7 The *application service* (4.3) system shall retain and back up the *VMM* (4.52) data to the requirements of the *jurisdiction* (4.29).

10.2.14.8 The *application service provider* (4.4) shall provide reports to the *jurisdiction* (4.29) or its agents as specified and required by the *jurisdiction* (4.29) when approving the product.

10.2.14.9 Electronic records shall be generated periodically by the *IVS* (4.26) when the *regulated vehicle* (4.40) is moving. The electronic record shall contain accurate time and location data as defined herein, and detail of the load shall be supplied in accordance with one of the profiles of ISO 26683-2. These *VMM* (4.52) records are generated automatically during the "*session*" (4.43) and also stored in the *IVS* (4.26).

10.2.14.10 TARV *VMM* (4.52) records generated by the VMMU and stored in the *data pantry* (4.17) of the TARV *IVS* (4.26) shall be sent to the *application service provider* (4.4) as determined by the requirements of the system and limitations specified in this *specification* (4.44). The *application service provider* transmits the *VMM* (4.52) records or reports to the *regulated vehicle* (4.40) *operator* (4.35), and in the event of contravention, to the *jurisdiction* (4.29), in accordance with the regime of the *jurisdiction* (4.29).

10.3 Sequence of operations for TARV VMM

10.3.1 General

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

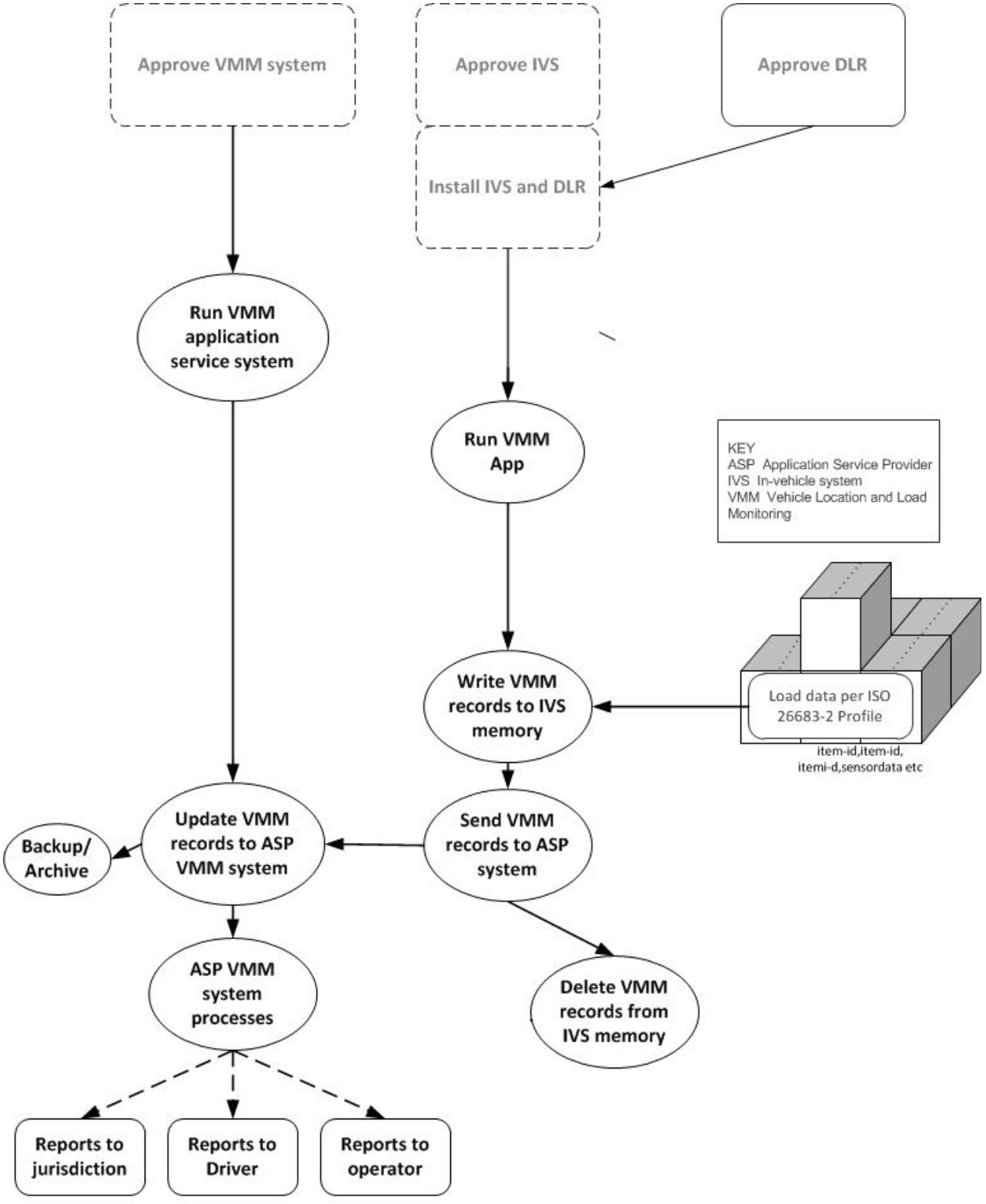

Figure 3 — TARV VMM business process and procedure

10.4 TARV VMM service elements

10.4.1 TARV VMM service element (SE) 1: Establish "vehicle mass monitoring" regulations, requirements, and approval arrangements

The *jurisdiction* (4.29) shall be responsible to define its requirements for its variant of the *vehicle mass monitoring* (4.52) *application service* (4.3), obtain any legislation and/or regulations, and define the procedure for an *application service provider* (4.4) to gain *approval* (4.6) for its instantiation of the TARV *VMM* (4.52) *application service* (4.3).

10.4.2 TARV VMM SE2: Request system approval

The *application service provider* (4.4) shall seek *approval* (4.6) for its instantiation of the *vehicle mass monitoring* (4.52) *application service* (4.3) from the *approval authority (regulatory)* (4.8) in accordance with the regime established by the *jurisdiction* (4.29).

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

It is a prerequisite for any potential vehicle *operator* (4.35) opting or being required to sign up for the TARV *VMM* (4.52) *application service* (4.3) that its *regulated vehicles* (4.40) are TARV equipped with a TARV compliant *IVS* (4.26) at point of manufacture or installed by a *prime service provider* (4.37), and that there is a maintenance contract with a *prime service provider* (4.37) for that equipment. [See ISO 15638-1 TARV *framework* (4.23) and *architecture* (4.9)].

10.4.4 TARV VMM SE4: User (operator) equips vehicle with a devices to provide load information

