
**Intelligent transport systems —
Reference model architecture(s) for
the ITS sector —**

**Part 1:
ITS service domains, service groups
and services**

*Systèmes intelligents de transport (ITS) — Architecture(s) de modèle
de référence pour le secteur ITS —*

Partie 1: Domaines de service, groupes de service et services ITS



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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 second edition cancels and replaces the first edition (ISO 14813-1:2007), which has been technically revised.

ISO 14813 consists of the following parts, under the general title *Intelligent transport systems — Reference model architecture(s) for the ITS sector*:

- *Part 1: ITS fundamental services*
- *Part 5: Requirements for architecture description in ITS standards*
- *Part 6: Data presentation in ASN.1*

Introduction

Intelligent transport systems (ITS) service domains and groups reflect the evolution of technology-oriented transportation practices and applications. So far this has been in the road transport domain, but ITS is beginning to appear in the maritime and rail transport domains. This has become of increasing importance and interest as the scope of ITS expands beyond its original range of services in road traffic management, traveller information and electronic payment systems. ITS is now also expected to address services in the following areas of the road transport domain:

- Transport network operations and maintenance activities;
- Freight mobility and inter-modal connectivity;
- Multi-modal travel including both pre-trip and on-trip information and journey planning where the trip starts and/or finishes in the road transport domain;
- Variable road pricing strategies for freight and personal travel;
- Emergency and natural disaster-related response activities and coordination;
- National security needs related to transportation infrastructure;
- Cooperative-ITS – sometimes referred to as ‘connected vehicles’ or ‘connected vehicle/highway systems’.

Services in some of the areas identified above also interface with more generalized activities and environments outside the road transport domain. For example, it is possible for road pricing and revenue systems activities to interface with electronic commerce, or eCommerce activities, and thus utilize standards and principles associated with the banking industry along with generally accepted accounting principles. The addressing of national security and coordination issues also requires addressing specific national standards related to civil defence, emergency communications, and other procedures. These interfaces, while largely outside the scope of TC 204, are nevertheless critical external influences on the functionality of the various services supported by ‘ITS service domains and groups’.

The standards that have been developed within TC 204 must all be mapped to one or more of the ITS domains, service groups and services described in this part of ISO 14813. Additionally, the development of a standard international data dictionary and registry for ITS requires the ability to address both current and emerging services that ITS can provide.

To this end, the ITS service domains, groups and services presented in this part of ISO 14813 serve as a framework for developing ITS architectures and ITS-related concepts of operation, which in turn lead to the definition of the appropriate requirements, functionality and standards necessary to deploy specific ITS services. As the range of transportation activities that utilize ITS tools has broadened, the original ‘fundamental services’ developed by TC 204 are now revised and expanded into ‘ITS service domains and groups’.

[Figure 1](#) illustrates the hierarchy of functional definitions, and how they might be used as the input to ITS architectures. The Service Domains that apply to ITS are listed in [6.1](#) with each defining the nature of the activities provided. Each of these Domains is then covered by separate annexes in this part of ISO 14813, each of which includes the descriptions of its own Service Groups and Services. The Service Groups describe more specific activities that are part of the Domain and the Services provide the more detailed description of what is provided within each Service Group.

The way in which the descriptions of the services are used in ITS architectures depends on the methodology that has been adopted for their creation. Thus the service descriptions can be used to generate ‘use cases’ which are the input to an ITS architecture created using object orientated methodology (see other parts of the ISO 14813 series), or ‘user needs’, which are the input to an ITS architecture created using the process orientated methodology (see ISO/TR 26999).

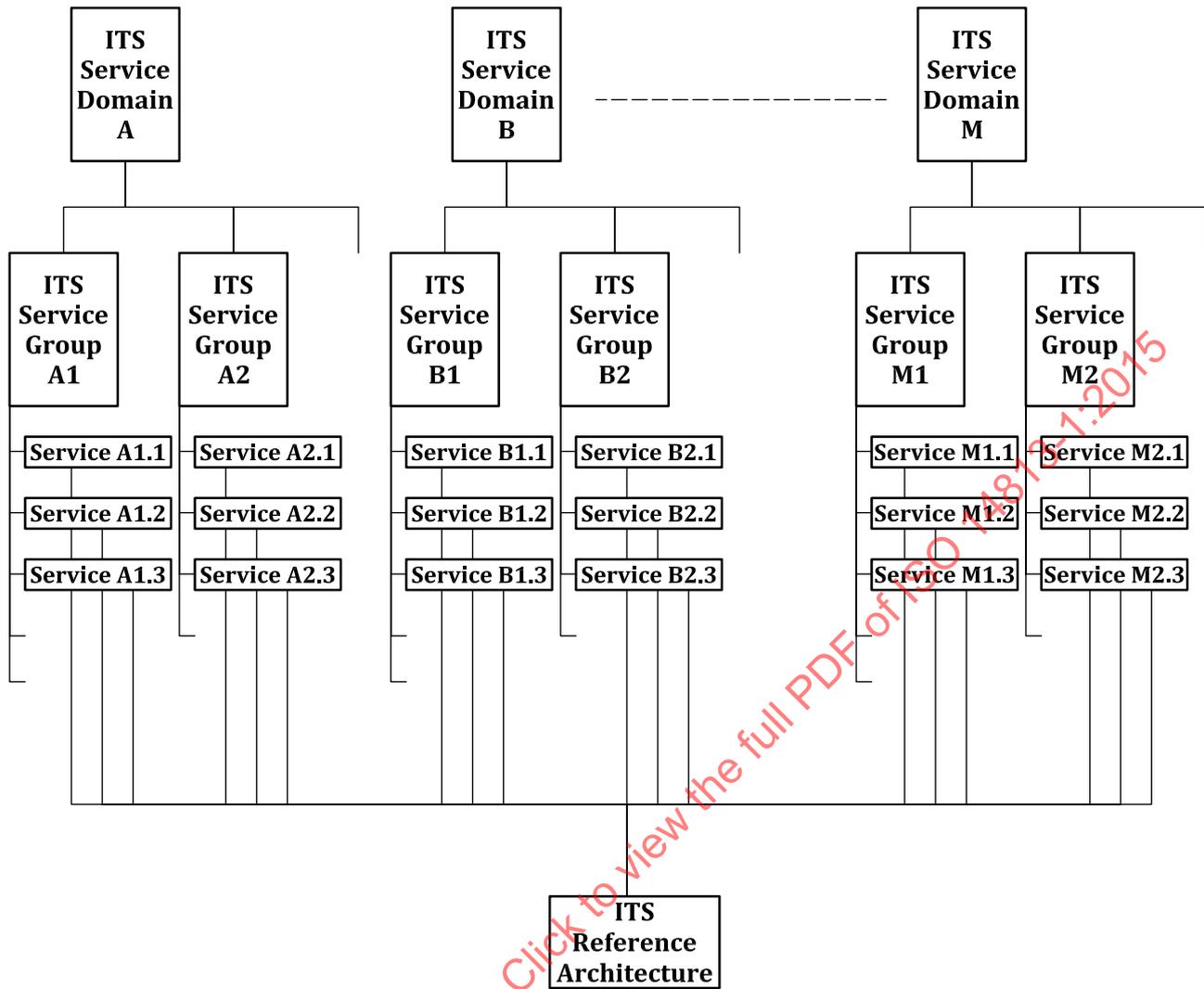


Figure 1 — ITS services — Hierarchy of definitions for ‘ITS reference architecture’

In order to develop a cohesive reference architecture, and in order to establish the relationship and interdependencies of the various ‘intelligent transport systems’ (ITS) services, it is beneficial to firstly determine the underlying ITS services. Thus, the purpose of this part of ISO 14813 is to identify the ‘ITS service groups’ and the domains within which the Service Groups reside, within the current perception of the ITS sector.

‘ITS service domains and groups’, while they build upon existing U.S., European Union, Japanese and other international and national taxonomies, or classification systems, can also *provide a common descriptive basis for comparing* these taxonomies, as well as others being developed throughout the world.

Currently there are many instantiations of ITS architecture in use around the world, with fragments of ITS architectures being used as the basis for several International Standards. This part of ISO 14813 embraces architecture concepts from the following sources:

- Other ITS architecture activities from several parts of the world, including the US National ITS Architecture and the European ITS Framework (FRAME) Architecture;
- Other ISO TC 204 and CEN TC278 working groups.

Most if not all ITS architectures that are in use around the world are based on either the US National ITS Architecture or the European ITS Framework (FRAME) Architecture. Unfortunately, the terminology used by these two ITS architectures is similar but not identical. The following table provides a high-

level comparison between some key terms used in these two ITS architectures that are relevant to this part of ISO 14813.

ISO 14813-1	US Architecture	FRAME Architecture
Actor	Terminator	Terminator/Actor
ITS Service Domain	User Service Bundle	ITS Service Group
ITS Service Group	User Service	ITS Service Topic
ITS Service	User Service Requirement	ITS Service

Note that in the FRAME Architecture, many of the terminators are classed as “generic”. This means that they have several forms (called “actors”) for specific instances. An example of this is the terminator “Driver”, which has specific instances that include actors such as drivers of private cars, plus drivers of other vehicle types, e.g. public transport, freight and emergency.

By combining the results of the work that has been done to develop these two architectures the working group has used the basic hypothesis that it is possible to define a set of ‘ITS service domains, groups and services’ that can be used in a variety of combinations and configurations, to provide an outline description of the different ITS architecture approaches.

Full documentation of all possible architectural approaches is not feasible given the high level of resources required to carry this out. Indeed full documentation and description of all possible approaches is undesirable as an item for standardisation. A defined and consistent approach is however required to facilitate reuse and interoperability.

Users of this part of ISO 14813 should note that it is also possible to use a sub-set of the Services as the starting point for the creation of an ITS architecture for a particular ITS implementation. It is possible to add specific services that are peculiar to that implementation in order that the ITS architecture will support all that the stakeholders would like ITS to provide.

A further important point to note is that it is assumed that the scope of the ITS sector always has a definable boundary. Experience over the last 20 to 30 years has shown that this will change over time and that it will be necessary for this International Standard to be revised again after five years, if not before.

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Intelligent transport systems — Reference model architecture(s) for the ITS sector —

Part 1: ITS service domains, service groups and services

1 Scope

This part of ISO 14813 provides a description of the primary services that an ITS implementation can provide to ITS users. Those services with a common purpose can be collected together in “ITS service domains” and within these there can be a number of “ITS service groups” for particular parts of the domain. This part of ISO 14813 identifies thirteen service domains, within which numerous groups are then defined.

In this version of this part of ISO 14813 an indication has been provided to show the relationship of each service to Cooperative-ITS. Cooperative-ITS provides services that have previously been unavailable, notably those for ITS users who are on the move. For many other services, Cooperative-ITS can actually be seen as a “delivery mechanism” that can be used to enhance their use and availability. Thus for some services, Cooperative-ITS is essential, whilst for others it adds value. However for a small number of services it is not relevant.

This part of ISO 14813 is intended for use by at least two groups of people involved in the ITS sector. The first group is those looking for ideas about the services that ITS implementations can provide and the second is for those who are developing standards.

For the first group, this part of ISO 14813 provides service descriptions that can act as the catalyst for more detailed descriptions. It is possible for the level of detail to differ from one ITS implementation to another, depending on whether or not a national ITS architecture is involved, and whether this architecture is based directly on services, or on groups of functions.

For standards developers, this part of ISO 14813 is applicable to the working groups of ISO TC 204 and other Technical Committees who are developing standards for the ITS sector and associated sectors whose boundaries cross into the ITS sector (such as some aspects of public transport (transit), plus inter-modal freight and fleet management). This part of ISO 14813 is designed to provide information and explanation of services that can form the basis and reason for developing standards.

This part of ISO 14813 is in itself, by its nature, advisory and informative. It is designed to assist the integration of services into a cohesive reference architecture, plus interoperability and the use of common data definitions. Specifically, services defined within the service groups shall be the basis for definition of ‘use cases’, ‘user needs’ or ‘user service requirements’ depending on the methodology being used to develop the resultant ITS architecture functionality, along with definition of applicable data within data dictionaries, as well as applicable communications and data exchange standards.

2 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 14817-3, *Intelligent transport systems — ITS central data registry and data dictionaries — Part 3: Object identifier assignments for ITS data concepts*

ISO/TR 17465-1:2014, *Intelligent transport systems — Cooperative-ITS — Part 1: Terms and definitions*

3 Terms and definitions

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

3.1

actor

entity that fulfils a role

3.2

application

mechanism of delivering some or all parts of a service

3.3

cooperative-ITS

subset of overall ITS that communicates and shares information between ITS stations to give advice or facilitate actions with the objective of improving safety, sustainability, efficiency and comfort beyond the scope of stand-alone systems

Note 1 to entry: This definition also appears in ISO 21217:2014. It is sometimes referred to as 'connected vehicles' or 'connected vehicle/highway systems'.

3.4

dangerous goods

substances or articles which are potentially hazardous (for example, poisonous to humans, harmful to the environment, explosive, flammable or radioactive) that require regulatory control when transported

Note 1 to entry: This definition is taken from ISO/TR 15638-18.

3.5

dedicated transport network

transport mechanism that is able to carry people in special vehicles through a purpose built network, which is usually separate from, but can be part of an existing road network

3.6

dispatch

action that requests specific resources to perform particular services

EXAMPLE The emergency communications centre *dispatches* an ambulance in response to an incident where it is determined the victim must be taken to a hospital.

3.7

ITS service

functionality provided to users of intelligent transport systems designed to increase safety, sustainability, efficiency, and/or comfort

Note 1 to entry: This definition also appears in ISO 21217:2014.

3.8

ITS service group

one or more similar or complementary ITS services provided to ITS users

3.9

ITS service domain

specific application area which comprises one or more ITS service groups

3.10**ITS stakeholders**

individual or organisation having a right, share, claim or interest in a system or in its possession of characteristics that meet their needs and expectations

Note 1 to entry: Their involvement can be through use, manufacture of products, provision of Services, or regulation.

3.11**ITS user**

one who directly receives and can act on ITS data or control products

Note 1 to entry: An ITS user is one who receives, directly or indirectly, or provides to, the transaction of an ITS service; these users of ITS services must be human, external systems, or another source of data, e.g. detection equipment.

3.12**navigation**

ITS service which provides directional information to an individual during a trip

3.13**mass**

mass of a given heavy vehicle as measured by equipment affixed to the regulated vehicle

Note 1 to entry: This definition is taken from ISO/TS 15638-12.

3.14**paratransit**

non-scheduled, non-fixed route public transport services for customers requiring special assistance and access to specific destinations at a user-requested time

EXAMPLE Disabled or elderly persons.

3.15**probe data**

vehicle sensor information that is processed, formatted, and transmitted to a land-based centre for processing to create a good understanding of the driving environment

3.16**probe vehicle system / vehicle probe**

system that comprises (1) vehicles which collect and transmit probe data and (2) land-based centres which do probe processing

Note 1 to entry: Probe processing builds an accurate understanding of the overall roadway and driving environment by fusing and analysing probe data sent from multiple vehicles and data from other data sources.

Note 2 to entry: This processed probe data can then be delivered back to vehicles to help them and their drivers perform better, to public authorities to help them manage the transportation system, and to other users for a variety of purposes.

3.17**route guidance**

service which utilizes directional information, destination or real-time data to select an appropriate route, either prior to or during a trip

3.18**transit**

alternative term for public transport that is used in some countries and in some instances and is expanded to "public transit"

3.19

telematics applications for regulated vehicles

provision of telematics services for regulated vehicles by an application service provider communicating with a regulated (usually commercial) vehicle using ITS-station to ITS-station communications

4 Symbols and abbreviated terms

C-ITS	Cooperative-ITS
EETS	European Electronic Toll Service
EFC	Electronic Fee Collection
HAZMAT	Hazardous materials
IFMS	Interoperable Fare Management Systems
ITS	Intelligent transport systems
OBE	On-board Equipment
PT	public transport
RSE	Roadside Equipment
TARV	Telematics applications for regulated vehicles
TICS	Transport information and control systems (old term for ITS)
UML	Unified modelling language

5 General requirements

5.1 ITS service domains, service groups and services

5.1.1 Characteristics of ITS service domains

Regardless of any specific ITS implementation, ITS services and groups of services are usually combined into different (although often interrelated) application areas. These application areas have as their focus one or more groups of ITS users, such as travellers, road network operators, drivers (both of all vehicles and of selected types), those who move freight. They are the highest level of abstraction in an ITS architecture, and are called service domains.

ITS services do not represent the technology or the functionality that will be required by any of the one or more ITS applications that are required to deliver them. In fact it is possible for the technology and functionality used by the ITS applications to vary from one ITS implementations to another and for the content of the ITS applications to vary because of the variances in the organisational structures used in different geographical areas.

There is no proscribed relationship between ITS service domains and the areas of common functionality that are included in different ITS architectures. Sometimes a relationship may appear to exist, but this is often illusory and a reflection of the choice of names for the areas of common functionality. For example, both the US National ITS Architecture and the European ITS Framework (FRAME) Architecture include an area of functionality called "Manage Traffic", which in both cases supports ITS services other than those included in the "Traffic Management and Operations" ITS service domain described in this part of ISO 14813.

5.1.2 Characteristics of ITS service groups

A service domain comprises one or more types of ITS service. It shall be possible for each type of ITS service to comprise several instances of related services. These collations of related ITS service instances are called “ITS service groups.” Therefore, an ITS service group consists of one or more similar or complementary services that can be provided to ITS users.

There are several characteristics of ‘ITS service groups’ and services contained within:

- a) Each ‘ITS service group’ is oriented to a specific activity related to management or information of the road transport network that is divided into specific services that should address particular users or modes.
- b) The name of each service group should reflect the type of activities supported (e.g., “pre-trip information”),
- c) Each service within the service group should reference both the service group activity and the nature of the users or modes supported by the service (e.g., “pre-trip information – public transport”)
- d) Each level of the hierarchy should be at an equivalent level of granularity

5.1.3 Characteristics of ITS services

An ITS service consists of a product or activity that can be provided to a specific ITS user. Thus ITS services shall be considered as the elemental building blocks of any ITS architecture/implementation.

The level of detail in this document is focused at the level of domains and service groups, and specific services. It is noted that different countries partition their reference architectures in different ways – some through more granular service or needs definition, others at a higher level of abstraction. However in order to provide a level of consistency and to avoid ambiguities arising from different definitions of services with the same name, high-level or outline definitions are provided for specific services. Despite this, users are still able to add to or replace some of the specific services described in this document in order to reflect particular location and/or jurisdictionally and/or societal requirements. Whenever this is done the names of these new or replacement services must not conflict or replicate the names of services used in this document.

