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

Part 20: Weigh-in-motion monitoring

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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).

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

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

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

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

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Introduction

Many ITS technologies have been embraced by commercial transport operators and freight owners, in the areas of fleet management, safety and security. On-board applications have also been developed for governmental use. Such regulatory services in use or being considered vary from jurisdiction to jurisdiction, but include electronic on-board recorders, digital tachograph, on-board mass monitoring, 'mass' data for regulatory control and management, weigh-in-motion, vehicle access methods, hazardous goods tracking and eCall. Additional applications with a regulatory impact being developed include fatigue management, speed monitoring and vehicle penalties imposed based on location, distance and time.

The ISO 15638 series of standards defines and addresses the framework for a range of cooperative telematics applications for regulated vehicles (e.g. access methods, driver fatigue management, speed monitoring, on-board mass monitoring, Remote Tachograph Monitoring, ADR management). The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative provision of services to regulated vehicles, using an on-board ITS platform. The framework is based on a (multiple) service provider-oriented approach with provisions for the approval and auditing of service providers.

The ISO 15638 series of standards provides both the means to achieve current requirements for telematics applications for regulated vehicles and the basis for future development of cooperative telematics applications for regulated vehicles.

The ISO 15638 series of standards is timely as many governments (Europe, North America, Asia and Australia/New Zealand) are considering the use of telematics for a range of regulatory purposes.

This document provides specifications for weigh-in-motion and on-board weighing monitoring and supports several defined communication profiles in which this function may be performed.

Consistent with other parts of the ISO 15638 series of standards, this document does not prescribe nor proscribe particular modes of operation. Rather, it provides a number of defined communication and data profiles within which jurisdictions may achieve their objectives for remote weigh-in-motion monitoring within the objectives and constraints of their regulations. This document recognizes that those requirements and constraints will differ between jurisdictions.

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

Part 20: Weigh-in-motion monitoring

1 Scope

This document addresses the provision of 'weigh-in-motion monitoring' and specifies the form and content of the transmission of such data required to support such systems, and access methods to that data.

This document provides specifications for both on-board weighing (WIM-O) systems and in-road "weigh-in-motion" (WIM-R) systems, and provides a profile where the vehicle weight measured is recorded on-board using equipment already installed for "Remote Tachograph Monitoring".

This document provides specifications for common communications and data exchange aspects of the application service weigh-in-motion monitoring (WIM-O and WIM-R) that a jurisdiction regulator can elect to require or support as an option, including:

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

b) Means to realize the service;

c) Application data naming, content and quality that an IVS has to deliver, including a number of profiles for data (noting that requirements and constraints of what can/cannot be transmitted over the air can vary between jurisdictions);

d) Support for a number of defined communication profiles to enable remote inspection.

The present version of this document provides specifications for the following application profiles:

— **Application Profile A1: Vehicle weight measurement from "On-Board Weighing" systems (WIM-O);**

— **Application Profile A2: Vehicle weight measurement from in-road 'weigh-in-motion' systems where data is transferred to the IVS (WIM-R).**

NOTE 1 Vehicle weight measurement from in-road 'weigh-in-motion' systems where data is linked to a specific vehicle by ANPR or other techniques and sent via landline or cellular communications to a processing centre is also a viable and alternate option, but as it does not include carrying data on-board the vehicle is not a TARV use case.

The present version of this document provides specifications for the following communication profiles:

— **Communication Profile 1: Roadside inspection using a short range wireless communication interrogator instigating a physical roadside inspection (master-:-slave):**

  — Profile C1a: via a hand aimed or temporary roadside mounted and aimed interrogator;

  — Profile C1b: via a vehicle mounted and directed interrogator;

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  - Profile C1c: via a permanent or semi-permanent roadside or overhead gantry.

- **Communication Profile 2: Roadside inspection using a short range wireless communication interrogator instigating a download of data to an application service provider via an ITS-station communication (master-:-slave + peer-:-peer):**
  - Profile C2a: via a hand aimed or temporary roadside mounted and aimed interrogator;
  - Profile C2b: via a vehicle mounted and directed interrogator;
  - Profile C2c: via a permanent or semi-permanent roadside or overhead gantry.
- **Communication Profile 3: Remote inspection addressed via an ITS-station instigating a download of data to an application service provider via a wireless communications interface** (as defined in ISO 15638-2).

Subsequent versions of this document can support additional communication profiles.

NOTE 2 The ISO 15638 series of standards has been developed for use in the context of regulated commercial freight vehicles (hereinafter referred to as 'regulated vehicles'). There is nothing, however, to prevent a jurisdiction from extending or adapting the scope to include other types of regulated vehicles, as it deems appropriate.