It is a prerequisite for any potential vehicle *operator* (4.35) opting or being required to sign up for the TARV *VMM* (4.52) *application service* (4.3) that its *regulated vehicles* (4.40) are equipped to provide the load data required by the chosen profile of ISO 26683-2, and that there is a maintenance contract with an approved *service provider* (4.42) for that equipment (see ISO 26683-1 and ISO 26683-2 for details of equipment requirements). That *service provider* (4.42) shall be, or shall be considered as an agent of, the *prime service provider* (4.37) in respect of the provisions of this part of ISO 15638.

10.4.5 TARV VMM SE5: User contracts with application service provider

The *user* (4.48) [*operator* (4.35)] shall contract with an *application service provider* (4.4) who offers an approved TARV *VMM* (4.52) *application service* (4.3) to provide the TARV *VMM application service* (4.3) to nominated vehicles.

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

The *application service provider* (4.4) shall upload and commission the on-board TARV *VMM* (4.52) *app* (4.2) software into the TARV equipped vehicles of the *operator* (4.35).

10.4.7 TARV VMM SE7: Time series or application service instigated recording of vehicle load

In the event that the system is designed to record the vehicle load at defined time intervals, at the predetermined times, the on-board *VMM* (4.52) *app* (4.2) shall create a file, type: VMM.

Vehicle/Location/Load/Monitoring file [VMM file], named

<VMM> <YYMMDDhhmm> <vehicle registration number>

At the appropriate time intervals, or at the instigation of the *application service provider* (4.4) via a wireless link to the *IVS* (4.26), the *VMM* (4.52) *app* (4.2) in the *IVS* (4.26) shall update the *VMM* (4.52) file with the following data:

<IVS ID>,

<VehicleLocation>,<LoadData>

<MassData>

<IVS ID>

<end>

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

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

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

Load [*consignment* (4.14)] data shall be in conformance with the selected profile of ISO 26683-2.

At time intervals determined by the on-board *VMM* (4.52) *app* (4.2), the *IVS* (4.26) shall send the file to the *VMM* (4.52) *application service provider* (4.4) system via a wireless communication supported by the *IVS* (4.26) and *application service provider* (4.4) system.

On successful receipt of the *VMM* (4.52) file the *application service provider* (4.4) system shall send an ACKnowledgement <VMX> to the *IVS* (4.26). On receipt of the ACKnowledgement <VMX> the *IVS* (4.26) shall clear the data held within the *VMM* (4.52) file and start to repopulate the *VMM* (4.52) file with data at the predetermined time intervals.

If an ACKnowledgement is not received within 30 s of sending the data, the *VMM* (4.52) *app* (4.2) shall attempt to resend the data and shall continue to do so at intervals determined by the *specification* (4.44) of the *VMM* (4.52) *application service* approved by the *approval authority (regulatory)* (4.8) until the data has been successfully sent and ACKnowledged.