The elaboration of specific ITS services must be undertaken in a consistent manner throughout any specific architecture. There are several methodologies that assist the development of this consistent elaboration.

ISO ITS architecture standards do not require the use of a specific methodology and it is possible to use either Unified Modelling Language (UML – see ISO/TR 24529) or process orientated techniques (see ISO 26999). The choice of methodology must be driven by factors such as the point in the ITS implementation process at which the architecture is being developed and hence who is the target audience for the architecture.

ISO 14813-5 provides guidance as to the requirements for architecture description in ITS standards and ISO 17452 provides guidance and assistance for the use of UML in defining ITS interfaces.

5.2 ITS users

The general definition of the ITS user is that it represents a “partner”, *i.e.* one who receives an ITS service through interaction with applications in the ITS implementation. ITS users have elsewhere been described as one of the sets of “stakeholders” who are involved in ITS implementations. . By definition, all human interaction with ITS implementations involves external actors interfacing with applications across the boundary of the system.

NOTE Humans interacting with applications in an ITS implementation are sometimes called “external ITS users.”

6 The structure of ITS service domains

6.1 ITS service domains

Categorisation of ITS activities is one of the first steps in defining the range of activities, some or all of which can be supported by any ITS implementation. It serves to delineate different sectors of the ITS industry.

The following lists and describes 13 'ITS service domains'. These are:

- Traveller Information – this domain addresses the provision of both static and dynamic information about the road transport network to users prior to and during their trips, including inter-modal options and transfers and the status of other transport modes.
- Traffic Management and Operations – this domain specifically addresses the management of the movement of all types of vehicles, travellers and pedestrians throughout the road transport network, and includes both automated monitoring and control activities as well as decision-making processes (both automated and manual) that address real-time incidents and other disturbances on the transportation network, as well as managing travel demand as needed to maintain overall mobility.
- Vehicle Services – this domain has as its focus the enhancement of safety, security and efficiency in vehicle operations, by warnings and assistance to users or input to the operation of the vehicle. These services use external information from on-board sensing devices, and/or from wireless communications with other sources.

NOTE The lead on standardization for the on-board issues will be agreed between TC204 and TC22.

- Freight Transport – this service domain addresses the management of the operation of commercial vehicle fleets and the movement of freight, including activities that expedite the authorization process for freight to move across national and jurisdictional boundaries, activities that expedite inter-modal transfers of freight and the operation of freight vehicles that use telematics applications to enhance their operation and management.
- Public Transport – this service domain addresses the management of public transport (transit) to enable them to provide services that operate more timely and efficiently and the provision of operational information to the operator and user, including multimodal aspects.
- Emergency Service – the services in this domain are delivered in response to incidents that are categorized as emergencies and permit emergency services to be more quickly initiated and expedited throughout the transportation network.
- Transport-related Payment – this domain addresses activities that permit revenues for transportation services and facilities to be collected either electronically through non-cash and non-stop payment, or using mechanisms that require vehicles to stop.
- Road transport related Personal Safety – the services in this domain are responsible for the protection of the personal safety of transport users including pedestrians and individuals using road transportation facilities.
- Weather and Environmental Conditions Monitoring – the services in this domain are responsible for activities that monitor and notify users and transport network managers of weather and environmental conditions that are likely to have an impact on the road transport network and its users.
- Disaster Response Management and Coordination – the services in this domain are concerned with road transport based activities that manage resources from multiple jurisdictions in their responses to natural disasters, civil disturbances, or terror attacks.
- National Security – the services in this domain are concerned with the remote monitoring of vehicles for explosives or HAZMAT detection, and operational control of such vehicles (permitting shut down of vehicle operations if it is currently occupied by terrorists or known to be equipped (e.g., rigged with explosives) to cause destruction.

- ITS Data Management – the services in this domain are responsible for the definition and management of data that is capable of being used by some or all of the other services described in this part of ISO 14813.
- Performance Management – the services in this domain are responsible for the on-line and off-line simulation of road transport network operation using archived and/or live data that has been obtained from monitoring of the road transport network.

The categorization of the services into 13 groups does also not imply that all ITS architectures and the implementations deployed from them should be required to follow this construction. The construction that they use should be that which is best suited to their ultimate use and should be independent of the services that they support.

Services are often interdependent on, or providers to, other services within a service group or are key enablers for the provision of services in other service groups. In ITS architecture elaborations based on these services it is important that the proposed classification schema identify WHO is responsible for the provision of the service.

6.2 Cooperative-ITS

The advent of Cooperative-ITS is seen by many as a completely new service or group of services. However closer study reveals that much of what Cooperative-ITS “provides” can in fact be categorised under one of the existing service groups. So for example, providing travel information in a vehicle through communication with the roadside infrastructure and/or other vehicles belongs in the “Traveller Information” group. The important attributes that Cooperative-ITS does provide are improved ways of communication both to collect road transport data from which information can be derived and to provide the information in real-time to the vehicle occupants. It also enables data to be shared between vehicles and with other entities within an ITS implementation. The agreed definition of Cooperative-ITS is provided in TR17465-1:2014.

NOTE In some countries, the use of the term “Cooperative-ITS” has been replaced by the term “Connected Vehicles”.

6.3 Service Domain Structure

[Table 1](#) shows the structure of each of the 13 service domains identified in [5.1](#). Within each domain are a number of groups, each of which can have one or more constituent services.

Table 1 — Structure of ITS service domains and groups

Service domain	Service group	Service	See clause
Traveller Information	Real-time transport Status Information	Traffic and roadway information	A.2.2.1
		Public transport information	A.2.2.2
		Intermodal facility information	A.2.2.3
		Airport information	A.2.2.4
		Parking information – external to facilities	A.2.2.5
	Real-time in-vehicle display	In-vehicle signing – guidance and regulatory	A.3.2.1
		In-vehicle signing – parking information	A.3.2.2
		In-vehicle signing – speed and lane control	A.3.2.3
		In-vehicle signing – advance warning and advisory	A.3.2.4
		Specific public transport vehicle related information	A.3.2.5
	Real-time route guidance and information	Dynamic in-vehicle route guidance using real-time information	A.4.2.1
		Dynamic personal route guidance using real-time information	A.4.2.2
		Public Transport-specific trip guidance	A.4.2.3
	Multi-modal trip planning	Multi-modal comparative trip guidance	A.5.2.1
		Centralized trip planning using real-time and policy inputs	A.5.2.2
Travel services information	Travel services information – destination	A.6.2.1	
	Travel services information – current location	A.6.2.2	
Traffic Management and Operations	Traffic management and control	Traffic monitoring	B.2.2.1
		Surface street control (signals)	B.2.2.2
		Freeway traffic control – ramp control	B.2.2.3
		Freeway traffic control – mainline speed and lane management	B.2.2.4
		Preferential treatment for specific vehicle types (signal priority and pre-emption)	B.2.2.5
		Reversible lane management	B.2.2.6
		Coordination of surface street and freeway control	B.2.2.7
		Intermodal highway junction management	B.2.2.8
		Parking management	B.2.2.9
		Work zone traffic management	B.2.2.10
		Traffic advisory and warning information	B.2.2.11
		Incident monitoring and confirmation	B.2.2.12
	Transport related incident management	Incident on-site driver assistance	B.3.2.1
		Incident on-site traveller assistance	B.3.2.2
		Incident co-ordination and clearance	B.3.2.3
		Hazardous materials monitoring and management	B.3.2.4
		Collection of incident details from other transport mode	B.3.2.5
	Demand management	Variable road pricing – dedicated lane	B.4.2.1
		Variable road pricing – entire facility	B.4.2.2
		Cordon and zone-based congestion pricing	B.4.2.3
		Access management	B.4.2.4
		High-occupancy lane management	B.4.2.5
		Air quality-based transport management	B.4.2.6
	Road transport infrastructure maintenance management	Roadway construction and maintenance management	B.5.2.1
		Winter maintenance	B.5.2.2
		Pavement management	B.5.2.3
		Automated road management	B.5.2.4
		Work zone safety management	B.5.2.5

Table 1 (continued)

Service domain	Service group	Service	See clause
	Policing/enforcing traffic regulations	Access control	B.6.2.1
		High-occupancy vehicle facility usage	B.6.2.2
		Parking regulation enforcement	B.6.2.3
		Speed limit enforcement	B.6.2.4
		Signal enforcement	B.6.2.5
Vehicle services	Road transport related vision enhancement	In-vehicle driver vision management	C.2.2.1
		External driver vision management	C.2.2.2
		Pedestrian and cyclist vision management	C.2.2.3
	Automated vehicle operation	Automated highway operation	C.3.2.1
		Automated low-speed manoeuvring	C.3.2.2
		Automated Parking	C.3.2.3
		Adaptive cruise control	C.3.2.4
		Cooperative adaptive cruise control	C.3.2.5
		Precision docking for public transport vehicles	C.3.2.6
	Collision mitigation / avoidance	Longitudinal collision mitigation/avoidance	C.4.2.1
		Lateral collision mitigation/avoidance	C.4.2.2
		Intersection collision mitigation/avoidance	C.4.2.3
	Safety readiness	Vehicle internal systems monitoring	C.5.2.1
		Vehicle external conditions monitoring	C.5.2.2
	Pre-crash restraint deployment	Pre-crash restraint deployment	C.6.2.1

Table 1 (continued)

Service domain	Service group	Service	See clause
Freight transport	Commercial vehicle pre-clearance	Weigh-in-motion	D.2.2.1
		Non-stop pre-clearance	D.2.2.2
		Vehicle safety records monitoring	D.2.2.3
	Commercial vehicle administrative processes	Freight movement information exchange	D.3.2.1
		Automatically identify, monitor and exchange emergency response information for dangerous goods	D.3.2.2
		Automated credential filing	D.3.2.3
		Automated commercial vehicle administration	D.3.2.4
		Automated border crossings	D.3.2.5
	Automated roadside safety inspection	Remote access to commercial vehicle safety data	D.4.2.1
		Remote access to commercial vehicle driver data	D.4.2.2
	Commercial vehicle on-board safety monitoring	Commercial vehicle internal systems monitoring	D.5.2.1
		Commercial vehicle driver alertness monitoring	D.5.2.2
		Commercial vehicle cargo state monitoring	D.5.2.3
	Intercity freight transport fleet management	Intercity commercial vehicle fleet tracking	D.6.2.1
		Intercity commercial vehicle fleet dispatching	D.6.2.2
	Intermodal information management	Vehicle and container arrival information exchange	D.7.2.1
		Customer freight information access	D.7.2.2
		Freight container tracking	D.7.2.3
	Management and control of intermodal centres	Intermodal centre facility management	D.8.2.1
		Intermodal vehicle and container control	D.8.2.2
	Management of dangerous freight	Dangerous goods movement data collection and sharing	D.9.2.1
		Dangerous goods movement data registry	D.9.2.2
		Dangerous goods movement fleet coordination	D.9.2.3
		Dangerous goods movement police/safety coordination	D.9.2.4
		Dangerous goods movement location monitoring	D.9.2.5
	Management of heavy goods vehicles	Heavy goods vehicle data collection and sharing	D.10.2.1
		Heavy goods vehicle registration processing	D.10.2.2
		Heavy goods vehicle location monitoring	D.10.2.3
	Management of local delivery vehicles	Delivery vehicle fleet tracking	D.11.2.1
		Delivery vehicle fleet dispatching	D.11.2.2
		Delivery zone and parking information services	D.11.2.3
	Telematics applications for regulated vehicles (TARV)	Procedures, and enforcement provisions for the providers of regulated services	D.12.2.1
		Provision of system security	D.12.2.2
		Provision of vehicle information	D.12.2.3
		Provision of vehicle access management	D.12.2.4
		Provision of remote tachograph monitoring	D.12.2.5
		Provision of Emergency messaging system/eCall	D.12.2.6
		Provision of driver work records	D.12.2.7
		Provision of vehicle 'mass' monitoring	D.12.2.8
		Provision of vehicle location, speed and consignment data	D.12.2.9
		Provision of vehicle parking facilities	D.12.2.10
Freight transport content identification and communication	Collection of freight transport identification data	D.13.2.1	
	Communication of freight transport identification data	D.13.2.2	

Table 1 (continued)

Service domain	Service group	Service	See clause
Public transport	Public transport management	Public transport operational management	E.2.2.1
		Public transport fleet management	E.2.2.2
		Public transport vehicle equipment monitoring	E.2.2.3
		Public transport service monitoring and scheduling	E.2.2.4
		Public transport operational strategies	E.2.2.5
		Public transport wayside status display	E.2.2.6
	Demand responsive and shared transport	On-demand public transport fleet management	E.3.2.1
		On-demand ridesharing management	E.3.2.2
		On-demand freight transport	E.3.2.3
Emergency service	Transport related emergency notification and personal security	User-initiated distress calls	E.2.2.1
		Automated emergency call and mayday (eCall) dispatch	E.2.2.2
		Automated vehicle intrusion and theft warning	E.2.2.3
	After-theft vehicle recovery	Remote vehicle immobilization	E.3.2.1
		Stolen vehicle tracking	E.3.2.2
	Emergency vehicle management	Emergency vehicle fleet tracking	E.4.2.1
		Emergency vehicle fleet management	E.4.2.2
		Emergency vehicle traffic management coordination	E.4.2.3
	Hazardous materials and incident notification	HAZMAT vehicle tracking and monitoring	E.5.2.1
		HAZMAT vehicle route management	E.5.2.2
		Automated HAZMAT emergency call/mayday notification	E.5.2.3
		HAZMAT pre-clearance services	E.5.2.4
	Transport-related payment	Electronic financial transactions for road use	Interoperable Electronic Fee Collection, e.g. EETS
Electronic Fee Collection (EFC)			G.2.2.2
Distance based road user pricing			G.2.2.3
Demand management based on road user pricing			G.2.2.4
Vehicle criteria based road user pricing			G.2.2.5
Car Park payment systems			G.2.2.6
Electronic fare management services		Electronic Fare Collection	G.3.2.1
		Interoperable Fare Management Systems (IFMS)	G.3.2.2
Transport related electronic financial transactions		Electronic Transport services payment	G.4.2.1
		Multi-modal transport services related electronic payment systems	G.4.2.2
Other mechanisms for collecting payment for road use		Cashless Road Use Payment Collection	G.5.2.1
		Cash Based Road Use Payment Collection	G.5.2.2
Road transport related personal safety		Public travel security	Silent alarm
	Emergency call/mayday alert for public transport		H.2.2.2
	Intrusion detection		H.2.2.3
	Public transport surveillance		H.2.2.4
	Safety enhancements for vulnerable road users	Non-motorized vehicle and pedestrian monitoring	H.3.2.1
		Systems to monitor specialized vehicles	H.3.2.2
	Safety enhancements for disabled road users	Intersection monitoring of specialized conveyances	H.4.2.1
		Driver warnings for specialized conveyances	H.4.2.2
	Safety provisions for pedestrians using intelligent junctions and links	Signal display advance warning	H.5.2.1
		Oncoming vehicle advance warning (for non-signalized junction)	H.5.2.2
		In-vehicle signage and warning systems	H.5.2.3

Table 1 (continued)

Service domain	Service group	Service	See clause
Weather and environmental conditions monitoring	Weather monitoring	Road weather information monitoring	1.2.2.1
		Road weather prediction	1.2.2.2
	Environmental conditions monitoring	Water level/tidal monitoring and prediction	1.3.2.1
		Seismic monitoring	1.3.2.2
		Pollution monitoring	1.3.2.3
	Avalanche, mud slide and fallen rock monitoring	1.3.2.4	
Disaster response management and coordination	Disaster data management	Disaster and emergency data collection	1.2.2.1
		Disaster and emergency data sharing	1.2.2.2
	Disaster response management	Disaster response planning for the transport network	1.3.2.1
		Disaster response implementation	1.3.2.2
	Coordination with emergency agencies	Disaster response coordination	1.4.2.1
National security	Monitoring and control of suspicious vehicles	Vehicle monitoring for HAZMAT and explosives presence	K.2.2.1
		Identification of suspicious vehicles	K.2.2.2
		Disablement of vehicles believed to be suspicious	K.2.2.3
		Road traffic management for suspicious vehicles	K.2.2.4
		Emergency notification to key agencies or suspicious vehicles	K.2.2.5
	Utility or pipeline monitoring	Pipeline and utility HAZMAT/explosives monitoring	K.3.2.1
		Implementation of mitigation strategies	K.3.2.2
		Emergency notification to key agencies	K.3.2.3
ITS data management	Data registries	Registration of ITS data concepts for re-use and interoperability	L.2.2.1
		Registration of ITS subroutines for re-use and interoperability	L.2.2.2
	Data dictionaries	Registration of the definition of terms used in ITS	L.3.2.1
Performance management	Data Storage	Data archiving (formerly traveller information domain)	M.2.2.1
		Data warehousing (formerly traveller information domain)	M.2.2.2
		Emissions monitoring	M.2.2.3
	Simulation	System performance simulation (on-line)	M.3.2.1
		System performance simulation (offline)	M.3.2.2

6.4 ITS service groups for each domain

‘ITS service groups’ represent a further delineation of the various sectors of ITS activity represented by the domains described in 5.1. The delineation specifically addresses different types of activities carried out within the domain. The service groups as described by domain in the following Annexes do not necessarily address specific users, modes or audiences for these activities. That level of detail is provided by the specific services, which are defined under each service group. This permits the transport operator (state, municipality or authority) to select which specific services within each service group are relevant to their needs and to add extra location and/or jurisdictional specific services if and when required.

ITS standards (as defined by ISO TC204 and approved by member bodies) are focused on the road transport sector and the interfaces with other transport modes. Other committees define standards and practices for rail, air, waterways. However, there are many ‘grey’ areas where ITS standards embrace aspects that affect both road and other transport modes. (Similarly there are standards for other transport modes that affect the ITS sector.) This particularly applies in the area of traveller information, scheduling, and traffic control.

6.5 Use of ITS services to provide Object Identifiers for data concepts

A unique Object Identifier (OID) for data concepts shall be used in other ITS related standards produced by ISO TC204. The format of this OID will be defined through the use of the ITS domain and service number in which the data concept will be used and will be according to the procedures for OID's defined by ISO/IEC JTC1/SC6 and ITU-T SG17. A full description of how this shall be achieved will be provided in ISO 14817-3.