2 Normative references

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

ISO 11898-1, *Road vehicles — Controller area network (CAN) — Part 1: Data link layer and physical signalling*

ISO 15638-1, *Intelligent transport systems — Framework for cooperative telematics applications for regulated vehicles (TARV) — Part 1: Framework and architecture*

ISO 15638-2, *Intelligent transport systems — Framework for cooperative telematics applications for regulated vehicles (TARV) — Part 2: Common platform parameters using CALM*

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

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

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

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

ISO 15638-9, *Intelligent transport systems — Framework for cooperative telematics applications for regulated commercial freight vehicles (TARV) — Part 9: Remote digital tachograph monitoring*

EN ETSI 300 674-1, *ETSI EN 300 674-1 V1.2.1 (2004-08) Electromagnetic compatibility and Radio spectrum Matters (ERM); Road Transport and Traffic Telematics (RTTT); Dedicated Short Range Communication (DSRC) transmission equipment (500 kbit/s / 250 kbit/s) operating in the 5,8 GHz Industrial, Scientific and Medical (ISM) band; Part 1: General characteristics and test methods for Road Side Units (Interrogator) and On-Board Units (OBU)*

ARIB STD-T75, *Dedicated Short-Range Communication (Japan)*

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TTAS KO-06.0025, Standard of *DSRC* Radio Communication between Road-side Equipment and On-board Equipment in 5.8 GHz band (Korea)

EN 12253, *Road transport and traffic telematics — Dedicated short-range communication — Physical layer using microwave at 5.8 GHz*

EN 12795, *Road transport and traffic telematics — Dedicated Short Range Communication (DSRC) — DSRC data link layer: medium access and logical link control*

EN 12834:2003, *Road transport and traffic telematics — Dedicated Short Range Communication (DSRC) — DSRC application layer*

EN 13372:2012, *Road transport and traffic telematics — Dedicated Short Range Communication (DSRC) — Profiles for RTTT applications*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
app
small (usually) *Java™* (3.23) applets, organized as software bundles, that support *application services* (3.3) by keeping the *data pantry* (3.16) provisioned with up to date data

3.2
application profile
characteristics and specification of the information and transaction detail required to meet a set of *user* (3.49) needs which within the common high-level *framework* (3.19) of this document, allows different *jurisdictions* (3.24) to receive different detail of transaction or to specify a particular communications means

3.3
application service
service provided by a *service provider* (3.44) enabled by accessing data from the *IVS* (3.19) of a *regulated vehicle* (3.43) via a wireless communications network

3.4
application service provider
ASP
party that provides an *application service* (3.3)

3.5
app library
separately secure area of memory in *IVS* (3.19) where apps are stored [with different access controls to *data pantry* (3.16)]

3.6
approval
formal affirmation that an applicant has satisfied all of the requirements for appointment as an *application service provider* (3.4) or that an *application service* (3.3) delivers the required service levels

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3.7
approval agreement
written agreement made between an *approval authority (regulatory)* (3.8) and a *service provider* (3.44)

Note 1 to entry: An *approval authority (regulatory)* (3.8) *approval agreement* recognizes the fact that a *service provider* (3.44), having satisfied the *approval authority's* requirements for appointment as a *service provider,* is appointed in that capacity, and sets out the legal obligations of the parties with respect to the on-going role of the *service provider.*

3.8
approval authority
<regulatory> organization (usually independent) which conducts *approval* (3.6) and ongoing *audit* (3.10) for *service providers* (3.44) on behalf of a *jurisdiction* (3.24)

3.9
architecture
formalized description of the design of the structure of *TARV* and its *framework* (3.19)

3.10
audit
auditing
review of a party's capacity to meet, or continue to meet, the initial and ongoing *approval agreements* (3.7) as a *service provider* (3.44)

3.11
basic vehicle data
data maintained/provided by all *IVS* (3.19) [regardless of *jurisdiction* (3.24)]

3.12
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* (3.49) determined parameters by using a suite of standards based on ISO 21217 [*CALM* (3.12) architecture] and ISO 21210 (*CALM* networking) that provide a common platform for a number of standardized media using *ITS-stations* (3.22) to provide wireless support for applications, such that the application is independent of any particular wireless medium

3.13
commercial application(s)
ITS applications in *regulated vehicles* (3.43) for commercial (non-regulated) purposes

EXAMPLE Asset tracking, vehicle and engine monitoring, cargo security, *driver* (3.17) management.

3.14
communications profile
characteristics and specification of the communication detail required to meet a set of *user* (3.49) needs using a selected wireless medium

3.15
core data
basic vehicle data (3.11) plus any additional data required to provide an implemented *regulated application service* (3.42)

3.16
data pantry
secure area of memory in *IVS* (3.19) where data values are stored [with different access controls to *app library* (3.5)]

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3.17
driver
person driving the *regulated vehicle* (3.43) at any specific point in time

3.18
facilities layer
layer that sits on top of the communication stack and helps to provide data interoperability and reuse, and to manage applications and enable dynamic real time loading of new applications

3.19
framework
particular set of beliefs or ideas referred to in order to describe a scenario or solve a problem

3.20
in-vehicle system
IVS
ITS-station (3.22) and connected (TARV/*WIM*) equipment on board a vehicle

Note 1 to entry: Known in EFC specific equipment as OBE (on-board equipment) or OBU (on-board unit).