Once the *application service provider* (4.4) identifies that the journey has been completed, the *application service provider* (4.4) system shall send an ACKnowledgement <MXX> to the *IVS* (4.26), and unless otherwise instructed by the *specification* (4.44) of the application service approved by the *approval authority (regulatory)* (4.8), on receipt of the ACKnowledgement <MXX> the *IVS* (4.26) shall delete the *VMM* (4.53) file from its memory and the *VMM* (4.52) *app* (4.2) shall terminate.

Because of the titling regime defined above, each *VMM* (4.52) file is uniquely identifiable by the host *VMM* (4.52) *application service* (4.3) when it is received.

In the case of time series or *application service* (4.3) instigated recording of vehicle load, the manner in which the *application service* (4.3) uses the information captured and forwarded to it by the *IVS* (4.26) [*VMM* (4.52) files] to determine location violations, and the method of reporting to the *jurisdiction* (4.29) and *operator* (4.35) is outside of the scope of this part of ISO 15638 shall be the subject of definition by the *jurisdiction* (4.29) and/or the *application service* (4.3) provider.

10.4.8 TARV VMM SE8: “Interrogated” request for vehicle mass monitoring data

10.4.8.1 An interrogating *ITS-station* (4.28) shall request specific data as determined in ISO 15638-6, 7.1 and 8.1.2.

10.4.8.2 In the event that the *IVS* (4.26) of a vehicle receives a wireless interrogation requesting the VMM 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.

10.4.8.3 On receipt of the request the *IVS* (4.26) shall acknowledge the request with the appropriate ACKnowledgement defined in ISO 15638-6, 8.3.5 <M>, which acknowledges that a request for *VMM* (4.52) data has been received.

10.4.8.4 The *IVS* (4.26) shall then close the communication *session* (4.43).

10.4.8.5 The *IVS* (4.26) shall then open a new communication *session* (4.43) using an available and appropriate *CALM* (4.12) wireless medium.

10.4.8.6 The *IVS* (4.26) shall then send the *VMM* (4.52) data file (as defined in 10.4.7) to a predetermined destination IPv6 (internet) address that has previously been stored in the memory of the *data pantry* (4.17) by its ASP, together with the URef and ReqDest provided by the interrogator.

10.4.8.7 On successful receipt of the data, the recipient at the predetermined destination IPv6 address shall send an acknowledgement <VMX> to the *IVS* (4.26).

10.4.8.8 On receipt of the acknowledgement <VMX> the *IVS* (4.26) shall close its communication *session* (4.43).

10.4.8.9 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.

10.5 Generic TARV VMM data naming content and quality

The process to obtain *basic vehicle data* (4.11) [TARV *LDT* (4.31)] data content shall be as defined in 8.3.2.1 and 8.3.2.2 above and ISO 15638-5.

The electronic records declared and stored by the *IVS* (4.26) shall be authenticated, have integrity, and be secure from interception or corruption.

The formal data content of a TARV *VMM* (4.52) record shall be as shown in Table 4

Table 4 — Formal data content of a TARV VMM record

FILE TYPE		Format of file name	Notes/Source
VMM	Mandatory	<VMM> <YYMMDD> <hhmmss> <vehicle registration number> Example VMM 110316 070603 KV76WRR As: VMM110316 070603KV76WRR	Clause 10.4.7 [Vehicle mass monitoring file (VMM file)]

Number	Data concept name	Use	Format	Notes/Source
VMM001	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5
VMM002	Vehicle location	Mandatory	S(serial number) timestamp location Example s0123 110316 x 0A5D3770 0 x 027E2938> 0123	Calculated as specified in ISO 15638-5, Clause 9.2.4.
VMM003	Vehicle load	Mandatory	Form as defined in selected profile of ISO 26682-2	Calculated as specified in ISO 26683-2

Table 4 *(continued)*

VMM004	Mass data	Mandatory	a) record number; as numeric,0-999999 b) axle group IDs; as AN(3) c) axle group configuration; as AN(2) d) axle group masses (AGMs);as numeric (5) e) gross combination mass (GCM); as numeric (5) f) TARV LDT Example; 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx ,128.16511,1G1JF27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,00 00,8,0,123,1,000,000,010326,UK,Peter Jones 01,02,03a,h1 120325,010326 124538 Peter Jones 01,02,h1 120325	See 10.2 above
VMM005	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5 (to indicate end of load data, as this data will vary from journey to journey)
In the event that the data is sent in response to an interrogation requesting data, the following data shall be appended:				

Table 4 *(continued)*

VMM006	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.
VMM007	ReqDes	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 tel- net://192.0.2.16:80/

10.6 TARV VMM application service specific provisions for quality of service

10.6.1 General

The integrity of the data is 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* (4.29). However, in defining such requirements *jurisdictions* (4.29) shall wherever possible, use performance based or functionally *specifications* (4.44) 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 above for general quality of service requirements.