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Annex A (normative)

Traveller Information service domain

A.1 Introduction

This domain covers the provision of both static and dynamic information about the road transport network to its users both prior to and during their trips. It includes information about inter-modal options and transfers and the status of other transport modes for use by some users.

This domain includes the following service groups:

1. Real-time transport status information – see [A.2](#) et seq.;
2. Real-time in-vehicle display – see [A.3](#) et seq.;
3. Real-time route guidance and information – see [A.4](#) et seq.;
4. Multi-modal trip planning – see [A.5](#) et seq.;
5. Travel services information – see [A.6](#) et seq.;

A.2 Real-time transport status information

A.2.1 Introduction

This service group encompasses travel information received at home, work, hotels, major public locations, such as shopping centres, and on portable terminals prior to travel. It shall be possible for pre-trip Information services to target road facilities, public transport, freight and intermodal users, and non-motorized travel. Depending on the service provided, pre-trip information includes current information on traffic conditions, schedule adherence and location of public transport vehicles relative to the user's location, road and weather information, prevailing traffic regulations and tolls. In geographic terms it shall relate to those parts of the travel network that are near to the current location of the traveller and must not be dependent on the route and modes of a trip that the traveller is currently undertaking.

A.2.2 Constituent Services

A.2.2.1 Traffic and roadway information

This service shall provide information about the current state of traffic and the roadway. The traffic information shall show the traveller the current real-time state of traffic flows, including such things as speed, headway and congestion state, plus queues at toll stations, bridges and road ferry terminals. Information about the roadway shall highlight such things as the presence of ice, snow, surface water and other conditions that have the possibility to affect the freedom of movement for road vehicles.

A.2.2.2 Public Transport information

This service shall cover road and other transport modes that have the possibility to be of interest to the pre-trip traveller. It shall consist of four major functions: (1) Available Services Information, (2) Current

Situation Information, (3) Trip Planning Service, and (4) User Access. Their individual components are described below.

(1) Available Services Information: this includes information about:

- Location of bus, tram and trolley stops plus railway stations, ferry terminals and airports;
- Schedules and services for road and other transport modes;
- Historical performance (schedule adherence and “vertical” mode performance);
- Transport fares and transfer costs.

(2) Current Situation Information: this includes information about:

- Detours, special services, and expected delays (current and near term situational status);
- Currently available parking near a public transport stop.

(3) Trip Planning Service: this provides trip planning for current or upcoming passenger trips including calculating itinerary and end-to-end navigation from origin to destination (including walking directions).

(4) User Access: this provides information on user channels for accessing planning and real time information on available services, current situational status, and trip planning.

A.2.2.3 Intermodal facility information

This service shall provide information about the facilities that are available for a traveller to transfer their mode of travel between different transport modes. This shall include modal transfer options coupled with recommended transfer locations between modes. It shall be based on both static and real-time dynamic information. The static information shall be provided by those who own, operate and manage the transport infrastructure and include:

- Location of inter-modal transfer points;
- Hours of operation;
- Modes between which transfers can be made;
- Transfer facilities, e.g. lifts, stairs and escalators.

The real-time dynamic information shall be provided by transport network operators and service providers and shall include:

- Current service availability;
- Next scheduled departure times for available services;
- Current transfer time.

Both types of information shall be available through a variety of mechanisms, such as local information outputs, the Internet, in-vehicle displays and personal devices.

A.2.2.4 Airport information

This service shall provide real-time dynamic information about predicted and planned arrivals and departures of flights at airports. It shall also provide information about any currently known delays or cancellations, the availability of car parking and the current status (arrivals and departures) of the services provided by other transport modes. Static information shall be included about airport facilities such as the location and type(s) of car parking and access by other transport modes.

A.2.2.5 Parking information – external to facilities

This service shall provide information about parking facilities and their current status. It shall include real-time dynamic information that comprises:

- Current numbers of available spaces;
- Predicted numbers of available spaces.

Both of these sets of information shall be provided for each type of parking, e.g. long stay, short stay and valet parking. There shall also be static information that includes:

- Directions to the parking facility;
- Type of parking available, e.g. long stay, short stay and valet parking;
- Allowable length of stay;
- Restrictions, e.g. no camping or overnight parking;
- Parking charges.

Both types of information shall be available through a variety of mechanisms that are provided through local information outputs and the Internet.

A.3 Real-time in-vehicle display

A.3.1 Introduction

This service group encompasses information provided to travellers in the vehicle, either provided for a mass audience or tailored to the specific vehicle or traveller location, or along the travel route. The information is provided as advisories and it shall be possible for it to comprise real-time travel information, including estimated time to a destination based on current conditions, as well as work zones, incidents, weather, tolls, parking availability, and other information of use to the traveller.

A.3.2 Constituent Services

A.3.2.1 In-vehicle signing – route guidance and regulatory

This service shall provide the facility for route guidance and regulatory information to be displayed to drivers in their vehicles. The route guidance information shall be based on some or all of the following data that is to be provided by drivers before the start of their trips:

- The trip origin and destination;
- Route preferences;
- Requested arrival time;
- Vehicle characteristics.

It shall be possible for some of this data to be automatically provided by the vehicle, and other items such as origin, destination and route preferences can be sourced from a pre-defined list of those used most often. The regulatory messages shall include such as weight, height and entry restrictions.

A.3.2.2 In-vehicle signing – parking information

This service shall provide the facility for parking information to be displayed to drivers in their vehicles. It shall be possible for this information to include some or all of the following:

- Location of available parking spaces, either as the location of a parking area, or spaces within a parking area;
- Cost of parking;
- Maximum allowable duration of stay and any other limitations, e.g. no camping, or maximum size of vehicle;
- Level of security and its type, e.g. entry/exit detection, car parking attendant and video monitoring.

It shall be possible for this information to be displayed for one or parking areas in the vicinity of the vehicle or at a location that is defined by the driver, e.g. the trip destination, and to book a parking space in advance.

A.3.2.3 In-vehicle signing – speed and lane control

This service shall provide the facility for speed and lane control information to be displayed to drivers in their vehicles. It shall be possible for this service to comprise some or all of the following:

- Current speed limit;
- Speed limit in the road ahead of the vehicle when different from the current speed limit;
- Vehicle staying out of lane;
- Vehicle in a lane not appropriate for its type and/or number of occupants;
- Vehicle headway is unsafe for current speed, vehicle and road conditions.

It shall be possible for the content of this information to be influenced by the type of vehicle and/or its size, plus its current condition, as well as the current state of the driver.

A.3.2.4 In-vehicle signing – advance warning and advisory

This service shall provide the facility for advance warning and advisory information not included in other services in this group to be displayed to drivers in their vehicles. It shall be possible for this information to comprise warnings and advisories about:

- Adverse road conditions on the planned route, or in the predicted vehicle trajectory;
- Changed in speed limits;
- Changes in weather conditions;
- Entry into tolled section and/or imminent arrival at a toll plaza/charging zone;
- Restricted access to the road ahead;
- Erratic driving, e.g. due to tiredness;
- Problems with the condition of the vehicle.

It shall be possible for the content of this information to be influenced by the type of vehicle and/or its size, plus its current condition.

A.3.2.5 Specific public transport vehicle related information

This provides travellers with real-time public transport vehicle information integrating information from different transit modes and presenting it to travellers for decision making. Thus it allows travel alternatives to be chosen once the traveller is enroute. It consists of three major functions, which are, (1) Information Distribution, (2) Information Receipt, and (3) Information Processing. Their individual components are described below.

- (1) Information Distribution: this provides real time situational information to travellers based on their needs, for example “in the right place, at the right time, for a reasonable ‘cost’”, including providing through signs or announcements current and next stop information on-board public transport vehicles.
- (2) Information Receipt: this includes provision of the following:
 - Information on mobile devices, equipment at a fixed location where passengers board or alight from a public transport vehicle, or on a public transport conveyance.
 - Interactive or static on-trip information dissemination via visual or audio media channels
 - Current situational status and/or predictive information about current public transport services
- (3) Information Processing: this provides services to reserve, confirm and pay for dynamic public transport service, including connection protection, rideshare, fixed route deviation, parking and other public transport services (or multimodal services connected with public transport trips).

A.4 Real-time route guidance and information

A.4.1 Introduction

This service group is categorised as a planning service undertaken during a trip to enable the traveller to complete the trip as planned. It shall be possible for the services in this group to enable the best route options to be calculated taking account of network and public transport information and to incorporate multi-modal options such as ‘Park and Ride’.

A.4.2 Constituent Services

A.4.2.1 Dynamic in-vehicle route guidance using real-time information

This service shall enable drivers of vehicles to be provided with route guidance information in their vehicles that is dynamically updated as the trip progresses. The route guidance information shall be based on some or all of the following data that is to be provided by drivers before the start of their trips:

- The trip origin and destination;
- Route preferences;
- Requested arrival time;
- Vehicle characteristics.

It shall be possible for some of this data to be automatically provided by the vehicle, and other items such as origin, destination and route preferences to be sourced from a pre-defined list of those used most often. As the trip progresses the route guidance information shall be modified from that originally produced to take account of real-time changes to one or more of the following:

- Road conditions, e.g. ice and snow;
- Traffic conditions, e.g. congestion and incidents;
- The condition of the vehicle, e.g. brakes becoming worn down;

- The driver's state, e.g. tiredness causing lack of concentration.

The changes to the route guidance shall enable the driver to avoid and/or compensate for the above. If the state of the driver is such that to continue to drive the vehicle is likely to present a danger to other road users, it shall be possible for the route guidance to provide direction to a nearby rest area.

A.4.2.2 Dynamic personal route guidance using real-time information

This service shall enable travellers to be provided with route guidance information through some kind of portable device that is dynamically updated as the trip progresses. The route guidance information shall be based on some or all of the following data that is to be provided by drivers before the start of their trips:

- The trip origin and destination;
- Route preferences;
- Requested arrival time;
- Requested preferences for transport modes to be used;
- The traveller's state, e.g. disabled, or elderly;
- Characteristics of the traveller's own transport means, e.g. car, bicycle, and motor cycle.

It shall be possible for some of this data to be automatically provided from a pre-defined list of those used most often, e.g. origin and destination plus route and mode preferences. As the trip progresses the route guidance information shall be able to be modified from that originally produced to take account of real-time changes to one or more of the following:

- Travel conditions, e.g. ice, snow, congestion, availability of other transport modes;
- The condition of the traveller's own transport means;
- The traveller's state, e.g. tiredness causing lack of concentration.

The changes to the route guidance shall enable the traveller to avoid and/or compensate for the above. It shall also be possible for unexpected changes to the use of transport modes to be included, as well as guidance to a place where rest can be taken, be it from driving, cycling, walking or the use of Public Transport.

A.4.2.3 Public Transport-specific trip guidance

This service shall enable travellers to be provided with route guidance information through information displays that are available on Public Transport vehicles or at other Public Transport related facilities. The route guidance information shall be generic in the sense that it must not necessarily relate to the trip being made by each traveller. However it shall be possible for it to include some or all of the following information:

- Expected time of arrival of the next service and subsequent services;
- Current service performance, e.g. running late or early;
- Other services available at the next stop and their time(s) of departure;
- Other transport modes available at the next stop.

The availability of this information and the display mechanism that is used shall depend on the physical location from where it is being displayed.

A.5 Multi-modal trip planning

A.5.1 Introduction

This service group covers services that shall enable travellers to plan trips that involve the use of two or more modes of transport. It shall be possible for the services in this group to enable the best route options to be calculated taking account of network and public transport information and to incorporate multi-modal options such as Park and Ride.

A.5.2 Constituent Services

A.5.2.1 Multi-modal comparative trip guidance

This service shall enable travellers to plan different trips and then compare them. The trips shall involve the use of two or more modes of transport, at least one of which must involve the use of the road network, either for walking, cycling, motor cycling, car driving, or using Public Transport. The comparison shall be made by the traveller selecting one or more of the following parameters:

- Cost;
- Total trip time, i.e. includes waiting time at modal transfers;
- Number of modes used;
- Number of mode changes.

As a result of the comparison, the traveller shall be able to refine the details of some or all of the trips and re-run the comparison. Once the traveller is satisfied, the trip can be retained for immediate or future use.

A.5.2.2 Centralized trip planning using real-time and policy inputs

This service shall provide trip planning that takes place using a “centralised” system. In this instance, “centralised” means that the service is to be provided by an organisation that has access to real-time travel data and transport policy, which it either gets from other organisations or makes for itself. Real-time travel data shall include some or all of the following:

- Traffic Data, to include speeds and congestion;
- Public Transport service data, to include current and expected schedule deviations;
- Weather Data, to include both current conditions and forecast changes that have the potential to adversely affect road travel.

The policy inputs shall cover such things as the requirement for trips to particular transport modes in preference to others. It shall also be possible for the policy inputs to enable the use of a particular transport mode to either be made a requirement or to be prohibited. Where the modes chosen by the traveller are not those used in the trip plan because of policy restrictions, the traveller shall be informed of the changes.

A.6 Travel services information

A.6.1 Introduction

This service group covers the provision of services other than actual travel that has the potential to be of use to a traveller before or during a trip. It shall be possible for the information made available from services in this group to relate to the proposed destination of the trip or to the current location of the traveller, which when the information is provided pre-trip to be about the trip origin.

A.6.2 Constituent Services

A.6.2.1 Travel services information – destination

This service shall provide information about the services that are available to the traveller at the destination of a trip, either before the trip is made, or whilst the trip is in progress. The information can be both static and real-time dynamic, the traveller being provided with a suitable indication for each piece of information.

Static information shall include any of the following:

- Hotels;
- Restaurants and fast or take-away food outlets;
- Places of entertainment;
- Medical facilities;
- Points of Interest, e.g. land marks and places of historical interest;
- Places offering other services, e.g. banking and currency exchange.

Real-time dynamic information shall include any of the following:

- Hotel availability and costs;
- Restaurants availability and costs;
- Current and predicted state of the weather and other phenomena such as tides, canal lock operating times, etc.

The availability of this information and the display mechanism that is used shall depend on the physical location from where it is being displayed. This could be a static device, computer equipment, vehicles and personal devices. In the case of computers and personal devices, it shall be possible for the traveller to pre-book hotels, restaurants and place advanced orders at fast or take-away food outlets.

A.6.2.2 Travel services information – current location

This service shall provide information about the services that are available to the traveller at the place where they are currently located. If this information is being provided before a trip commences then it shall be possible for it to be about the trip origin. The information can be both static and real-time dynamic, the traveller being provided with a suitable indication for each piece of information.

Static information shall include any of the following:

- Restaurants and fast or take-away food outlets;
- Places of entertainment;
- Medical facilities;
- Places offering other services, e.g. banking and currency exchange.

Real-time dynamic information shall include any of the following:

- Current and predicted arrivals and departures of available Public Transport modes;
- Current and predicted state of the weather and other phenomena such as tides, canal lock operating times, etc.

The availability of this information and the display mechanism that is used shall depend on the physical location from where it is being displayed. This could be a static device, computer equipment, vehicles

and personal devices. In the case of computers and personal devices, it shall be possible for the traveller to pre-book restaurants and place advanced orders at fast or take-away food outlets.

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Annex B (normative)

Traffic Management and Operations service domain

B.1 Introduction

This domain covers the management of the movement of all types of vehicles, travellers and pedestrians throughout the road transport network, and includes both automated monitoring and control activities as well as decision-making processes (both automated and manual) that address real-time incidents and other disturbances on the transportation network, as well as managing travel demand as needed to maintain overall mobility.

This domain includes the following service groups:

1. Traffic management and control – see [B.2](#) et seq.;
2. Transport related incident management – see [B.3](#) et seq.;
3. Demand Management – see [B.4](#) et seq.;
4. Road transport infrastructure maintenance management – see [B.5](#) et seq.;
5. Policing/enforcing traffic regulations – see [B.6](#) et seq.

B.2 Traffic management and control

B.2.1 Introduction

The service group addresses the management of traffic flows through the road network. It includes the use of various mechanisms to monitor and manage traffic using the road network, including facilities to give preference to the movement of specific types of vehicle such as buses and taxis, plus vehicles belonging to the emergency services, as well as the management of the physical road network, modal interfaces and parking.

B.2.2 Constituent Services:

B.2.2.1 Traffic monitoring

This service shall enable the monitoring of the traffic conditions that currently exist in the road network being managed by ITS. The data to be monitored shall include some or all of the following:

- Traffic flow rate (a measure that shows the numbers of vehicles passing particular points);
- Traffic speed (for vehicles passing particular points);
- Headway between vehicles (at particular points and in particular lanes at those points);
- Congestion (defined as the location of stationary traffic at particular points).

It shall be possible for some or all of the above data items to be measured at one or more points in the road network. Also it shall be possible for the data to be classified by type of road vehicle, e.g. car, bus, freight vehicle and bicycle. Also it shall be possible for the collected data to be both archived and made available for use by applications delivering other services.

B.2.2.2 Surface street traffic management

This service shall enable the flow of traffic in surface streets to be managed in whatever way the management authority deems to be appropriate. It shall be necessary for the way that traffic is managed to be the same in all parts of the road network.

It shall be possible for the methods of management that can be applied to the surface streets to be one of more of the following:

- Local control, using traffic signal controllers that only take account of local conditions;
- Vehicle actuated control, using traffic signal controllers that use their own detection of vehicle presence;
- Fixed time control, using pre-programmed traffic signal controllers;
- Pedestrian control, using traffic signal controllers that can respond to demands from pedestrians to be allowed to cross the roadway;
- Adaptive control, using traffic signal controllers subject to one or more different methodologies;
- No control – traffic is allowed to flow without being managed.

It must be possible for each of these methods of management to be applied to some parts or the entire road network at different times or the day and days of the year. Pedestrian access to cross the road network can also be provided in conjunction with traffic management without input from pedestrians.

B.2.2.3 Freeway traffic control – ramp control

This service shall enable the control of ramps that give access for vehicles to freeways. It shall be possible for this control to restrict the access of vehicles to freeways to limit the impact of joining traffic on the flow of vehicles that are already using the freeways. It shall be possible for the criteria used to decide whether vehicle access to the freeway shall be limited to include:

- Freeway traffic flow;
- Freeway traffic speed;
- Traffic conditions in the surface street networks adjacent to the freeway ramps.