Note 2 to entry: Often known in weigh-in-motion and *tachograph* (3.47) specific regulations as VU (vehicle unit).

3.21
interrogator
off-board device which can establish a wireless communications session with the IVS (including 5,8 GHz DSRC) and request the provision of weigh-in-motion data, often a mobile device under the control of an agent of the *jurisdiction* (3.24)

3.22
ITS-station
ITS-s
entity in a communication network, comprised of application, *facilities layer* (3.18), networking and access layer components specified in ISO 21217 that operate within a bounded secure management domain

3.23
Java™[1)]
object oriented open source operating language developed by SUN systems

3.24
jurisdiction
government, road or traffic authority which owns the r*egulatory applications* (3.41)

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

3.25
jurisdiction regulator
agent of the *jurisdiction* (3.24) appointed to regulate and manage *TARV* within the domain of the *jurisdiction* which may or may not be the *approval authority (regulatory)* (3.8)

3.26
on-board weighing system
generation of vehicle weight data from equipment on-board the vehicle

Note 1 to entry: The technical means of generating such data is not specified in this document, only the resultant data.

1) Java™ is an example of a suitable product available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

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3.27
operator
operator of interrogation equipment

3.28
physical roadside inspection
physical inspection of the weigh-in-motion data of a stopped vehicle by agents of the *application service provider* (3.4) [most usually police or inspectors appointed by the *jurisdiction* (3.24)]

3.29
prime service provider
service provider (3.44) who is the first contractor to provide *regulated application services* (3.42) to the *regulated vehicle* (3.43), or a nominated successor on termination of that initial contract, responsible to maintain the installed *IVS* (3.19) and to install and commission new *IVS* (3.19)

3.40
profile
common and consistent elaboration of content and sequence of a set of chosen classes, conforming subsets, options, parameters, and/or data concepts to accomplish a particular function/specification

3.41
regulated application
regulatory application
application arrangement using TARV utilized by *jurisdictions* (3.24) 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*

Note 1 to entry: May be mandatory or voluntary at the discretion of the *jurisdiction.*

3.42
regulated application service
TARV application service (3.3) to meet the requirements of a regulated application (3.41) that is mandated by a regulation imposed by a *jurisdiction* (3.24), or is an option supported by a *jurisdiction*

3.43
regulated vehicle
vehicle that is subject to regulations determined by the *jurisdiction* (3.24) as to its use on the road system of the *jurisdiction* in regulated circumstances, subject to certain conditions, and in compliance with specific regulations for that class of *regulated vehicle*

Note 1 to entry: At the option of *jurisdictions,* this may require the provision of information via *TARV* or provide the option to do so.

3.44
service provider
party which is certified by an *approval authority (regulatory)* (3.8) as suitable to provide regulated or commercial ITS *application services* (3.3)

3.45
session
wireless communication exchange between the *ITS-station* (3.22) of an *IVS* (3.19) and the *ITS-station* of its *application service provider* (3.4) to achieve data update, data provision, upload apps, or otherwise manage the provision of the *application service* (3.3), or a wireless communication provision of data to the *ITS-station* of an *IVS* (3.19) from any other *ITS-station*

3.46
specification
explicit and detailed description of the nature and functional requirements and minimum performance of equipment, service or a combination of both

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3.47
tachograph
sender unit usually mounted to a vehicle gearbox, a tachograph head and a digital *driver* (3.17) card, which records the *regulated vehicle* (3.43) speed and the times at which it was driven and aspects of the *driver's* (3.17) activity selected from a choice of modes

3.48
telematics
use of wireless media to obtain and transmit (data) from a distant source

3.49
user
individual or party that enrols in and operates within a regulated or *commercial application* (3.13) *service* (3.2)

EXAMPLE *Driver* (3.17), fleet manager, freight owner.

3.50
weigh-in-motion
weigh-in-motion system
generation of vehicle weight data from equipment either onboard (WIM-O) or embedded in the road pavement (WIM-R) and transferred to the *IVS* (3.20) of the vehicle ready for subsequent inspection

Note 1 to entry: The technical means of generating such data is not specified in this document, only the resultant data.

3.51
weigh-in-motion system-onboard
WIM-O
generation of vehicle weight data from equipment within the vehicle

Note 1 to entry: The technical means of generating such data is not specified in this document, only the resultant data.

3.52
weigh-in-motion system-roadway
WIM-R
generation of vehicle weight data from equipment embedded in the road pavement and transferred to the *IVS* (3.20) of the vehicle ready for subsequent inspection

Note 1 to entry: The technical means of generating such data is not specified in this document, only the resultant data.

4 Symbols and abbreviated terms

ADU	Application Data Unit
APDU	application protocol data unit
ANPR	Automatic number plate recognition
App	applet (JAVA™ application or similar)
ASN.1	Abstract Syntax Notation One
ASP	application service provider
BER	Bit Error Rate
BLE	Bluetooth Low Energy

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