10.6.2 Tamper evidency

This *specification* (4.44) addresses *tampering* (4.46) on the principle of *tamper* (4.46) evidency. For example, a mechanical seal that is broken once a device is removed is one example of a *tamper* (4.46) evident measure. In performance based *specifications* (4.44), *tamper* (4.46) evidency is typically addressed via alarms, data protocols, security features, and a range of indicators that can be crossed checked for consistency in the data records.

In particular for *VMM* (4.52) systems, making a scale "*tamper* (4.46) proof" would considerably increase its cost as well as administrative processes. Making it *tamper* (4.46) evident is considerably more effective. The main areas of *tamper* (4.46) are likely to occur with the *mass* (4.33) parameters. These can be addressed with the use of both a static *mass* (4.33) readout as well as two dynamic *mass* (4.33) indicators.

10.7 TARV VMM 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 VMM application specific rules for the approval of IVSs and "service providers"

As described 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* (4.12) standards themselves are free of patents and intellectual property, *CALM* (4.12), 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 (4.3) 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:—[3)], 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* (4.29) and its regulations for instantiation in this respect.

3) To be published.

Annex A
(informative)

ASN.1 Modules for ISO 15638-12 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 International 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 International Standard.

A.2 ASN.1 modules for ISO 15638-12 (vehicle "mass"monitoring)

A.2.1 Data concepts defined in ISO 15638-5 and used in ISO 15638-12 (VMM)

```
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..358) -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 15638-12 (VMM)

```
-Type definition for 15638-12 module
VehicleMassMonitoring DEFINITIONS AUTOMATIC TAGS::=
   BEGIN
      IMPORTS LDTData, Location FROM TARVLocalDataTree;

      VMMData::= SEQUENCE
      {vMM001 IVSID,
       vMM002 Location, -Vehicle location as per TARV LDT
      vMM003 VehicleLoad,
      vMM004 MassData,
      vMM005 IVSID,
      vMM006 Uref,
      vMM007 ReqDes
      }

      IVSID::= VisibleString (SIZE (9))
```

```
  VehicleLoad::= VisibleString

  MassData::= SEQUENCE
  {recordNumber           INTEGER (0.. 999999),
   axleGroupID            VisibleString (SIZE (3)),
   axleGroupConfiguration VisibleString (SIZE (2)),
   axleGroupMass          NumericString (SIZE (5)),
   grossCombinationMass   NumericString (SIZE (5)),
   tarvldt                LDTData
  }

  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 shall 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 shall 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* (4.3). 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* (4.4) address. No other part of the system *specifications* (4.44) are to be tested (they appear in the figures below for context, and because there are copied from the base standards.)

b) *CALM* (4.12) 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, it 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.