It shall be possible for the first two of these criteria to be defined by freeway lane and/or vehicle type and for the access restriction to be applied by time of day and day or year. If necessary it shall be possible for the current access restriction to be modified or a new access restriction imposed without any reference to the current freeway traffic conditions, e.g. in the event of some kind of incident, or emergency. Any changes in control must be applied in a safe manner that does not lead to a diminution in the safety of vehicles using the surface street network.

B.2.2.4 Freeway traffic control – mainline speed and lane management

This service shall enable the flow of traffic using freeways to be controlled. It shall be possible for the control of traffic to be based on one or both of the following:

- Mainline speed, i.e. the average speed of vehicles using the freeway;
- Lane management, i.e. the use that is made of each lane of the freeway.

It shall be possible for either of these control methods to be applied to one or more of the lanes provided by the freeway, to vary from one location to another and to be applied in different ways to different types of vehicles. Any changes in control must be applied in a safe manner that does not lead to a diminution in the safety of vehicles using the freeway network.

B.2.2.5 Preferential treatment for specific vehicle types (signal priority and pre-emption)

This service shall enable priority to be given to the way in which particular types of vehicle are able to move through the road network. It shall mainly be applied to the surface street part of the road network as this is where the most beneficial effects are able to be produced.

The types of vehicle for which priority shall be available shall include some or all of the following:

- Bicycles;
- Public Transport Vehicles, including buses and trams plus light rail vehicles where their routes interact with the road network;
- Emergency Vehicles, i.e. Police, Fire and Ambulance;
- Freight Vehicles;
- Special Vehicles, e.g. military vehicles or those carrying hazardous goods.

It shall be possible for priority to be given to each vehicle type at the same location and to different types of vehicles at specific locations throughout the road network.

B.2.2.6 Reversible lane management

This service shall enable the direction of the flow of traffic in a lane of the roadway to be changed. It shall be possible for this service to be applied on a very selective basis and must be made in a way that does not lead to a diminution in the safety of vehicles using the road network.

Whenever a change is made it shall be made in such a way that causes the minimum of disruption to the current flow of traffic. The lanes for which the direction of traffic flow is to be changed must be clearly identified in a way that can be understood by all drivers. This shall apply to drivers using the roadway in which the affected lane exists and drivers joining the affected lane from other parts of the road network, e.g. from side roads. Any change in the direction of traffic flow must be preceded by a closure of the use of the lane to ensure that the traffic that is currently using it has been cleared.

Changes shall not be made at frequent intervals. In this case "frequent" shall mean 1 hour, i.e. changes can only be made at intervals of over one hour.

B.2.2.7 Coordination of surface street and freeway traffic management

This service shall make it possible for the management of traffic using the surface streets in the road network to be co-ordinated with the management of traffic using the freeway part of the road network. The activities to be supported by this service shall include:

- Switching of traffic between surface streets and freeway parts of the network to enable traffic use to be balanced;
- Switching of traffic between surface streets and freeway parts of the network to reduce congestion in one part of the network if there is spare capacity in the other;
- Switching of traffic between surface streets and freeway parts of the network when some or all of one part of the network has been closed;
- Temporary restriction of access for one or more types of vehicle to either the surface streets or freeway parts of the network.

It shall be possible for any of these activities to be applied to some or all of either the surface streets or freeway parts of the road network. Also it shall be possible for these activities to be applied where the some or all of the surface streets and freeway parts of the road network are managed and/or operated by different authorities and/or jurisdictions.

B.2.2.8 Inter-modal highway junction management

This service shall enable the management of inter-modal highway junctions to be managed so that any temporary restriction on the operation of one mode is managed in such a way that the disruption to the other mode is minimised. The activities at inter-modal junctions to be supported by this service shall include:

- The stoppage of one or modes of travel to give priority to one or more other modes, e.g. stopping road traffic to permit heavy or light rail vehicles to move through the junction, or the closure of part of the road network to permit a bridge over a river or canal to open to water borne traffic;
- The application of a temporary speed restriction to one or more modes so that they are not brought to a physical stop by the passage of vehicles using one or more of the other modes.

It shall be possible for each of these activities to be applied to one, some or all of the modes that use a particular inter-modal junction. Appropriate and adequate warning that either of the activities is in progress shall be given to drivers of all effective modes well in advance of the inter-modal crossing. For the road network where possible and appropriate, it shall be possible for the warning that the activity is in progress to include advice about the temporary use of one or more alternative routes.

B.2.2.9 Parking management

This service shall enable the use of parking areas within the road network to be managed¹⁾. It shall be possible for this management to include one or more of the following measures:

- The opening and/or closing of some or all of a parking area, either permanently or for a temporary period;
- The provision of real-time information to drivers about the number of vacant spaces in a parking area;
- The real-time monitoring of the usage of a parking area to establish how many vacant spaces exist at any point in time;
- The real-time monitoring of a parking area in total and/or some or all of the individual spaces within a parking area to identify vehicles that have stayed longer than the time for which they have paid and/or the maximum time allowed.

It shall be possible for these measures to be applied to some or all of the parking areas in some or the entire road network. Also it shall be possible for different measures to be applied at each parking area and for the measures to also be applied to one or more different types of vehicle at each parking area.

B.2.2.10 Work zone traffic management

This service shall enable the traffic passing work zones (road works) to be managed. It shall be possible for this management to include one or more of the following measures:

- Application of speed restrictions for some or all of the part of the road network where the work zone (road works) is (are) active;
- Application of different speed restrictions for some or all of the part of the road network where the work zone (road works) is (are) active;
- Provision of appropriate lane management to ensure the safety of both the road workers and the passing traffic;
- Where possible and appropriate the provision of physical barriers to ensure the safety of both the road workers and the passing traffic;

1) Note: The service for the collection of payment for parking is described in G.2.2.5.

- The temporary closure of the part of the road network in which the work zone (road works) is (area) present;
- The provision of appropriate and safe access for road workers, plant and equipment and construction materials to the work zone (road works);
- The provision of the appropriate advanced warning to drivers that any of the above measures have been implemented on the road network ahead in the direction of travel.

It shall be possible for each of these measures to be implemented at some or all of the work zones (road works) present in the road network and for different measures to be implemented at each work zone (road works).

B.2.2.11 Traffic advisory and warning information

This service shall enable the provision of traffic advisory and warning information to drivers. It shall be possible for both types of information to be provided in vehicles and at the roadside. It shall be possible for the information to comprise one or more of the following:

- Advice about the onset of adverse traffic conditions that are causing delays;
- Warning of impending adverse weather and in the current location and/or in the direction of travel;
- The likely effect of congestion and/or adverse weather on speeds and/or journey times;
- Warning of a work zone (road works) ahead, including any temporary speed limits;
- Warning of carriageway restrictions ahead, such as narrow lanes, bridges, severe curves, weight restrictions;
- Warning of road closure in the direction of travel;
- Advice about alternative routes for any of the previously defined advisories and warnings.

The advisory and warning information shall be provided in a form that is easily readable in all expected types of lighting conditions, whether due to the natural progression of day and night or due to bad weather, and at the prevailing average vehicle speeds, according to any local regulations that are in force. Information must also be presented in a timely manner and at locations where drivers are able to make decisions about what alternative route choices to make, depending on what is available.

B.2.2.12 Incident monitoring and confirmation

This service shall enable the monitoring of data and the use of that data to detect and confirm that an incident has occurred that affects the movement of vehicles in the road network. It shall be possible for the detection of incidents to be by one or more of a number of mechanisms including:

- Traffic flow monitoring;
- Congestion monitoring;
- Changes in Public Transport service running times away from the expected;
- Failure of roadside equipment;
- Reports for Police or other Emergency Services;
- Reports from travellers and persons who have sight of the road network but not actually travelling;
- Reports from drivers, e.g. using eCall, On-Star or similar public or proprietary services;
- Automatic reports from ITS stations, whether on-board vehicles or at the roadside.

It shall be possible for any number of these mechanisms to be used to provide an indication of the possibility that an incident has occurred. The ability to assign a “degree of confidence” to each indication shall be included and shall depend on the mechanism providing the incident indication and the number of mechanisms reporting each incident. Thus it shall be possible for confirmation of that an incident has occurred to be provided either by a single source with a high “degree of confidence” or many sources the sum of whose “degrees of confidence” is high.

B.3 Transport related incident management

B.3.1 Introduction

This service group provides the capability for responding to various incidents in the transport network, which specifically involve conditions initiated in the network itself rather than purely from external sources (e.g. natural disasters, terrorist attacks). It is assumed that the detection of incidents shall be provided by other services, e.g. those in the “Traffic management and control” group, but some services in this group shall support the detection of potential incidents by systems responsible for the management of other transport modes, e.g. rail and air:

B.3.2 Constituent Services:

B.3.2.1 Incident on-site driver assistance

This service shall enable assistance to be provided to a driver wherever and whenever it is needed. It shall be possible for this assistance to include some or all of the following types:

- Removal of a broken down vehicle to a safe place where it is not a hazard to other road users and there is little or no hazard to the vehicle occupants;
- Towing of a broken down vehicle to a place of repair;
- Repair of a broken down vehicle when and where it is safe to do so;
- Removal by emergency vehicle (road vehicle, or airborne, e.g. helicopter or aeroplane) of any person in the vehicle, including the driver to a place where the appropriate medical treatment can be provided;
- Removal of some or all of the cargo of a freight vehicle, particular when the continued presence of that cargo is causing a hazard to other road users, despite the cargo not being classed as a hazardous material.

There shall be no limit to the number of times that assistance is provided to a driver and for it to be provided on the same occasion at the same location, or on different occasions and at different locations. Each time assistance is provided it shall be possible for it to be any number of the types described above.

B.3.2.2 Incident on-site traveller assistance

This service shall enable assistance to be provided to travellers wherever and whenever it is needed. It shall be possible for this assistance to be one or more of the following types:

- Medical assistance to assist the traveller with the completion of their journey;
- Removal of the traveller to a place where continuous medical treatment can be provided in the event that they are unable to continue their journey;
- Advice on what changes need to be made to the traveller’s itinerary to enable a journey to be completed;
- Advice on the location of nearby facilities such as hotels, restaurants, hospitals and other forms of medical aid providers, banks, etc.;
- Advice on the location of modal interchange points and the modes of travel available from them.

There shall be no limit to the number of times that assistance is provided to a traveller and for it to be provided on the same occasion at the same location, or on different occasions and at different locations. Each time assistance is provided it shall be possible for it to be any number of the types described above.

B.3.2.3 Incident co-ordination and clearance

This service shall enable the co-ordination of the response to an incident and the clearance of any results from the incident that have the potential to affect road users. It shall be possible for the “co-ordination and clearance” to involve any combination of the Emergency Services (Fire, Police and Medical), as well as other forms of assistance such as tow trucks and other mechanisms for removing people, vehicles and freight from the incident location.

B.3.2.4 Hazardous materials monitoring and management

This service shall enable the movement of hazardous materials through the road network to be monitored. It shall be possible for this monitoring to cover all types of road network, e.g. surface streets, freeways, toll roads plus privately operated and maintained roads, as well as places and occasions when a hazardous load is stationary, e.g. awaiting a clear path through the road network.

The management of the movement of the hazardous materials shall enable the route it is to follow through the road network to be planned and monitored. It shall also enable the Emergency Services to be alerted if the state of the hazardous materials becomes a danger to other road users, or people and objects adjacent to the road network.

B.3.2.5 Collection of incident details from other transport modes

This service shall enable the collection of details to be collected about incidents that have occurred on other transport modes. It shall be possible for the collected details to include some or all of the following:

- Transport mode;
- Location;
- Impact on the operation of the transport mode involved in the incident;
- Details of any involvement of the Emergency Services.

It shall be possible to use these details as the source of warning and advisory messages to be provided to drivers and travellers and for these details to be used to assess the impact of the incident on the movement of vehicles through the road network.

B.4 Demand Management

B.4.1 Introduction

This service group covers the development and implementation of management and control strategies designed to influence the demand for travel. It shall be possible for the strategies included in this service group to influence the overall level of demand for travel at different times of the day and the relative demand for different modes of transport, through the management of pricing structures, area access control or zone entry regulations and the facilities specifically dedicated to high-occupancy vehicles.

B.4.2 Constituent Services

B.4.2.1 Variable road pricing – dedicated lane

This service shall enable the price for the use of a particular lane within the road network to be fixed and varied from time to time. It shall be possible for the variation to apply to the following:

- The total length of a lane;

- One or more parts of the total length of a lane;
- A lane which is in either the surface streets and/or freeway part of the road network.

It shall be possible for variations to be made by time of day and day of the year and for several variations to be made during the day. The actual price for using the lane should be clearly indicated and easily read by all drivers. Any changes should also be clearly indicated before they occur, so that drivers are able to decide to use an alternative and cheaper lane.

B.4.2.2 Variable road pricing – entire facility

This service shall enable the price for using a particular part of the road network to be varied. The price shall apply to all lanes in the selected part of the road network and for any period of time. It shall be possible for several different prices to be applied and varied for some or the entire the road network and for the prices applied to different parts to be varied independently of one another.

It shall be possible for variations to be made by time of day and day of the year and for several variations to be made during the day. The actual price for using the lane should be clearly indicated and easily read by all drivers. Any changes should also be clearly indicated before they occur, so that drivers are able to decide to use an alternative and cheaper part of the road network.

B.4.2.3 Cordon and zone-based congestion pricing

This service shall enable the price for the use of parts of the road network to be applied in such a way that either a cordon is created around a particular location, or a zone is created where a particular price applies. It shall be possible for one or more of these cordons and/or zones to be created in a single road network and for the part(s) of the road network to which they apply to be varied.

It shall be possible for variations to be made by time of day and day of the year and for several variations to be made during the day. The actual price for using the lane should be clearly indicated and easily read by all drivers. Any changes should also be clearly indicated before they occur, so that drivers are able to decide to use an alternative and cheaper part of the road network.

B.4.2.4 Access management

This service shall enable access to some parts or the entire road network to be managed. It shall be possible for access to be managed by any combination of the following ways:

- Vehicle type;
- Vehicle cargo;
- Time of day;
- Day of year;
- Traffic conditions within the part of the road network for which access is being managed.

It shall be possible for way that access is managed to be changed by time of day and day of year. When management is applied the information about it must be clearly indicated in a form that is easily read by drivers without having to stop their vehicles. The information must be displayed at locations where it is possible for drivers to be able to decide to use a different “access free” part of the road network

B.4.2.5 High-occupancy lane management

This service shall enable the management of those lanes within the road network that are for use by vehicles with more than one occupant. It shall be possible for the use of these lanes to be managed using any of the following criteria:

- Number of vehicle occupants;

- Type of vehicle;
- Time of day;
- Day of year;
- Direction of travel.

It shall be possible for any combination of these criteria to be applied to individual high occupancy lanes, or to all such lanes within the road network. Any restrictions that are applied to the use of high occupancy vehicle lanes must be clearly indicated and displayed in a way that is easily read by drivers regardless of the type of vehicle they are driving and the expected speed of the vehicle. These restrictions must be displayed at locations where it is possible for drivers to change their use of the high occupancy vehicle lanes so that they shall not infringe the criteria.

B.4.2.6 Air quality-based road transport management

This service shall enable the use of the road network to be managed according to the air quality being experienced by road users. It shall be possible to exclude vehicles from using areas of the road network with low air quality according to the following criteria:

- Type of bad air quality;
- Level of air quality;
- Prevailing and/or forecast weather conditions;
- Type of vehicle.

It shall be possible for any combination of these criteria to be applied to some or the entire road network. Any restrictions that are applied must be clearly indicated and displayed in a way that is easily read by drivers regardless of the type of vehicle they are driving and the expected speed of the vehicle. Any restrictions on access to parts or the entire road network shall be displayed at locations where drivers can change their routes so as not to infringe the access requirements.

B.5 Road transport infrastructure maintenance management

B.5.1 Introduction

This service group covers the management of the road network maintenance, plus the maintenance of the communication and computer infrastructures used to support travellers using the road network. In addition to the maintenance of the physical road network (including those parts used by cyclists and pedestrians) this service group also includes activities particular to winter weather conditions, roadway construction and the management of the safety of those carrying out road maintenance work.

B.5.2 Constituent Services

B.5.2.1 Roadway construction and maintenance management

This service shall enable roadway construction and maintenance activities to be managed. It shall be possible to manage these activities so that the minimum of disruption is caused to road users whilst maintaining a safe environment for road workers.

B.5.2.2 Winter maintenance

This service shall enable winter maintenance activities to take place on some of, or the entire road network. It shall be possible to apply these activities so that the disruption to road users caused by

winter conditions is minimised, whilst maintaining a safe working environment for road workers. The types of maintenance activities that can be applied shall be one or more of the following:

- Snow ploughing;
- Gritting;
- De-icing;
- Heavy snow clearance.

It shall be possible for some or several of these activities to be applied to different parts of the road network and for more than one of them to be applied to the same part of the road network.

B.5.2.3 Pavement management

This service shall enable the condition of the road pavement to be managed. It shall be possible for this management to keep the road pavement in a condition that is appropriate for its continued use at the expected levels of traffic, without causing any hazard to road users. Any pavement management activities must be carried out at times and in ways that shall cause the minimum of disruption to road users.

B.5.2.4 Automated road management

This service shall enable the management of the road network to be carried out in an automated way.

B.5.2.5 Work zone safety management

This service shall enable work zone (road works) areas to be managed in a way that is safe for both road workers and road users. The management activities that this service is expected to include are:

- Application of speed restrictions;
- Application of restrictions on vehicle size, weight and type;
- Application of some or all of these restrictions to one or more of the traffic lanes in the vicinity of the work zone (road works);
- Segregation of the work zone (road works) from passing traffic that takes as its first priority the provision of a safe working environment, but also minimises the impact on passing traffic;
- The provision of adequate warning of the position of the work zone (road works) and the restrictions that are in force to approaching traffic;
- For warnings of restrictions other than speed, these shall be provided at location from which vehicles can use alternative parts of the road network.

It must be possible for any of the above activities to be applied to parts of, or the entire road network and for them to be in place for any required length of time.

B.6 Policing/enforcing traffic regulations

B.6.1 Introduction

This service group covers the enforcement of laws and regulations governing the way in which the road network is to be used. It includes the monitoring and detection of violations of laws and regulations and the collection of information that it shall be possible to use in any subsequent legal action(s). However the implementation of any legal action(s) is not included as it is considered to be outside the ITS domain.

Many transport vehicles have the ability to be used by drivers who are not their owners. Therefore it is crucial that information is obtained about the identity of the driver in charge of the vehicle when the

infringement of the laws and/or regulations occurs. This is in addition to information about the identity of the vehicle itself. It shall be possible for both sets of information to be used in the actual processing of the enforcement and creating a default history archive for any of the constituent services. Such a default history archive shall be capable of being used by enforcement agencies for infringement history for regular offenders.

B.6.2 Constituent Services:

B.6.2.1 Access control

The service shall control, monitor and enforce the access for vehicles to certain parts of a road network (zones) or road sections depending on traffic management policies and respective special official regulations. It shall take into account factors such as:

- Time of the day/day of week;
- Special access rights of the drivers (e.g. residents);
- Vehicle types (e.g. private cars, trucks);
- Vehicle properties (e.g. weight, height);
- Purpose of the journey (e.g. deliveries, ambulances, tourist buses);
- Payment of access fees or road toll.

It shall be possible for the actual processing of the enforcement, i.e. prosecution and imposition of penalties, to be carried out by an external agency, or within the road management organisation for which the control, monitoring and enforcement is being carried out.

B.6.2.2 High Occupancy Vehicle facility usage

The service shall control, monitor and enforce the use of dedicated lanes for vehicles which are occupied with a certain minimal number of passengers (more than one). These lanes are often called "HOV lanes" and are intended to reduce congestion and pollution by encouraging the use of vehicles by more than one person, e.g. car-pooling or ride sharing. It shall be possible for the numbers of vehicle occupants to be determined and for enforcement action to be initiated where this is below the minimum required for the lane that the vehicle is using.

The service shall enable the minimum numbers of vehicle occupants to be the same across all lanes in the carriageway, or to be specific to particular lanes, and to apply over specific lengths of the roadway. It shall also be possible for lanes in the carriageway to be made HOV temporarily at particular times of the day and/or days of the week.

The service shall collect sufficient parameters to enable the enforcement to be processed. These shall include but not be limited to the following:

- Time of the day/day of week;
- Location;
- Vehicle types (e.g. private cars, trucks);
- Vehicle identity;
- Direction of travel.

It shall be possible for the actual processing of the enforcement, i.e. prosecution and imposition of penalties, to be carried out by an external agency, or within the road management organisation for which the control, monitoring and enforcement is being carried out.

B.6.2.3 Parking regulation enforcement

The service shall enable the enforcement of parking regulations for both on-street and off-street parking facilities. It shall take into account factors such as:

- Permanent or temporary parking bans and restrictions;
- Parking fees and ticketing;
- Licences for special road users (e.g. residents, disabled people).

The service shall collect sufficient parameters to enable the enforcement to be processed. These shall include but not be limited to the following:

- Time of the day/day of week;
- Location of parking space;
- Vehicle types (e.g. private cars, trucks);
- Vehicle identity.

It shall be possible for the actual processing of the enforcement, i.e. prosecution and imposition of penalties, to be carried out by an external agency, or within the road management organisation for which the control, monitoring and enforcement is being carried out.

B.6.2.4 Speed limit enforcement

This service shall enable the speed limits set for each segment of the road network to be enforced. It shall be possible for both maximum and minimum speed limits to be enforced and for different speed limits to be applied for the following:

- Particular vehicle types, so that those groups of vehicles with a lower speed limit (often commercial vehicles) and be distinguished from other vehicles with a higher speed limit (usually private cars);
- Particular types of weather, such as rain, fog, ice and snow, plus other conditions capable of causing problems to drivers.

It shall also be possible for compliance with speed limits to be ignored for emergency vehicles responding to incidents, or in other special circumstances, e.g. VIP convoys.

The service shall collect sufficient parameters to enable the enforcement to be processed. These shall include but not be limited to the following:

- Time of the day/day of week;
- Location;
- Vehicle types (e.g. private cars, trucks);
- Vehicle identity;
- Direction of travel.

It shall be possible for the actual processing of the enforcement, i.e. prosecution and imposition of penalties, to be carried out by an external agency, or within the road management organisation for which the control, monitoring and enforcement is being carried out.

B.6.2.5 Signal enforcement

This service shall enable compliance with operation of traffic signals to be enforced. It shall be possible for the enforcement to be according to individual signal phases, so that for example, a private car using the green phase for a Public Transport vehicle can be detected.

The service shall collect sufficient parameters to enable the enforcement to be processed. These shall include but not be limited to the following:

- Time of the day/day of week;
- Location;
- Vehicle types (e.g. private cars, trucks);
- Vehicle identity;
- Signal phase that is relevant to the vehicle's movement.

It shall be possible for the actual processing of the enforcement, i.e. prosecution and imposition of penalties, to be carried out by an external agency, or within the road management organisation for which the control, monitoring and enforcement is being carried out.

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Annex C (normative)

Vehicle Services domain

C.1 Introduction

This domain covers the provision of ITS services in the vehicle. Its focus is on the enhancement of safety, security and efficiency in vehicle operations, by warnings and assistance to users or input to the operation of the vehicle. There are both services which use external information, as well as services which use in-vehicle information only. However none of them shall actually exercise control over the vehicle as any services that do this shall be covered by standards developed by other Technical Committees within ISO and other Standards Development Organisations. Note: within ISO the lead on standardization for the on-board issues shall be agreed between ISO TC204 and ISO TC22.

This domain includes the following service groups:

1. Road transport-related vision enhancement – see [C.2](#) et seq.;
2. Automated vehicle operation – see [C.3](#) et seq.;
3. Collision mitigation/avoidance – see [C.4](#) et seq.;
4. Safety readiness – see [C.5](#) et seq.;
5. Pre-crash restraint deployment – see [C.6](#) et seq.

C.2 Road transport-related vision enhancement

C.2.1 Introduction

The service group covers the enhancement of driver perception through the use of in-vehicle equipment. It also includes the need to provide legible information to drivers outside the vehicle and to travellers using other road based modes, such as walking, cycling and public transport. In many instances the precise format and layout for the display of information shall be proscribed by national and/or regional regulations

C.2.2 Constituent Services

C.2.2.1 In-vehicle driver vision management

This service covers the provision of vision management to drivers using facilities that are located within vehicles. All management activities shall comply with the national and/or regional regulations, taking account of such things as lighting and legibility requirements. The management activities that this service is expected to provide shall apply to the road ahead and behind the vehicle so that the driver can see all objects around the vehicle. They are expected to include:

- The provision of lighting so that the driver can have adequate vision in all ambient light conditions;
- The provision of alternative illumination to supplement either lighting from the vehicle and/or lighting from other sources so that the driver can have adequate vision in all ambient light conditions;
- The mitigation of the effects of rain, snow, ice and fog on the ability of the driver to have clear vision of the roadway.

The management activities provided by this service must not cause un-necessary or unsafe distraction to vehicle drivers. It must be possible for the driver to retrieve visual inputs that might have been missed due to the demands of the driving task.

C.2.2.2 External driver vision management

This service covers the provision of vision management to drivers using facilities that are located outside vehicles. It assumes that all information displays shall comply with the national and/or regional regulations, taking account of such things as lighting and legibility requirements. The displays must also be provided at suitable locations in the road network at which drivers are able to safely and properly react to the information being provided, e.g. access to an alternative route is within reach, or an unavailable parking location can be avoided.

C.2.2.3 Pedestrian and cyclist vision management

This service covers the provision of provision of vision management to pedestrians and cyclists using displays that are located on and adjacent to the part of the road network that they are permitted to use. It assumes that all information displays shall comply with the national and/or regional regulations, taking account of such things as lighting and legibility requirements. The displays must also be provided at suitable locations in the parts of the road network used by pedestrians and cyclists at which they are able to safely and properly react to the information being provided, e.g. it is safe to cross part of the road network used by another road based transport mode.

C.3 Automated vehicle operation

C.3.1 Introduction

This service group covers either the automation of the vehicle driving process, creating a 'hands off' driving environment, or partially automated operation supporting drivers. For public transport, specific tools can be used to permit vehicles to be aligned properly at stops, assuring access either to same-height platforms or specific access for disabled travellers (e.g., wheelchair lifts, bus lowering mechanisms).

C.3.2 Constituent Services

C.3.2.1 Automated highway operation

This service enables vehicles to operate without the intervention of their drivers over a dedicated transport network or specific part(s) of the road network that are equipped for automatic highway operation. Only suitably equipped and operating vehicles shall be allowed to access the dedicated transport network or these part(s) of the road network, the drivers of all other vehicles being required to find alternative routes.

Once it has entered a dedicated transport network or a part of the road network equipped for automatic operation the vehicle shall be controlled and guided along the road within certain constraints. These constraints shall comprise the following:

- Road keeping – keep within the dedicated transport network or specific part of the road network equipped for automatic highway operation;
- Lane keeping – keep within the lane occupied at the start of the dedicated transport network or specific part(s) of the road network assigned to automatic highway operation and only change lanes in response to specific command(s);
- Speed – maintain the speed required by the dedicated transport network or specific part(s) of the road network equipped for automatic highway operation, only changing speed in response to specific command(s);

- Headway – maintain the appropriate headway with the vehicle in front taking into account speed, road conditions and the operating condition of the vehicle, e.g. effectiveness of brakes.

It shall be possible for suitably equipped and operating vehicles to join and leave the dedicated transport network or the specific part(s) of the road network that are equipped for automatic highway operation at places other than their beginning and/or end. Whatever the reason, the joining or leaving shall be accomplished without affecting other vehicles using the dedicated transport network or the part(s) of the road network that are equipped for automatic highway operation, or if appropriate vehicles using other adjacent parts of the transport or road network.

Should the vehicle suffer a problem that prevents it from following the automatic highway operation, it shall either move into a safe area of the transport or road network without detrimental effects on the safety of other vehicles using adjacent parts of the transport or road network, or come to a complete stop. In both cases the driver and/or passengers shall be informed about what has happened. Also should the mechanism(s) used to implement the automatic highway operation cease to operate correctly, all vehicles shall either revert to driver operation in a manner that is safe for all vehicles using the transport or road network, or come to a complete stop. In both cases a warning indication shall be provided to the drivers and/or passengers.

C.3.2.2 Automated low-speed manoeuvring

This service shall enable suitably equipped and operating vehicles to carry out specific low speed manoeuvres automatically, i.e. without the active participation of the driver in the manoeuvre. It shall be possible for the driver to cancel this mode of vehicle operation at any time and for the vehicle to then revert to normal driver operation.

It shall be possible for the initiation of the automatic low-speed manoeuvring to be initiated by the driver and for all other vehicle warning facilities such as those that detect objects close by to remain in operation during the manoeuvre. If more than one type of low-speed manoeuvre is available from the vehicle, the selection shall be easy and clear for the driver to make. When carrying out the manoeuvre, the vehicle shall take whatever action is necessary to ensure it maintains the safety of its occupants and of other users of the dedicated transport or road network.

If for any reason the vehicle is unable to start or complete the automated low-speed manoeuvre, it shall provide an immediate warning to the driver. The vehicle shall immediately cease to carry out the requested manoeuvre without adversely affecting the safety of its occupants and of other users of the dedicated transport or road network.

C.3.2.3 Automated Parking

This service shall enable suitably equipped and operating vehicles to carry out parking manoeuvres automatically, without the driver participating in the operation of the vehicle.

It shall be possible for the initiation of the automated parking manoeuvres to be started by the driver from inside or outside the vehicle. If the driver is outside the vehicle, then the communication mechanism shall ensure that the driver is only a short distance away and so can be reasonably expected to be within visual sight of the vehicle. When carrying out the automated parking, the vehicle shall take whatever action is necessary to ensure it maintains the safety of itself and of other users of the parking facility, or if parking at a roadside location, other road users.

If for any reason the vehicle is unable to start or complete the automated parking, it shall provide an immediate warning to the driver, through an external mechanism if the driver is not in the vehicle, or internally if the driver is present. The vehicle shall then immediately cease to carry out the automated parking without adversely affecting the safety of itself and of other users of the parking facility, or if parking at a roadside location, other road users.

C.3.2.4 Adaptive cruise control

This service shall enable the vehicle systems to be instructed to automatically maintain a selected range or distance from the forward vehicle as it travels through the dedicated transport or road network. The vehicle systems shall maintain this distance regardless of speed changes of the forward vehicle.

The service shall be initiated by a specific input from the driver and shall cease to operate when either the driver de-selects it, or applies the brakes of the vehicle. An indication of the control shall be provided to the driver whilst the service is in operation.

C.3.2.5 Cooperative adaptive cruise control

This service shall provide an enhancement to the adaptive cruise control by the addition of wireless communication with preceding vehicles and/or the infrastructure to augment the adaptive cruise control active sensing capability for connected vehicles. It shall use active sensing data such as ranging to forward vehicle, subject vehicle data, over the air data from other surrounding vehicles and from infrastructure, and driver input to longitudinally control the vehicle via throttle and brake controls.

The service shall be initiated by a specific input from the driver and shall cease to operate when either the driver de-selects it, or applies the brakes of the vehicle. An indication of the cooperative adaptive cruise control status shall be provided to the driver whilst the service is in operation.

C.3.2.6 Precision docking for public transport vehicles

This service shall enable public transport vehicles to dock at any number of specific points in the dedicated transport or road network with precision. The precision with which the docking shall be achieved shall enable passenger to enter and/or leave the vehicle safely and without any access constraints, e.g. curb not the same height as the vehicle entrance or exit and a gap between the curb and the vehicle entrance or exit.

It shall be possible for the precision docking to be achieved either by the driver through guidance being provided from the vehicle, or automatically when initiated by a specific input from the driver. Where and when automatic operation is initiated by the driver, the service shall enable the driver to cancel it at any time and without any detrimental effects on the vehicle passengers, any passengers waiting to board the vehicle, or any other users of the dedicated transport or road network.

C.4 Collision mitigation/avoidance

C.4.1 Introduction

The collision mitigation/avoidance service group includes the use of sensors and control systems to detect potential for collisions either between vehicles or between vehicles and other objects in their surrounding areas. It shall be possible for each service in this group to prompt the driver to take action or automatically initiate some form of avoiding action in a way that is not unsafe for other road users.

C.4.2 Constituent Services

C.4.2.1 Longitudinal collision mitigation/avoidance

This service shall enable vehicles to avoid collisions with other vehicles and/or objects that appear to be in the predicted trajectory of the vehicle. It shall rely on the use of obstacle detection and tracking systems so that the likelihood of an impact can be determined, thus precipitating the need (or not) for the vehicle to take avoiding action. The service shall be able to communicate the need for action to the driver of the vehicle by suitable warnings. Even if this does not in itself prevent a collision, it shall lead to a mitigation of its effects dependent on the speed and content of the driver's action. It shall also be possible for the speed of the vehicle to be modified to prevent the collision if the driver takes no action.

C.4.2.2 Lateral collision mitigation/avoidance

This service shall enable vehicles to avoid collisions with other vehicles and/or objects that appear to be outside the predicted trajectory of the vehicle. It shall rely on the use of systems (such as sensors and control systems) in the vehicle to monitor the potential hazards to the vehicle in lane keeping, lane changing, entering and leaving high-speed roads and overtaking. The service shall be able to communicate the need for action to the driver of the vehicle by suitable warnings. Even if this does not in itself prevent a collision, it shall lead to a mitigation of its effects dependent on the speed and content of the driver's action. It shall also be possible for the speed of the vehicle to be modified to prevent the collision if the driver takes no action.

C.4.2.3 Intersection collision mitigation/avoidance

This service shall enable a vehicle approaching a road intersection to avoid collisions with other vehicles that are approaching the same intersection. It shall rely on the use of systems (such as sensors and control systems) in each vehicle to monitor the progress of other vehicles toward the intersection. When a vehicle determines that it is going to collide with another vehicle approaching the same intersection, it shall be possible for this service to request that the vehicle systems modify its speed to prevent the collision and to alert the driver of the vehicle to the reason for the change of its speed. However if this does not remove the possibility of a collision the driver shall be advised of the avoiding action that needs to be taken.

C.5 Safety readiness

C.5.1 Introduction

The safety readiness service group covers the use of monitoring and warning systems for all types of vehicle and their drivers. They cover both the conditions of the vehicles themselves and the conditions in the area surrounding the vehicle.

C.5.2 Constituent Services

C.5.2.1 Vehicle internal systems monitoring

This service shall enable the operation of internal systems within the vehicle to be monitored. It shall be impossible for the monitoring action to in any way affect the operation of the vehicle internal systems, i.e. it shall be passive monitoring. The data collected through the monitoring process shall be processed and where and when abnormal operation is detected, suitable indications shall be provided to the driver. In these circumstances, the driver shall be expected to take all necessary actions to ensure the safety of the vehicle, its occupants and other road users.

C.5.2.2 Vehicle external conditions monitoring

This service shall enable to vehicle to monitor the external conditions existing in its current location. It shall be possible for this monitoring to take place in real time and for the collected data to be updated as and when the conditions change. Indications of the conditions shall be made available to the driver as a result of specific inputs, although once the indications appear it shall be possible for them to continue until specifically cancelled by the driver.

C.6 Pre-crash restraint deployment

C.6.1 Introduction

This service group covers the determination of the need to deploy crash restraint systems because a potential collision is imminent. It includes anything not already covered by services identified by ISO TC22.

C.6.2 Constituent Services

C.6.2.1 Pre-crash restraint deployment

This service shall enable the need for crash restraint systems to operate when it is detected that a potential collision is imminent. It shall be possible for the operation of the systems to be initiated automatically without any input from the driver, or any of the other vehicle occupants (if present). When the operation of the systems is initiated, a suitable indication shall be provided within the vehicle, for the benefit of the driver (and any other occupants if present) and for those who respond the occurrence of the collision, e.g. emergency services.

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Annex D (normative)

Freight transport services domain

D.1 Introduction

This domain covers the management of the operation of commercial vehicle fleets and the movement of freight, including activities that expedite the authorization process for freight to move across national and jurisdictional boundaries, activities that expedite inter-modal transfers of freight and the operation of freight vehicles that use telematics applications to enhance their operation and management.

This domain includes the following service groups:

1. Commercial vehicle pre-clearance – see [D.2](#) et seq.;
2. Commercial vehicle administrative processes – see [D.3](#) et seq.;
3. Automated roadside safety inspection – see [D.4](#) et seq.;
4. Commercial vehicle on-board safety monitoring – see [D.5](#) et seq.;
5. Intercity freight transport fleet management – see [D.6](#) et seq.;
6. Intermodal information management – see [D.7](#) et seq.;
7. Management and control of intermodal centres – see [D.8](#) et seq.;
8. Management of dangerous freight – see [D.9](#) et seq.;
9. Management of heavy vehicles – see [D.10](#) et seq.;
10. Management of local delivery vehicles – see [D.11](#) et seq.;
11. Telematics applications for regulated vehicles (TARV) – see [D.12](#) et seq.;
12. Freight transport content identification and communication – see [D.13](#) et seq.