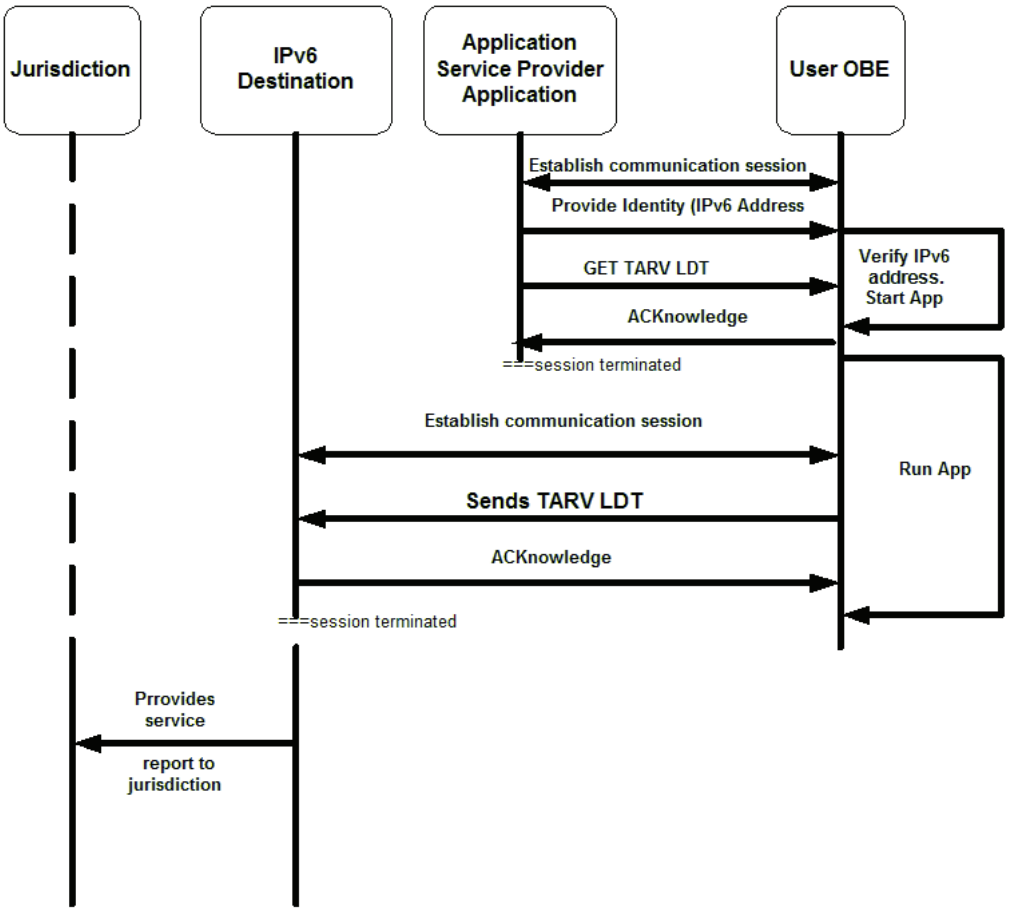

Figure B.1 — Communications sequences to obtain TARV LDT

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

Test sequences follow.

B.2 Test script 6 service: VMM vehicle mass monitoring

TEST 6.1 0,1: VMM– via 2G. Instigated

STEP 6.1.1.1 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 TARV VMM record

FILE TYPE		Format of file name	Notes/Source
VMM	Mandatory	<VMM> <YYMMDD> <hhmmss> <vehicle registration number> Example	Clause 14.4.7 [Vehicle mass monitoring file (VMM file)]

Number	Data concept name	Use	Format	Notes/Source
VMM002	Vehicle location	Mandatory	S(serial number) timestamp location	Calculated as specified in ISO 15638-5, Clause 9.2.4.
VMM003	Vehicle load	Mandatory	Form as defined in selected profile of ISO 26682-2	Calculated as specified in ISO 26683-2

Table B.1 *(continued)*

VMM004	Mass data	Mandatory	a) record number; as numeric, 0-999999 b) axle group IDs; as AN(3) c) axle group configuration; as AN(2) d) axle group masses (AGMs); as numeric (5) e) gross combination mass (GCM); as numeric (5) f) TARV LDT	See 14.2 above
VMM005	IVS ID	Mandatory	AN (9)	IVS identifier as defined in ISO 15638-5 (to indicate end of load data, as this data will vary from journey to journey)

FILENAME:

<<VMM110316 070603KV76WRR>>

FILE CONTENT:

<ID0o3M45S, s0123^110316x0A5D3770 0x027E2938> 0123, 123456,T43,03,12345,12355,

AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16511,1G1JF27W8GJ178227,000000

0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,000,000,010326,UK,Peter Jones,01,02,03a ,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S>

STEP 6.1.1.2 IVS sends file named <<VMM110316 070603KV76WRR>>

<ID0o3M45S, s0123^110316x0A5D3770 0x027E2938> 0123, 123456,T43,03,12345,12355,

AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16511,1G1JF27W8GJ178227,000000

0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,000,000,010326,UK,Peter Jones,01,02,03a ,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S>

STEP 6.1.1.3 Destination address sends ACK <VMM>

STEP 6.1.1.4 IVS receives ACK <VMM>

STEP 6.1.1.5 IVS closes communication session

B.2.1 CTP 6.1.1 Instigated vehicle mass monitoring using 2G

S.U.T. reference	Instigated send of vehicle mass monitoring using 2G
CTP/6.1.1	
S.U.T. test objective	The IVS of a vehicle establishes a new communication using one of (and shall 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. Recipient address sends acknowledgement. IVS closes the communication on receipt of acknowledgement.
CTP origin	CSI
Reference requirement	ISO 15638-12
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
6.1.1.1	1	IVS instigates a communication session using selected media (2G) to predetermined destination IP address	Session established
6.1.1.2	2	IVS sends file named <VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316x0A5D3770 0x027E2938> 0123, 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16511,1G1JF 27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,000,000,010 326,UK,Peter Jones,01,02,03a,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S> <END>	File sent and arrives correctly at destination
6.1.1.3	3	Destination address sends ACK <VMX>	
6.1.1.4	4	IVS receives ACK <VMX>	File received and ACK <VMX> sent
6.1.1.5	5	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 6.1.1	Pass/Fail		Date: 28th June 2102
Signature/initials 	PASS		 k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