D.2 Commercial vehicle pre-clearance

D.2.1 Introduction

The commercial vehicle pre-clearance service group provides services that enable commercial vehicles, including trucks and buses to have credentials and other documents, safety status and weights checked automatically at normal road speeds. A principal objective of this service is to effect pre-clearances with minimal disruption to the vehicle journey and the general flow of traffic.

D.2.2 Constituent Services

D.2.2.1 Weigh-in-motion

The service shall detect and record information about individual wheel and axle loads imposed by vehicles as well as their gross vehicle weights as the vehicles move over a measurement point. The collection of this information shall be accomplished without the need for a vehicle to stop.

It shall be possible for the service to support the non-stop preclearance service (see [D.2.2.2](#)) at normal speed and/or the precision weighing of individual vehicles at reduced speed. It shall also be possible for this service to support other services such as, access control, infrastructure protection and monitoring, road user charging, law enforcement and infrastructure planning.

D.2.2.2 Non-stop preclearance

This service shall enable the safety, credential, and size and weight data for transponder-equipped vehicles to be electronically checked before they reach an inspection site. It shall be possible for only illegal or potentially unsafe vehicles to be selected for the requirement to enter the site for an inspection. Safe and legal carriers and vehicles shall be able to travel without stopping for compliance checks at weigh stations, ports-of-entry, and other inspection sites.

D.2.2.3 Vehicle safety records monitoring

This service shall enable the safety records carried on-board a vehicle to be accessed and monitored as the vehicle passes a suitable interrogation point in the road network. The collection of the information containing the records from the vehicle shall be accomplished without the need for the vehicle to stop. It shall be possible for the collected information to be used to check that the vehicle and/or its cargo are not in breach of any safety regulations.

D.3 Commercial vehicle administrative processes

D.3.1 Introduction

This service group enables a number of individual services to be provided to commercial vehicle fleet drivers and operators and/or freight shippers. They shall be able to exchange information about freight movements, including those that utilise different transport modes, to automatically identify, monitor and exchange emergency response information about dangerous goods, to purchase annual and ad-hoc vehicle credentials, using communications and computer technologies. It shall be possible for the services in this group to enable these credentials to include those necessary for the crossing of regional and national boundaries.

D.3.2 Constituent Services

D.3.2.1 Freight movement information exchange

This service shall provide information exchange necessary for the movement of freight by different transport modes, its intermodal transfer and its conveyance across national borders. The scope of the information to be exchanged includes that for motor transport within the international supply chain that shall satisfy the requirements of both businesses and governmental organizations.

This service is applicable to freight shipments that originate in one country and terminate in another or stay in the same country. It shall be possible for it to be applied to freight shipments that are made entirely by road and freight movements that start or finish in the road transport mode but include the use of other transport modes.

D.3.2.2 Automatically identify, monitor and exchange of emergency response information for dangerous goods

This service shall provide for the application of automated identification, monitoring and exchange of emergency response information for dangerous goods carried on board road transport vehicles. It shall be possible for such information to include the identification, quantity, and current condition of the dangerous goods, such as its pressure and temperature, as well as any relevant information that shall be required if an emergency response is needed. Suitably equipped vehicles carrying dangerous goods shall be able to respond to queries regarding their status from authorised organisations or self-initiate

a message to such organisations. It shall be possible for the information to be transferred to authorised organisations by whatever communications means are appropriate to that roadside system.

D.3.2.3 Automated credential filing

This service shall enable the automated filing of credentials about commercial vehicles and drivers. It shall be possible for this to be done electronically, i.e. application to application across either fixed line or mobile interfaces, or through manual entry to an application by a commercial vehicle fleet administrator or a commercial vehicle owner/driver.

The credentials for a commercial vehicle shall include information that comprises any or all of the following and once entered it shall be possible to update any or all of the following as the vehicle carries out its assigned work duty:

- Information about the vehicle itself, e.g. identity, type and number of axles, plus number of trailers and method of attachment;
- Carrier information, e.g. carrier identification, identity of vehicle within a fleet and details of valid operating licences currently held, plus if not held elsewhere, contact details;
- Cargo information, e.g. type of cargo and whether or not it is classified as HAZMAT or explosive material, plus its origin, its destination, who owns it and who is paying for its shipment;
- Trip information, e.g. origin, destination, way points (including places where cargo is to be collected and/or dropped off and stops made for regulated driver rest stops), expected times of departure and arrival, plus the route;
- Driver information, e.g. identity, qualifications (i.e. are they qualifies to drive the vehicle), experience, number of hours worked and details of any licence endorsements.

The service shall enable the credential information to be either or temporary, with a time of expiry being provided for the latter. Credential information about the cargo shall be capable of being split down into each item, so that where several items are being carried on one vehicle during one trip, those items with different origins and/or destinations can be easily identified. The service shall also provide an appropriate response to show that the supplied credential information (or its update) has been accepted, or if not what has to be done for it to be accepted.

D.3.2.4 Automated commercial vehicle administration

This service shall enable commercial vehicle fleet operators and/or owner/drivers to purchase credentials and to collect and report fuel and mileage tax information electronically. It shall be possible for this to be done electronically, i.e. application to application across either fixed line or mobile interfaces, or through manual entry to an application by a commercial vehicle fleet administrator or a commercial vehicle owner/driver.

The service shall enable the following types of credential to be purchased or payments made for previous purchases:

- Annual, monthly or weekly electronic credentials, i.e. those only valid for a specified period of time;
- Temporary electronic credentials, i.e. those only valid for a particular trip, regardless of whether or not any cargo is being carried;
- Multiple permits to make specific trips, or carry specific cargos on a variety of identified trips;
- Specific situation permits, i.e. those that cover the conveyance of a particular cargo or the use of a particular route, or other commercial vehicle service.

The service shall also enable the following types of report to be provided or for previously submitted reports to be updated:

- Quarterly reports about vehicle use, including mileage driven;
- Electronic vehicle log showing the status of the vehicle, including any maintenance and/or repairs that have been carried out;
- Data about the amount of fuel that has been purchased, including dates, type and quantities;
- The creation of any reports required for audit or tax purposes.

All purchased and payments shall be processed electronically regardless of how they were input, with the possibility of additional banking information being provided if required. The service shall also provide an appropriate response to show that the submitted purchase, payment or report entry has been accepted, or if not what has to be done for it to be accepted.

D.3.2.5 Automated border crossings

This service shall enable commercial vehicle fleet operators and/or owner/drivers to submit data required for their vehicles and their cargos to cross international borders and for that data to be verified. The verification process shall enable the commercial vehicle to cross the national border without stopping, unless for a spot check or for another reason. It shall be possible for this to be done electronically, i.e. application to application across either fixed line or mobile interfaces, or through manual entry to an application by a commercial vehicle fleet administrator or a commercial vehicle owner/driver.

The service shall enable the following data about the vehicle, its cargo and its driver to be submitted and verified so that it is possible for the vehicle to cross a national border without stopping:

- Information about the driver, including their identity;
- The nature of the cargo, including any safety issues and/or duties that have to be paid;
- Information about the vehicle carrying the cargo, including its identity, weight and credentials;
- Details of the shipper, particularly if it is not the owner or the vehicle carrying the cargo;
- Information about the safety record of the owner and/or operator of the vehicle carrying the cargo.

All verification of this data shall be processed electronically regardless of how the data was input, with the possibility of additional information and payment of unpaid duties being requested as and when required. The service shall also provide an appropriate response to show that the submitted data has been verified and accepted, or if not what has to be done for this to be achieved.

D.4 Automated roadside safety inspection

D.4.1 Introduction

The automated roadside safety inspection service group includes services that provide roadside access to safety performance records of commercial vehicle fleet managers, the commercial vehicles themselves and the vehicle drivers. This shall enhance existing systems of spot checks by providing inspectors with easy access to current data relevant to the inspection.

D.4.2 Constituent Services

D.4.2.1 Remote access to commercial vehicle safety data

This service shall enable data about the operation and status that is held electronically on board a commercial vehicle to be accessed from a remote location. It shall be possible for this remote location

to be at the roadside so that the data is access as the commercial vehicle passes and/or in a central location, such as a vehicle inspection station, border crossing or centre responsible for some aspect of road management, e.g. traffic management or toll collection.

The type of safety data that it shall be possible to access remotely from a commercial vehicle shall include the following:

- Vehicle identity, type, classification, weights (laden and un-laden) and number of axles, plus type(s) and number of trailers;
- Vehicle maintenance data including details of when the last maintenance was carried out on the vehicle, plus details of any emissions checks that have been done, with the date(s) when those checks were carried out;
- Vehicle repair data including details of any breakdowns and accidents in which the vehicle has sustained damage, plus information about what has been repaired;
- Current vehicle operating parameters, included powertrain, brakes and suspension plus tyre wear and pressures;
- Fuel state, i.e. how much fuel is in the tank(s).

All of this data is to be collected for both the vehicle itself as well as for each of the trailers it is towing. If any data cannot be obtained electronically, this shall be reported by the system responsible for collecting the data remotely from the vehicle. A report shall also be made if the driver of the vehicle had to be contacted in order for the vehicle data to be retrieved, or there are communications link problems of any kind.

D.4.2.2 Remote access to commercial vehicle driver data

This service shall enable data about the current status and history that is held electronically on board a commercial vehicle about its driver to be accessed from a remote location. It shall be possible for this remote location to be at the roadside so that the data is access as the commercial vehicle passes and/or in a central location, such as a vehicle inspection station, border crossing or centre responsible for some aspect of road management, e.g. traffic management or toll collection.

The type of driver status and history data that it shall be possible to access remotely from a commercial vehicle shall include the following:

- Identity and qualifications;
- Any licence endorsements, with nature(s), date(s) and location(s);
- Number of hours the driver has been working since the last rest break;
- Number of hours the driver plans to work before taking the next rest break.

If any of this data cannot be obtained electronically from the commercial vehicle, this shall be reported by the system responsible for collecting the data remotely from the vehicle. A report shall also be made if the driver of the vehicle had to be contacted in order for their data to be retrieved, or there are communications link problems of any kind.

D.5 Commercial vehicle on-board safety monitoring

D.5.1 Introduction

This service group shall cover the use of on board monitoring systems to oversee the safety status of commercial vehicles, commercial vehicle drivers and cargo during the entire course of the trip, including the sensing and collection of data about the internal systems of the commercial vehicle, the state of its cargo and the vehicle driver. It shall be possible for the services in this group to enable results of these activities to include the provision of warnings to both the driver and/or remote monitoring facilities.

D.5.2 Constituent Services

D.5.2.1 Commercial vehicle internal systems monitoring

The service shall use on-board monitoring systems to oversee the safety status of commercial vehicles during the course of their trips. This shall include the real-time sensing and collection of data about the operation and state of internal systems in the commercial vehicle and any trailers it is towing, such as brakes, tyres and the lighting equipment.

The collected data shall be used to provide real-time warnings to both the commercial vehicle driver and/or remote monitoring facilities, e.g. fleet management systems. In the vehicle, the driver shall be alerted by acoustic and/or mechanical means (e.g. a vibrating steering wheel). It shall also be possible for the remote monitoring facilities to store the collected data in such a way that the operational history of the commercial vehicle can be reviewed to enable such things as the need for repair and/or maintenance to be determined. Provision shall also be made for the collected data to be archived and if required made available to regulatory authorities responsible for the monitoring of the safety of vehicle operations.

D.5.2.2 Commercial vehicle driver alertness monitoring

The service shall use on-board systems to monitor the alertness displayed by drivers of commercial vehicles during the time that they are at the vehicle controls. This shall include the real-time sensing and collection of data about the current alertness of the driver, e.g. by monitoring the driver's eyes, plus steering, throttle and brake inputs.

The collected data shall be used to provide real-time warnings to both the commercial vehicle driver and/or remote monitoring facilities, e.g. fleet management systems. In the vehicle, the driver shall be alerted by acoustic and/or mechanical means (e.g. a vibrating steering wheel). It shall also be possible for the remote monitoring facilities to store the collected data in such a way that the performance of the driver on the current trip and/or the history of previous trips can be reviewed to enable such things as the need for rest and/or further training can be identified. Provision shall also be made for the collected data to be archived and if required made available to regulatory authorities responsible for the monitoring of drivers' hours of work.

D.5.2.3 Commercial vehicle cargo state monitoring

The service shall use on-board systems to monitor the state of the cargo being conveyed by a commercial vehicle (and/or any trailers it is towing) during the course of its trips. This shall include the real-time sensing and collection of data about the state of the cargo. It shall be possible for the data that shall be collected to relate to one or more of the following:

- The current physical characteristics of the cargo like temperature, volume, pressure, moisture or weight;
- Where appropriate the status of any on-going chemical or physical processes, e.g. fermentation, or evaporation;
- The position of the cargo on the vehicle, particularly if this changes during the course of the trip;
- Any changes in behaviour of the cargo during the trip not covered by the previous points, e.g. the condition of livestock including the availability of food and/or water.

The collected data shall be used to provide real-time warnings to both the commercial vehicle driver and/or remote monitoring facilities, e.g. fleet management systems. In the vehicle, the driver shall be alerted by acoustic and/or mechanical means (e.g. a vibrating steering wheel). It shall also be possible for the remote monitoring facilities to store the collected data in such a way that the status of the cargo on the current trip and/or the history of previous trips can be reviewed to enable the way that particular types of cargo are transported to be reviewed and updated as a result of experience. Provision shall also be made for the collected data to be archived and if required made available to the relevant regulatory authorities.

D.6 Intercity freight transport fleet management

D.6.1 Introduction

The intercity freight transport service group covers dispatch and tracking of commercial vehicles on trips to enable the optimisation of use and safety of the vehicles. Thus it includes the use of automatic vehicle location (AVL) to achieve automatic freight carrier location/container location and vehicle-to-control centre communications to provide vehicle location and other status information to those operating fleet management systems.

D.6.2 Constituent Services

D.6.2.1 Intercity commercial vehicle fleet tracking

The service shall continually and automatically determine the location of a commercial vehicle that is involved in intercity freight transport and send this data to a dispatching centre where the vehicle's journey can be monitored by a fleet operator. It shall be possible for this data about the vehicle's position to be displayed in the dispatching centre. The service shall be able to display this positional data for all vehicles of a fleet so that the fleet operator obtains an overview of the positions of all vehicles.

D.6.2.2 Intercity commercial vehicle fleet dispatching

The service shall support the communication between commercial vehicles that are involved in intercity freight transport and their dispatching centre(s). It shall ensure that status information on the vehicles, any cargo they are carrying and their origin and destination are sent to their dispatching centre(s). The possibility of data about a vehicle being sent to a centre other than the one in charge of its operation shall be excluded.

This service shall also enable transport orders and instructions to be sent from the fleet operator to the vehicle driver. It shall be possible for an acknowledgement that the driver of the vehicle has received the orders and instructions to be returned to its dispatching centre. Again the possibility that a vehicle can be in communication with a dispatching centre other than the one in charge of its operation shall be excluded.

D.7 Intermodal information management

D.7.1 Introduction

This service group covers the exchange of information about the transport of goods across different transport modes. It includes knowledge of where the units transporting the goods are located, plus their condition and status, as well as similar information about the vehicle transporting the container. It is also possible to locate sub-units, provide customers with information about the progress with the movement of the containers containing their goods.

NOTE This service group includes services which cross modal boundaries. These services are therefore being and/or shall be developed in conjunction with either other standardization committees within ISO or by other Standards Development Organisations in conjunction with ISO TC204.

D.7.2 Constituent Services

D.7.2.1 Vehicle and container arrival information exchange

The users of this service are fleet managers and intermodal carriers and the managers of freight storage nodes.

D.7.2.2 Customer freight information access

The users of this service are customers and shippers.

D.7.2.3 Freight container tracking

This service shall enable the automatic determination of the current physical location of a freight container. It shall be possible for the container number to be determined and used as identification of the container. The location and the container number shall be repeatedly sent to a despatching centre of the carrier responsible for moving the container throughout the portion of its journey for which that carrier is responsible. Thus it shall be possible for the location of the container to be passed from one carrier to another if more than one is involved in the movement of a container from its origin to its destination.

This service shall also enable an information service to be provided for the organisation(s) that contracted with the carrier(s) to move the container can track its current location and status.

D.8 Management and control of intermodal centres

D.8.1 Introduction

This service group includes services that manage the operation of the intermodal centres. It differs from other services in this domain because it concerns the facilities and not the commercial vehicles or goods containers themselves. Services in this group include managing the operation of the modal interchanges, and managing the personnel concerned with the transportation of the goods.

D.8.2 Constituent Services

D.8.2.1 Intermodal centre facility management

The service shall enable the co-ordinated handling operation of the facilities at intermodal centres including modal interchanges. It shall include the planning and management of all internal resources of an intermodal centre for freight transshipment, i.e.:

- The handling equipment, e.g. gantry cranes;
- Any internal means of transport for goods, e.g. conveyor systems, straddle carriers and mobile cranes;
- Storage areas and storage facilities, e.g. cold stores;
- The management of the personnel that work in the facilities.

The “operation” covered by this service shall comprise the elements of the full handling chain, i.e.

- The receipt of cargo;
- The handling of cargo within the facilities;
- The storage and re-arrangement of received consignments to enable distribution to a variety of destinations and using different modes of transport;
- The onward despatch of previously received cargo.

The service shall support the organisation and monitoring of all associated planning and management processes required by the intermodal centre for its operation.

D.8.2.2 Intermodal vehicle and container control

The service shall enable the monitoring and control of the transport and handling of intermodal vehicles and containers, regardless of whether they are carrying cargo or not. In the context of this service, it shall be possible for intermodal vehicles to be units like swap bodies, trailers or semitrailers. However it shall also be possible for this service to include specialist vehicles that are capable of using more than one transport mode, e.g. road-rail trucks.

The service shall provide processes across the whole transport chain from the consignor to the consignee like despatching, tracking and tracing and status messaging. Between the origin and destination of their trips the intermodal vehicles or containers shall be conveyed by changing means of transport, e.g. rail, road and maritime (i.e. ferries and ships).

D.9 Management of dangerous freight

D.9.1 Introduction

This service group includes services that manage the operation of transport fleets concerned with the movement of dangerous goods, including the monitoring of their status and condition and their movement through the road transport network and any other transport modes that are to be used. It also includes the exchange of information with organisations responsible for the actual transportation of the dangerous goods.

D.9.2 Constituent Services

D.9.2.1 Dangerous goods movement data collection and sharing

The service shall enable the collection and sharing of data that gives an overview of the planned, approved and on-going transport of dangerous goods in a defined geographic area. It shall be possible for this geographic area to be defined by national, state, region, county or city administrative boundaries, or be within part of a nation, state, region, county or city, or cover multiple combinations of these.

The service shall give information about the transport of dangerous goods to a range of interested stakeholders such as the police, emergency services and road authorities. This information shall comprise the following:

- The nature of the “danger”;
- The quantity of the goods;
- The type(s) of vehicles transporting the goods;
- The planned route that the vehicles shall take;
- The position(s) or the vehicle(s) in real time, which shall be collected from sensors on-board the vehicle(s).

It shall also be possible to make the data available to experts in the transport of dangerous goods so that advice on routes and the need for precautions in the event of incidents made available for potential use by the police, emergency services and road authorities

D.9.2.2 Dangerous goods movement data registry

The service shall provide facilities for the systematic collection, storage and management of data about the transport of dangerous goods in a defined geographic area. It shall be possible for this geographic area to be defined by national, state, region, county or city administrative boundaries, or be within part of a nation, state, region, county or city, or cover multiple combinations of these.

The data shall cover the planned, approved and on-going transport of dangerous goods. It is anticipated that this data is to be used for the provision of other service for the transport of dangerous goods, e.g. the service described in [D.9.2.1](#). It shall be possible for the data to be archived and used as a historic record of when, how and by what route particular types of dangerous goods were transported in the past.

D.9.2.3 Dangerous goods movement fleet coordination

The service shall support the despatching of a vehicle to transport dangerous goods either from within a fleet of vehicles, designed for that purpose, or a specially designed vehicle from within a fleet

or vehicles design to transport all types of goods. The service shall enable the following despatching actions to be carried out:

- The planning and issuing transport orders to drivers and despatchers;
- The real time monitoring of the status of the vehicle;
- The real time tracking of the vehicle position during both the transport of the dangerous goods and any movement of the vehicle after the goods it was conveying have been unloaded;
- The real time monitoring the condition of the dangerous goods;
- The real time monitoring of the operational state and status of the vehicle;
- The real time monitoring of the state of the driver, paying particular attention to the ability of the driver to handle a vehicle conveying dangerous goods.

The service shall also provide facilities for two way communication with the driver of the vehicle, using voice and/or data communication and shall enable instructions to be given to the driver and for the driver to report any events that might affect the dangerous goods being conveyed by the vehicle.

D.9.2.4 Dangerous goods movement police / safety coordination

This service shall provide support to enable the coordination of the activities of police and other relevant emergency services plus road authorities for the transport of dangerous goods. The service shall provide the following facilities:

- The planning, registration and approval process for the route to be used to move each and every item of dangerous goods;
- The identification and implementation of safety measures that shall ensure the safe transport of the dangerous goods. These measures may include such things as the closure of roads, and providing information to road authorities, emergency services, plus other relevant stakeholders.
- The real time monitoring of the movement of the vehicle(s) conveying the dangerous goods;
- The provision and implementation of escorting measures, e.g. escort vehicles.

The service shall be able to support different stipulations for route choice, objects to be avoided, times at which movement can take place and other transport related factors (e.g. weather), depending on the nature of the dangerous goods that are to be transported.

D.9.2.5 Dangerous goods movement location monitoring

This service shall enable the real time determination of a position and the tracking of a vehicle which carries dangerous goods. The position shall be sent together with a vehicle ID to central system where the position data is assigned to a digital map so that the movement of the vehicle can be monitored by an operator. If the "centre" is not one that is operated by the road authority(ies) through whose jurisdiction(s) the dangerous goods are being transported, then it shall be possible for the collected data to be made available to such (a) centre(s).

It shall also be possible for this data to be stored and archived so that a historical record of the movement of the dangerous goods can be provided. This archived data shall be readily available for subsequent retrieval and analysis by a relevant organisation.

D.10 Management of heavy goods vehicles

D.10.1 Introduction

This group includes services that are related to the movement of vehicles that are either carrying heavy goods or because of the nature of the goods they carry have an abnormally high un-laden weight. Thus these vehicles are defined as those that because of their gross vehicle weight need some form of permit to travel through the road network. Also included is the monitoring of these vehicles to check that they have not used parts of the road network that are inappropriate for their weight.

D.10.2 Constituent Services

D.10.2.1 Heavy goods vehicle data collection and sharing

This service shall provide an overview of planned, approved and on-going movement of heavy goods vehicles in a defined geographic area. It shall be possible for this geographic area to be defined by national, state, region, county or city administrative boundaries, or be within part of a nation, state, region, county or city, or cover multiple combinations of these.

The service shall enable the real time collection and provision of information about the movements of heavy goods vehicles to a range of interested stakeholders such as the police and road authorities for shared use. It shall enable the collection and sharing of the following data:

- The nature of goods, e.g. its weight and dimensions;
- Data about the heavy goods vehicle, e.g. gross vehicle weight, dimensions and gross weights per axle;
- The route that the heavy goods vehicle is to take;
- The real time position of the heavy goods vehicle as it moves along its route.

It shall be possible for this collected data to be made available to and shared with all relevant road authorities and other authorities that have the potential to be affected by the passage of the heavy goods vehicles, e.g. organisations providing utilities that make use of underground cables, pipes, etc. on or near the route to be used.

D.10.2.2 Heavy goods vehicle registration processing

This service shall provide facilities that enable the support of the process by which the transport of heavy goods can be registered. These facilities shall include:

- The planning and approval of the route that the heavy goods vehicle is to take;
- The registration and approval process for heavy goods vehicles;
- The preparation of any safety measures that the is required for the movement of the heavy goods vehicle, e.g. closure of roads, plus informing authorities and other relevant stakeholders;
- The provision of escort services for the heavy goods vehicle movement;
- The real time monitoring of the movement of the heavy goods vehicle along its planned route.

The service shall be able to support different stipulations for route choice, objects to be avoided, times at which movement can take place and other transport related factors (e.g. weather), depending on the weight of the heavy goods vehicles.

D.10.2.3 Heavy goods vehicle location monitoring

The service shall enable the continuous and automatic determination of the location of a heavy goods vehicle during its journey through the road network. It shall be possible for this data to be sent to the

dispatching centre from which the vehicle's journey can be monitored by an operator. If the "centre" is not one that is operated by the road authority(authorities) through whose jurisdiction(s) the dangerous goods are being transported, then it shall be possible for the collected data to be made available to such (a) centre(s).

This service shall enable the position of the heavy goods vehicle to be displayed by an appropriate mechanism to the operator in the despatching centre from which the movement of the vehicle is being monitored. It shall be possible to check that the vehicle is following its previously determined route, or if this route has not been produced, to check that the vehicle does not use parts of the road network which it must not access due to its weight.

D.11 Management of local delivery vehicles

D.11.1 Introduction

This group includes services that are related to the management of the movement of vehicles that are making freight deliveries and/or pick-ups within a confined geographic area. Thus on their trips stops must be made to load/unload freight at two or more locations, necessitating the optimisation of the routes and sequence with which the trips are made. It shall be possible for services in this group to include the need provide information about the management of access to zones within the road network and the availability of parking to enable freight to be loaded/unloaded.

D.11.2 Constituent Services

D.11.2.1 Delivery vehicle fleet tracking

The service shall enable the continuous and automatic determination of the location of a delivery vehicle as it makes its deliveries and/or pick-ups. It shall be possible for this data (including time, date and vehicle identity) to be sent to the dispatching centre from which the vehicle's journey can be monitored by a fleet operator.

This service shall enable the position of the vehicle to be displayed in the despatching centre by an appropriate mechanism. It shall be possible for this to be done for all vehicles of a fleet so that the fleet operator obtains an overview of the positions of all vehicles and monitor their progress with their deliveries and/or pick-ups.

D.11.2.2 Delivery vehicle fleet dispatching

The service shall support the communication between delivery vehicles and their dispatching centre during freight deliveries and/or pick-ups. It shall ensure that status information on the vehicle, its cargo and its progress with the current transport task(s) is sent to the despatching centre.

The service shall also enable transport orders and instructions to be sent from the fleet operator to the vehicle driver. It shall be possible for these instructions to include the changes to the route to achieve better optimisation of the vehicle and/or driver use, including changes to the sequence with which the deliveries and/or pick-ups are made. The ability of the driver to provide an acknowledgement that the changes have been received and understood shall also be included.

D.11.2.3 Delivery zone and parking information services

The service shall enable drivers of vehicles making deliveries to be provided with information about the availability of parking to enable the freight in their vehicles to be loaded/ unloaded. It shall be possible for this to be done prior to the start of and/or during the delivery and/or pick-up trip.

If no parking is available for the required loading/unloading, the service shall enable the driver to be provided with directions to a location where the vehicle can be parked until it is possible for the loading/unloading to commence. It shall be possible for this location to be a dedicated delivery vehicle parking area, or a roadside location that does not cause disruption to other road users.

D.12 Telematics applications for regulated vehicles (TARV)

D.12.1 Introduction

This service group embraces the framework for a range of Telematics Applications for Regulated commercial freight Vehicles. The overall scope includes the concept of operation, legal and regulatory issues, and the generic cooperative provision of services to regulated commercial freight vehicles, using an on-board ITS platform for highly cost-effective delivery of a range of services. The provision of these services is based on a (multiple) service provider oriented approach provisions for the approval and auditing of service providers.

D.12.2 Constituent Services

D.12.2.1 Procedures, and enforcement provisions for the providers of regulated services

This service shall enable the monitoring and enforcement of regulated vehicles and the approval of the necessary procedures by an approval authority. The monitoring, enforcement and necessary procedures are expected to be generic and independent of a specific application or platform'

D.12.2.2 Provision of system security

This service address both hardware and software aspects for TARV and includes the certification of a service plus the auditing of a service provider so that client confidence can be maintained and risks to privacy avoided. It also includes the management of security for messages, identities and access control.

D.12.2.3 Provision of vehicle information

This service shall enable generic basic vehicle data to be provided to application service providers for use by in-vehicle systems in the provision of other services and to support interoperable cooperative intelligent transport systems. Within the data provided by this service shall be items that are only relevant within a particular jurisdiction, or to a class of TARV within a jurisdiction. Equipped vehicles operating internationally must carry all of the additional data required by all of the jurisdictions within which they operate, so that it is possible for the expected services to be provided.

D.12.2.4 Provision of vehicle access management

This service shall provide vehicle access to certain parts of a geographical area to be monitored and managed by an appropriate regulatory authority or its nominated and approved service provider. It shall be possible for access restrictions to be applied, particularly if any part of the consignment being carried by the vehicle is classed as 'dangerous goods'. The service shall enable the identity of the regulatory authority and/or the service provider to change as the vehicle moves from one jurisdiction to another through the course of its movement of freight. It shall be possible for the service to be provided through a framework that is either regulated using common standards for communication or unregulated and by one, or multiple service providers.

D.12.2.5 Provision of remote tachograph monitoring

This service shall provide a vehicle tachograph to be remotely monitored by an appropriate regulatory authority, or its nominated and approved service provider. It shall be possible for the identity of the regulatory authority and/or the service provider to change as the vehicle moves from one jurisdiction to another through the course of its movement of freight. It shall be possible for the service to be provided through a framework that is either regulated using common standards for communication or unregulated and by one, or multiple service providers.

D.12.2.6 Provision of Emergency messaging system/eCall

This service shall provide the provision of the 'Emergency Messaging System/eCall' to vehicles by an appropriate regulatory authority, or its nominated and approved service provider. It shall be possible for the identity of the regulatory authority and/or the service provider to change as the vehicle moves from one jurisdiction to another through the course of its movement of freight. It shall be possible for the service to be provided through a framework that is either regulated using common standards for communication or unregulated and by one, or multiple service providers.

D.12.2.7 Provision of driver work records

This service shall provide some or all of the work records for a vehicle driver to be provided to the appropriate regulatory authority, or its nominated and approved service provider. It shall be possible for the identity of the regulatory authority and/or the service provider to change as the vehicle moves from one jurisdiction to another through the course of its movement of freight. It shall be possible for the service to be provided through a framework that is either regulated using common standards for communication or unregulated and by one, or multiple service providers.

D.12.2.8 Provision of vehicle 'mass' monitoring

This service shall provide for the 'Mass' of a suitable equipped vehicle to be monitored by an appropriate regulatory authority, or its nominated and approved service provider. The service shall make it possible for this 'Mass' to be monitored to enable the regulatory authority or its nominated and approved service provider to implement jurisdictional control and enforcement, for the identity of the regulatory authority and/or the service provider to change as the vehicle moves from one jurisdiction to another through the course of its movement of freight, and for it to be provided through a framework that is either regulated using common standards for communication or unregulated and by one, or multiple service providers.

D.12.2.9 Provision of vehicle location, speed and consignment data

This service shall provide suitably equipped vehicles to be monitored so that their location, speed and details of the freight consignment being carried can be continuously provided to an appropriate regulatory authority, or its nominated and approved service provider. It includes the extra monitoring that is required when the consignment is classed as 'dangerous goods'. The service shall enable the identity of the regulatory authority and/or the service provider to change as the vehicle moves from one jurisdiction to another through the course of its movement of freight. It shall be possible for the service to be provided through a framework that is either regulated using common standards for communication or unregulated and by one, or multiple service providers.

D.12.2.10 Provision of vehicle parking facilities

This service shall provide the use of parking facilities by suitably equipped freight vehicles to be managed in the most efficient way that is possible and practical. The management shall enable vehicles to make bookings for access to and egress from designated parking facilities. It shall be possible for these facilities to be provided for the loading and/or unloading of consignments of goods and/or for secure parking during statutory driver rest periods, or whilst waiting for a loading or unloading parking space to become available. The service shall be available from one suitable provider (or multiple suitable providers), the identity (or identities) of which are able to be different (or the same) for each and every parking facility.

D.13 Freight transport content identification and communication**D.13.1 Introduction**

This service group includes services that enable the identification of the content of freight shipments that are being transported by land. The identification can be for particular items or packages of

freight and containers that are used to carry freight, regardless of whether they are empty or full. It also includes a service that provides communications to transfer the identification data between the item of freight (or container) and a data collection point at which data can be fused for use by various organisations to provide other services.

D.13.2 Constituent Services

D.13.2.1 Collection of freight transport identification data

This service shall provide for the collection of identification data about freight that is being transported by land and is to be obtained from the freight itself. It shall be possible for the data to be about a particular item of freight, a freight package, or a container in which freight is being carried, or can be carried because the container is currently empty.

D.13.2.2 Communication of freight transport identification data

This service shall provide for the communication of data that identifies freight being transported by land. It shall be possible for the data to relate to an individual item of freight, a freight package, or a container carrying freight, or an empty container. The actual data transfer shall use one or more of the currently available international standards and is to be between the freight and a data collection point, at which all collected data shall be fused in a coherent manner.

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Annex E (normative)

Public transport service domain

E.1 Introduction

This domain covers the management of public transport (transit) to enable them to provide services that operate more timely and efficiently and the provision of operational information to the operator and user, including multimodal aspects.

This domain includes the following service groups:

1. Public transport management – see [E.2](#) et seq.;
2. Demand responsive and shared transport – see [E.3](#) et seq.

E.2 Public transport management

E.2.1 Introduction

This service group covers the operation, planning and management of public transport operations, including the application of public transport scheduling and planning systems for assuring reliable connections with minimum between different modes (e.g., bus and rail services). It also includes the provision of real time information on vehicle location and status, enabling the identification of departures from schedules and dynamic rescheduling. This also includes the monitoring of public transport vehicle status such as passenger loadings and vehicle systems.

E.2.2 Constituent Services

E.2.2.1 Public transport operational management

This service covers the normal operation of public transport vehicles that are scheduled for use in earning revenue through the conveyance of passengers. The service includes operational planning which includes the design and planning of operator, vehicle and route schedule, dispatching and special event planning activities, plus emergency and incident planning activities with other transportation agencies.

E.2.2.2 Public transport fleet management

This service covers the management of public transport vehicles to provide for reliable service to meet customer demand. It includes the management of headways between public transport vehicles including service pull outs, special event public transport services and public transport vehicle availability.

E.2.2.3 Public transport vehicle equipment monitoring

This service covers the need of public transport organisations to collect and monitor data from vehicle internal systems to support vehicle maintenance operations. The capability enables public transport organisations to improve their vehicle maintenance practices, by allowing the vehicles' performance to be monitored, so that they can be brought into the maintenance facility if needed. Data collected from vehicles includes operating data, diagnostic data and data about the on-board environment for passengers, plus data about the way that the driver is using the vehicle.

E.2.2.4 Public transport service monitoring and scheduling

This service covers the collection, monitoring and managing of planned public transport services and service consumption. It includes the provision of real-time information on vehicle location and status, enabling the identification of departures from schedules, the monitoring of service consumption such as passenger loadings, use of lifts, bicycle racks, and other passenger related amenities. Performance measurement supports public transport demand management strategies and planning activities, plus support for improvements in the operations of public transport services.

E.2.2.5 Public transport operational strategies

This service shall enable the collection of service and equipment performance, as well as data such as weather, congestion and historic performance information, so that it is possible for various operational strategies to be put in place to improve public transport speed and reliability, as well as enable more flexible services for public transport customers. These more flexible services include demand management and integrated corridor management, the protection of connections between services (particular when services are disrupted), deviations from fixed routes to enable a better service to be provided, traffic congestion avoidance and priority at road traffic signals.

E.2.2.6 Public transport wayside status display

This service shall provide the display of information about public transport services at wayside locations. It shall be possible for these locations to be where public transport vehicles stop on the routes that they are performing as well as other locations such as transport interchanges, retail shopping outlets, and other public places. The information that is provided shall be able to be static information and show which routes serve the location of the display and their scheduled times of arrival and departure and/or real-time information showing when vehicles on the routes serving the display location are expected to arrive, based on their current location.

E.3 Demand responsive and shared transport

E.3.1 Introduction

This service group covers the provision of on-demand transport services to individuals and/or groups of travellers. It addresses both the needs of commuters by providing a viable shared transport alternative to the single occupancy private car and also addresses the needs of specific groups such as elderly and disabled and the needs of those wishing to move a particular item of freight from one location to another.