B.2.2 CTP 6.1.2 Interrogated vehicle mass monitoring using 2G

S.U.T. reference	Interrogated send of vehicle mass monitoring using 2G
CTP/6.1.2	
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. Opens a new communication session using one of (and shall be tested for each of) several wireless media defined below. Sends the datafile to a predetermined destination IPv6 (internet) address. Recipient address sends acknowledgement. IVS Closes the communication on receipt of acknowledgement.
CTP origin	CEN
Reference requirement	ISO 15638-12
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
6.1.2.1	1	Session connected (incoming call)	Call in progress
6.1.2.2	2	Caller sends data request command (GPRS, EDGE, etc.) GET VMM	Data request sent
6.1.2.3	3	IVS acknowledges request by returning ACKnowledgement <M>	ACK <M> received
6.1.2.4	4	IVS closes communication session	Communication session closed
6.1.2.5	5	IVS instigates a communication session using selected media to predetermined destination IP address	Communication session successfully opened

6.1.2.5	6	IVS sends file named <VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316 x0A5D3770 0x027E2938 > 0123, 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16511,1G1JF27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,000,000, 010326,UK,Peter Jones,01,02,03a,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S> <END>	File sent and arrives correctly at destination
6.1.2.6	7	Destination address sends ACK <VMX>	
6.1.2.7	8	IVS receives ACK <VMX>.	File received and ACK <VMX> sent
6.1.2.8	9	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 6.1.1	Pass/Fail	Date: 28th June 2102
Signature/initials 	PASS	 k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

B.2.3 CTP 6.1.3 Interrogated vehicle mass monitoring using 5,9GHz and responding using 2G or 3G

S.U.T. reference	Interrogated vehicle mass monitoring using 5,9 GHz and send of vehicle mass monitoring using 2G or 3G
CTP/6.1.3	
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. Opens a new communication session using 2G or 3G. Sends the datafile to a predetermined destination IPv6 (Internet) address Recipient address sends acknowledgement. IVS closes the communication on receipt of acknowledgement.
CTP origin	CEN
Reference requirement	ISO 15638-12
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
6.1.3.1	1	Session connected (incoming call) using 5,9GHz (IEEE 802.11p)	Call in progress
6.1.3.2	2	Caller sends data request command GET VMM	Data request sent
6.1.3.3	3	IVS acknowledges request by returning ACKnowledgement <M>	ACK <M> received
6.1.3.4	4	IVS closes communication session	Communication session closed
6.1.3.5	5	IVS instigates a communication session using 2G or 3G	Communication session successfully opened
6.1.3.5	6	IVS sends file named	File sent and arrives correctly at destination

		<VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316 x0A5D3770 0x027E2938 > 0123, 123456,T43,03,12345,12355,Aa aSs,0,0, xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16511,1G1JF27W8GJ178227,000000,1297339499,0x0A5D3770,0x027E2938,0000, 8,0,123,1,000,000,010326,UK,Peter Jones,01,02,03a,h1,120325, 010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S > <END>	
6.1.3.6	7	Destination address sends ACK <VMX>	
6.1.3.7	8	IVS receives ACK <VMX>	File received and ACK <VMX> sent
6.1.3.8	9	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 6.1.3	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

B.2.4 CTP 6.2.1 Instigated vehicle mass monitoring using 3G

S.U.T. reference	Instigated send of Vehicle Mass Monitoring using 3G
CTP/6.2.1	
S.U.T. Test Objective	The IVS of a vehicle establishes a new communication using one of (and shall 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. Recipient address sends acknowledgement. IVS closes the communication on receipt of acknowledgement.
CTP origin	CSI
Reference requirement	ISO 15638-12
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
6.2.1.1	1	IVS instigates a communication session using selected media (3G) to predetermined destination IP address	Session established
6.2.1.2	2	IVS sends file named <VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316 x0A5D3770 0x027E2938> 0123, 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16511,1G1JF27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,000,000,010326,UK,Peter Jones,01,02,03a,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S> <END>	File sent and arrives correctly at destination
6.2.1.3	3	Destination address sends ACK <VMX>	
6.2.1.4	4	IVS receives ACK <VMX> File received and ACK <VMX> sent	
6.2.1.5	5	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 6.2.1	Pass/Fail		Date: 28th June 2102
Signature/initials 	PASS		 k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

B.2.5 CTP 6.2.2 Interrogated at 5,9 GHz and send of vehicle mass monitoring using 3G

S.U.T. reference	5,9 GHz Interrogated and send of vehicle mass monitoring using 3G
CTP/6.2.2	
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 wireless interrogation requesting a packet of data. On receipt it acknowledges the request (ACK). It closes the communication. Opens a new communication session using one of (and shall be tested for each of) several wireless media defined below. Sends the datafile to a predetermined destination IPv6 (Internet) address. Recipient address sends acknowledgement. IVS Closes the communication on receipt of acknowledgement.
CTP origin	CEN
Reference requirement	ISO 15638-12
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, 5,9 GHz (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
6.2.2.1	1	Session connected (incoming call) using 5,9 GHz (IEEE 802.11p)	Call in progress
6.2.2.2	2	Caller sends data request command GET VMM	Data request sent
6.2.2.3	3	IVS acknowledges request by returning ACKnowledgement <M>	ACK <M> received
6.2.2.4	4	IVS closes communication session.	Communication session closed
6.2.2.5	5	IVS instigates a communication session using selected media (2G or 3G) to predetermined destination IP address	Communication session successfully opened

6.2.2.5	6	IVS sends file named <VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316 x0A5D3770 0x027E2938> 0123, 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16 511,1G1JF27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,0 00,000,010326,UK,Peter Jones,01,02,03a,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S > <END>	File sent and arrives correctly at destination
6.2.2.6	7	Destination address sends ACK <VMX>	
6.2.2.7	8	IVS receives ACK <VMX>	File received and ACK <VMX> sent
6.2.2.8	9	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 6.2.2	Pass/Fail	Date: 28th June 2102
Signature/initials 	PASS	k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

B.2.6 CTP 6.3.1 Instigated vehicle mass monitoring using 802.11p (WAVE) 5,9 GHz

S.U.T. reference	Instigated vehicle mass monitoring using 802.11p (WAVE) 5,9 GHz
CTP/6.3.1	
S.U.T. test objective	The IVS of a vehicle establishes a new communication using one of (and shall 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. Recipient address sends acknowledgement. IVS closes the communication on receipt of acknowledgement.
CTP origin	CSI
Reference requirement	ISO 15638-12
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, 5,9 GHz (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
6.3.1.1	1	IVS instigates a communication session using selected media (5,9 GHz) to predetermined destination IP address	Session established
6.3.1.2	2	IVS sends file named <VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316 x0A5D3770 0x027E2938> 0123, 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16 511,1G1JF27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,0 00,000,010326,UK,Peter Jones,01,02,03a,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S> <END>	File sent and arrives correctly at destination
6.3.1.3	3	Destination address sends ACK <VMX>	
6.3.1.4	4	IVS receives ACK <VMX>	File received and ACK <VMX> sent
6.3.1.5	5	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 6.2.2	Pass/Fail		Date: 28th June 2102
Signature/initials 	PASS		 k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

B.2.7 CTP 6.3.2 Interrogated vehicle mass monitoring using 802.11p (WAVE) 5,9 GHz

S.U.T. reference	Instigated vehicle mass monitoring using 802.11p (WAVE) 5,9 GHz
CTP/6.3.2	
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 wireless interrogation requesting a packet of data. On receipt it acknowledges the request (ACK). It closes the communication. Opens a new communication session using one of (and shall be tested for each of) several wireless media defined below. Sends the datafile to a predetermined destination IPv6 (Internet) address. Recipient address sends acknowledgement. IVS Closes the communication on receipt of acknowledgement.
CTP origin	CEN
Reference requirement	ISO 15638-12
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
6.3.2.1	1	Session connected (incoming call) using 5,9 GHz (IEEE 802.11p)	Call in progress
6.3.2.2	2	Caller sends data request command GET VMM	Data request sent
6.3.2.3	3	IVS acknowledges request by returning ACKnowledgement <M>	ACK <M> received
6.3.2.4	4	IVS closes communication session	Communication session closed
6.3.2.5	5	IVS instigates a communication session using 5,9GHz selected media to predetermined destination IP address	Communication session successfully opened

6.3.2.5	6	IVS sends file named <VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316 x0A5D3770 0x027E2938 > 0123, 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16 511,1G1JF27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,0 00,000,010326,UK,Peter Jones,01,02,03a,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S > <END>	File sent and arrives correctly at destination
6.3.2. 6	7	Destination address sends ACK <VMX>	
6.3.2.7	8	IVS receives ACK <VMX>	File received and ACK <VMX> sent
6.3.2.8	9	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 6.3.1	Pass/Fail	Date: 28th June 2102
Signature/initials 	PASS	 k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

B.2.8 CTP 6.4.1 Instigated vehicle mass monitoring using mesh WiFi

S.U.T. reference	Instigated send of vehicle mass monitoring using mesh WiFi
CTP/6.4.1	
S.U.T. test objective	The IVS of a vehicle establishes a new communication using one of (and shall 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. Recipient address sends acknowledgement. IVS closes the communication on receipt of acknowledgement.
CTP origin	CSI
Reference requirement	ISO 15638-12
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
6.4.1.1	2	IVS instigates a communication session using selected media (Mesh WiFi) to predetermined destination IP address.	Session established
6.4.1.2	3	IVS sends file named <VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316 x0A5D3770 0x027E2938> 0123, 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16 511,1G1JF27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,0 00,000,010326,UK,Peter Jones,01,02,03a,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S> <END>	File sent and arrives correctly at destination
6.4.1.3	3	Destination address sends ACK <VMX>	
6.4.1.4	4	IVS receives ACK <VMX>	File received and ACK <VMX> sent
6.4.1.5	5	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 6.3.2	Pass/Fail		Date: 28th June 2102
Signature/initials 	PASS		 k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

B.2.9 CTP 6.4.2 Interrogated vehicle mass monitoring using mesh WiFi

S.U.T. reference	5,9 GHz Interrogated and send of vehicle mass monitoring using mesh WiFi
CTP/6.4.2	
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 wireless interrogation requesting a packet of data. On receipt it acknowledges the request (ACK). It closes the communication. Opens a new communication session using one of (and shall be tested for each of) several wireless media defined below. Sends the datafile to a predetermined destination IPv6 (Internet) address. Recipient address sends acknowledgement. IVS Closes the communication on receipt of acknowledgement.
CTP origin	CEN
Reference requirement	ISO 15638-12
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, 5,9 GHz (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
6.4.2.1	1	Session connected (incoming call) using 5,9 GHz (IEEE 802.11p)	Call in progress
6.4.2.2	2	Caller sends data request command (GPRS, EDGE, etc.) GET VMM	Data request sent
6.4.2.3	3	IVS acknowledges request by returning ACKnowledgement <M>	ACK <M> received
6.4.2.4	4	IVS closes communication session	Communication session closed
6.4.2.5	5	IVS instigates a communication session using mesh WiFi selected media to predetermined destination IP address	Communication session successfully opened

6.4.2.5	6	IVS sends file named <VMM110316 070603KV76WRR> <START> <ID0o3M45S, s0123^110316 x0A5D3770 0x027E2938> 0123, 123456,T43,03,12345,12355, AaaSs,0,0,xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx,128..16 511,1G1JF27W8GJ178227,000000 0,1297339499,0x0A5D3770,0x027E2938,0000,8,0,123,1,0 00,000,010326,UK,Peter Jones,01,02,03a,h1,120325,010326 124538,Peter Jones 01,02,h1, 120325, ID0o3M45S> <END>	File sent and arrives correctly at destination
6.4.2.6	7	Destination address sends ACK <VMX>	
6.4.2.7	8	IVS receives ACK <VMX>	File received and ACK <VMX> sent
6.4.2.8	9	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 6.4.2	Pass/Fail	Date: 28th June 2102
Signature/initials 	PASS	k4, MIRA, Watling St, Nuneaton, Warwickshire, CV10 0TU, UK Tel: +44 (0)7730 922 810 Web: www.innovits.com/advance

Bibliography

[1] ISO 128-30, *Technical drawings — General principles of presentation — Part 30: Basic conventions for views*

[2] ISO 128-34, *Technical drawings — General principles of presentation — Part 34: Views on mechanical engineering drawings*

[3] ISO 128-40, *Technical drawings — General principles of presentation — Part 40: Basic conventions for cuts and sections*

[4] ISO 128-44, *Technical drawings — General principles of presentation — Part 44: Sections on mechanical engineering drawings*

[5] ISO 31 (all parts), *Quantities and units*

[6] ISO 690, *Information and documentation — Guidelines for bibliographic references and citations to information resources*

[7] ISO 690-2, *Information and documentation — Bibliographic references — Part 2: Electronic documents or parts thereof*

[8] ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*

[9] ISO 10241, *International terminology standards — Preparation and layout*

[10] IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

[11] ISO/IEC Directives, Part 2, Rules for the structure and drafting of International Standards, 2011

[12] ISO/IEC/TR 10000-1, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 1: General principles and documentation framework*

[13] ISO 21210, *Intelligent transport systems — Communications access for land mobiles (CALM) — IPv6 Networking*

[14] ISO 21217, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

[15] ISO 26683-1:2013, *Intelligent transport systems — Freight land conveyance content identification and communication — Part 1: Context, architecture and referenced standards*

[16] ISO 26683-2:2013, *Intelligent transport systems — Freight land conveyance content identification and communication — Part 2: Application interface profiles*

[17] ISO/TR 12859:2009, *Intelligent transport systems — System architecture — Privacy aspects in ITS standards and systems*

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