The services in this group shall enable users to request on-demand transport by specifying their origin and destination plus any special needs they have such as carrying a baby buggy, using wheel chair lifts, etc., or other special services for the disabled. The most appropriate type of vehicle covering a corridor, or area, shall then be despatched to the traveller by a dispatching system. It shall be possible for the types of vehicles deployed on this service group to include buses of any size, vans and taxis.

E.3.2 Constituent Services

E.3.2.1 On-demand public transport fleet management

This service shall provide for the management of the fleet of vehicles that are employed in providing on-demand public transport services. It shall also include the following facilities:

- The real-time scheduling and planning of routes for these vehicles so that they can serve the demands of travellers in the optimum way;
- Monitoring the performance of the vehicles so that they can be properly maintained;

- Monitoring the vehicle drivers to ensure that they are driving vehicles for which they have the necessary skills and do not exceed their maximum permitted hours between rest breaks.

It shall be possible for the vehicles and/or drivers used in this service to be managed by one or more agencies. Each agency shall be able to carry out its management activities either centrally, or through a mechanism that promotes self-governance for drivers and their vehicles. If the self-governance of drivers and their vehicles is used, then they shall only be provided by information about the demand for public transport services when they request it, and then only if they have provided information to show that they are complying with all applicable rules and regulations.

E.3.2.2 On-demand ridesharing management

This service shall provide for the management of the way that vehicles are “shared” amongst travellers who have request on-demand public transport. This means scheduling the most appropriate vehicle to pick-up the traveller at the requested time and taking them to their desired destination whilst combining this individual request with all the other transport requests from travellers.

E.3.2.3 On-demand freight transport

This service shall enable freight shippers and ordinary people to request one off transport and delivery of freight on demand. Typically it shall cover the transport of small items of freight from the location of the shipper to the required destination, making best possible use of the available transport vehicle availability and if necessary using two or more different modes of transport. Thus a user could be anyone from a company with products that need to be delivered to different locations at irregular intervals to the person who has just sold something on e-Bay.

Annex F (normative)

Emergency Services service domain

F.1 Introduction

This domain covers the management of public transport (transit) to enable them to provide services that operate more timely and efficiently and the provision of operational information to the operator and user, including multimodal aspects.

This domain includes the following service groups:

1. Transport related emergency notification and personal security – see [F.2](#) et seq.;
2. After theft vehicle recovery – see [F.3](#) et seq.;
3. Emergency vehicle management – see [F.4](#) et seq.;
4. Hazardous materials & incident notification – see [F.5](#) et seq.

F.2 Transport related emergency notification and personal security

F.2.1 Introduction

This service group provides both driver/personal security services and automatic incident notification for private car drivers and goods vehicle drivers. It shall be possible for this service group to include services for the automatic dispatch of emergency vehicles in response to and emergency (eCall), user initiated distress calls, plus automated warning of vehicle intrusion and theft.

NOTE The work to produce standards for this service group shall be agreed between TC204 and TC22.

F.2.2 Constituent Services

F.2.2.1 User-initiated distress calls

This service shall send a distress call to a service centre in case of an emergency. Its operation shall be based on the active involvement of a user, such as the driver or a passenger in the vehicle involved in the emergency. Notification shall be provided within the vehicle that the distress call has been sent.

The service also includes the receipt of the distress call at an emergency centre and the arrangement by operators at that centre of the appropriate response measures. The determination of the “appropriate response measures” shall involve an assessment of the emergency situation by the operator and alerting the necessary emergency services. Information about the response that is being provided shall be made available within the vehicle.

It shall be possible for the distress call to be provided by sending data, by voice message, or a combination of the two. Similarly the response to the distress call by either be through the display of a message, the activation of a warning indication, a voice message, or a combination of any of these. Where voice is the communication mechanism that is used, it shall be possible for there to be a dialogue between the vehicle and the operator in the service centre, to better determine the reason for the distress call and the most appropriate response.

F.2.2.2 Automated emergency call and mayday (eCall) dispatch

This service shall automatically detect that a vehicle is involved in an emergency. With the help of on-board systems it shall automatically generate and send an emergency call to a dedicated emergency call centre.

The service shall also enable the receipt of the emergency call at the emergency centre and the immediate arrangement of required emergency measures. This shall involve an assessment of the emergency situation by the operator and alerting of the necessary and appropriate emergency services.

F.2.2.3 Automated vehicle intrusion and theft warning

This service shall automatically detect that somebody broke into a vehicle or that it has been stolen. With the help of on-board systems the service shall automatically generate and send a warning message to a dedicated service centre and/or to the vehicle owner to enable the appropriate measures to be taken. It shall be possible for these to include the immediate determination of the damage so that an investigation can be initiated. The operation of this service shall not be apparent to anyone in the vehicle, unless the owner or the dedicated service centre requires it.

F.3 After theft vehicle recovery

F.3.1 Introduction

This service group enables the tracking, immobilizing and/or recover stolen vehicles. Tracking of vehicles shall start from the moment that they are stolen. The immobilization shall not be automatic and must only take place on command to ensure that it is done in a way that does not compromise the safety of other road users and/or the vehicle occupants.

F.3.2 Constituent Services

F.3.2.1 Remote vehicle immobilization

This service shall enable the immobilization of a vehicle remotely. It shall be based upon the use of on-board vehicle systems that enable a command to immobilize the vehicle to be sent to the vehicle from an external location. This external location shall have the necessary facilities for such a command to be sent and shall either be static, e.g. in the home or place of work of the vehicle owner or operator, and/or an appropriate management centre, or in a device carried by the vehicle owner or operator.

The immobilization of the vehicle shall include the movement of the vehicle to the side of the road, or to any other location that does not make it a hazard to other road network users. The action of this service shall be apparent to those in the vehicle and the fact that the vehicle is moving without the involvement of the person in the driving position shall be apparent to those outside the vehicle.

F.3.2.2 Stolen vehicle tracking

This service shall enable the identification of a vehicle as “stolen” when it has been taken away by an unauthorised person. The “taking away” shall include both being driven away and being towed or transported away by another vehicle. Once this has been detected, the service shall automatically trigger the determination and real-time update of the vehicle’s location together with a stolen vehicle alert. It shall be possible for both the alert message and the current location to be sent to an appropriate management centre and/or the vehicle owner. The real-time update of the vehicle’s location shall enable its movement to be tracked so that recovery can be affected at some point in the future. All communications between the vehicle and the appropriate management centre shall be hidden from those who are taking the vehicle away.

F.4 Emergency vehicle management

F.4.1 Introduction

The emergency vehicle management service group includes the application of fleet management, route guidance and traffic signal priority techniques to fleets of emergency vehicles, such as fire, police and ambulance. It also includes the co-ordination with traffic management centres of the movement of emergency vehicles through the road network.

F.4.2 Constituent Services

F.4.2.1 Emergency vehicle fleet tracking

This service shall enable emergency vehicles to be tracked in real-time as they respond to emergency calls and/or return from these responses. The tracking provides information about the location of the vehicles and their current status, e.g. going to or returning from an emergency call, plus an indication as to whether or not anything is being carried, e.g. injured people, or materials from the emergency.

F.4.2.2 Emergency vehicle fleet management

This service shall enable the use of individual vehicles in emergency vehicle fleets to be managed. The intention is to ensure that the most appropriate emergency vehicle(s) are sent in response to an emergency call and that they are made available for deployment elsewhere once their involvement in a particular emergency call has been completed.

F.4.2.3 Emergency vehicle – traffic management coordination

This service shall enable the co-ordination of the movement of emergency vehicles through the road network to be co-ordinated with the relevant traffic management centres. The purpose of this co-ordination is to ensure that the emergency vehicle responds to the emergency and any subsequently required vehicle movement in the most efficient and beneficial way. It shall be possible for the service to also include the co-ordination of the operation of facilities shared with other modes of transport, e.g. level crossings and lifting bridges.

F.5 Hazardous materials & incident notification

F.5.1 Introduction

This service group covers the provision of government organisations with data on the nature, location and condition of freight that is classed as hazardous goods, i.e. given the code name HAZMAT. This facilitates the enforcement of routing instructions and the effective response to any incident involving the load.

F.5.2 Constituent Services

F.5.2.1 HAZMAT vehicle tracking and monitoring

This service shall enable the movement of vehicles carrying freight that is HAZMAT rated through the road network and the collection of data that is relevant to that movement. It shall be possible for the collected data to include vehicle location and status, plus the type of HAZMAT material it is carrying.

F.5.2.2 HAZMAT vehicle route management

This service shall enable the route taken by vehicles carrying freight that is HAZMAT rated through the road network to be managed so that any contentious areas are avoided. It requires that the vehicles are monitored and any deviation from the pre-planned and authorised route is highlighted so that the driver and/or escort can be advised of the need to change their direction of travel. The service also include

the designation of routes for vehicles carrying freight that is HAZMAT rated, either in advance of the commencement of their movement, or in real-time during their movement through the road network.

F.5.2.3 Automated HAZMAT emergency call / mayday notification

This service shall provide for the appropriate response to be initiated if a vehicle carrying freight that is HAZMAT rated is involved in an emergency. Such an emergency can include the vehicle breaking down, it being stuck in traffic or the deterioration of the state of the HAZMAT material being carried, including spillage. The response shall be initiated automatically once it has been detected that an emergency exists and must be co-ordinated with the appropriate emergency service(s).

F.5.2.4 HAZMAT preclearance services

This service shall enable the pre-clearance of the movement of vehicles carrying freight that is HAZMAT rated through the road network that is managed by jurisdictions that require prior notification. If clearance is not provided then the movement can be re-routed in advance to avoid it being stranded in part of the road network.

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Annex G (normative)

Transport-related payment service domain

G.1 Introduction

This domain covers activities that permit revenues for transportation services and facilities to be collected electronically through non-cash and non-stop payment.

This domain includes the following service groups:

1. Electronic financial transactions for road use – see [G.2](#) et seq.;
2. Electronic fare management services – see [G.3](#) et seq.
3. Transport related electronic financial transactions – see [G.4](#) et seq.;
4. Other mechanisms for collecting payment for road use – see [G.5](#) et seq.

G.2 Electronic financial transactions for road use

G.2.1 Introduction

This service group includes the use of electronic or 'cashless' payment systems for transportation services, along with the implementation of automated systems to collect road user fees (vehicle related transport services) and fares (public transport related services).

G.2.2 Constituent Services

G.2.2.1 Interoperable Electronic Fee Collection, e.g. EETS

This service shall be provided based on the principle that the transport user (usually the vehicle owner) has one electronic fee collection (EFC) contract and one On-board Equipment (OBE) that may be fixed, mounted, or portable, provided by the Toll, or Transport, or Payment Service Provider. However it shall be possible for the same contract with or without the same OBE to be used in all other EFC systems where the Toll, or Transport Operator has a contract with the Toll, or Transport, or Payment Service Provider. For the transport user the interoperable EFC shall appear as a seamless payment system enabling the transport user to pay for all transport services consumed in other EFC systems by receiving only one invoice from his or her Toll, or Transport, or Payment Service Provider.

G.2.2.2 Electronic Fee Collection (EFC)

This service shall enable drivers to pay a fee (toll) for the use of all or specific parts of the road network, e.g. the use of a tolled bridge or tunnel or the road network inside a city toll ring. The payment of the fee shall take place in an automatic way so that the vehicle is not required to stop. It shall be possible for either of the following mechanisms to be used to detect and identify vehicles so that payment can be demanded:

- An On-Board Equipment (OBE) unit is used to identify the vehicle and/or its driver as it enters and leaves each part of the road network for which a fee is needed for its use;
- A mobile device, not connected with the vehicle, but belonging to the driver that has the facility to enable the fee to be paid.

Although it shall be possible for any of these mechanisms to be used for each and every part of the road network for which payment is required, it is strongly recommended that only one mechanism is used within a single geographic area.

It shall be possible for a driver or vehicle owner to pay in advance for the use of all or specific parts of the road network. If this is done, then the detection mechanisms described above shall be used to verify that the vehicle has used all or specific parts of the road network and that the cost can be deducted from the advanced payment. Drivers and vehicle owners shall be provided with information about how much of the advanced payment is available for use and be provided with facilities to top-up the advanced payment whilst using the part(s) of the road network for which a fee is required.

G.2.2.3 Distance based road user pricing

This service shall enable road operators to charge drivers for the use of their road networks according to the distance that the drivers travel on them. It shall be possible for the distance to be measured between two points on a road network, where the second point is downstream (i.e. in the direction of normal traffic flow) from the first point. Payment shall be collected automatically using any of the mechanisms described in [G.2.2.2](#).

The two points mentioned in the previous paragraph do not have to be at the road network entry and exit points. Signs indicating that distance measured road user pricing is being used shall be prominently displayed so that all drivers can be in no doubt about its operation.

G.2.2.4 Demand management based on road user pricing

This service shall enable the payment willingness of the transport user to be used to regulate the transport service demand, e.g. the use of the road network inside a congested city or a road section with traffic volumes exceeding the road section capacity. It shall be possible for the tariff structure to be dynamic, for it to reflect the different levels of road use demand if required and for the payment to be collected automatically using any of the mechanisms described in [G.2.2.2](#).

G.2.2.5 Vehicle criteria based road user pricing

This service shall enable road operators to charge drivers for the use of their road networks according to the type of vehicle that the driver is using. It shall be possible for the vehicle type to be different for each application of the service and to use one or more criteria for vehicles such as type of prime mover (e.g. petrol, electric, hybrid or diesel), emissions (e.g. Euro5 diesel or better), vehicle type (e.g. car, heavy goods vehicle, or public transport vehicle), or other criteria such as vehicle identification number (i.e. number plate details). Payment shall be collected automatically using a form of passive vehicle recognition, such as the number plate, which is detected and used to identify the vehicle, so that the criteria for charging and the owner of the vehicle can be identified. Signs indicating the vehicle criteria that are being used shall be prominently displayed so that all drivers can be in no doubt about its operation.

G.2.2.6 Car Park payment systems

This service shall enable the operators of areas where vehicles may park to charge for their use²⁾. It shall be possible for these parking areas to be dedicated (i.e. car parks or parking lots), or a series of one or more designated parking spaces at the side of a roadway. More than one mechanism for collecting the charge can be made available in each parking area, so that for example, regular users can pay by a different mechanism to that used by occasional or one time users.

It shall also be possible for operators of parking areas to enable payment for parking to be combined with payment for other services, e.g. public transport and admission to events. Also operators of several parking areas shall be able to use a charging mechanism that can be used at several places within a set time, e.g. park in two or more different parking areas within one hour for a single payment.

2) Note: the operation of parking areas will be found in service B.2.2.9.

G.3 Electronic fare management services

G.3.1 Introduction

This service group includes electronic fare collection systems and interoperable fare management systems. The interoperable fare management systems shall enable public transport customers to move seamlessly between different public transport operator domains and modes.

G.3.2 Constituent Services

G.3.2.1 Electronic Fare Collection

This service shall enable customers travelling by public transport, e.g. buses and metros, to electronically validate the ticket (proof of travel) so that they can legitimately travel having paid the appropriate fare. It shall be possible for typical ticket media to be devices such as smart cards and smart phones communicating with the validator / payment gateway via a contact based or contactless (air interface) communication.

It shall be possible for customer to top-up the amount of credit held on their ticket media using a variety of mechanisms, including machines at public transport facilities and electronic means. The top-up facilities shall be available both before and during journeys, so that customers are not left “locked inside” the public transport system.

G.3.2.2 Interoperable Fare Management Systems (IFMS)

This service shall enable public transport customers to travel seamlessly across different public transport operator domains and different transport modes using one payment medium for fare management. Fare management (FM) shall encompass all the processes designed to manage the distribution and use of fare products in a public transport environment. It shall also be possible for IFMS to be applied when electronic media are not being used as the mechanism for payments using mechanisms such as combined or “through” ticketing.

G.4 Transport related electronic financial transactions

G.4.1 Introduction

This service group includes the use of electronic or ‘cashless’ payment systems for transportation services that are not directly related to the use of all or parts of the road network. Thus it covers such things as the purchase of fuel, ride sharing, travel information, etc.

G.4.2 Constituent Services

G.4.2.1 Electronic Transport services payment

This service shall enable any provider of a transport related service to charge the transport user a fee for the provided service. Examples of typical services shall include the purchase of fuel, the provision of traffic information services, the use of public transport services (including those that are not road based) and rides in the same shared vehicle.

It shall be possible for the transport related service provider to use any mechanism of their choice to collect the require fee. However transport service providers shall be actively and positively encouraged to use the same mechanism as used by other transport related service and/or EETS/EFC providers in the same geographic area, thereby reducing the burden for the transport user of having too many separate devices for each fee collection mechanism.

G.4.2.2 Multi-modal transport services related electronic payment systems

This service shall enable the traveller to electronically pay for transport (and associated items). It shall be possible for the traveller to make their payments by electronic means, such as a mobile device, or a device on which advanced payment can be loaded, such as an “electronic purse”. Whatever electronic mechanism is used, it shall be possible for it to also be used for other services such as public transport and EFC.

G.5 Other mechanisms for collecting payment for road use

G.5.1 Introduction

This service group includes the use of other mechanisms that enable payment for the use of the road network to be collected. They include both electronic and cash payment mechanisms, the latter being especially important for visitors to the road network.

G.5.2 Constituent Services

G.5.2.1 Cashless Road Use Payment Collection

This service shall enable drivers to pay a fee (toll) for the use of all or specific parts of the road network, e.g. the use of a tolled bridge or tunnel or the road network inside a city toll ring. The payment of the fee shall take place in an automatic way so that the vehicle is not required to stop. It shall be possible for the mechanism used to detect and identify vehicles so that payment can be demanded to be a form of passive vehicle recognition, such as the number plate, which is detected and used to identify the owner of the vehicle so that they can be charged.

It shall be possible for a driver or vehicle owner to pay in advance for the use of all or specific parts of the road network. If this is done, then the passive vehicle recognition mechanism described above shall be used to verify that the vehicle has used all or specific parts of the road network and that the cost can be deducted from the advanced payment. Drivers and vehicle owners shall be provided with the ability to access information about how much of the advanced payment is available for use and be provided with facilities to top-up the advanced payment whilst using the part(s) of the road network for which a fee is required.

G.5.2.2 Cash Based Road Use Payment Collection

This service shall enable drivers to pay a fee (toll) for the use of all or specific parts of the road network, e.g. the use of a tolled bridge or tunnel or the road network inside a city toll ring. The payment of the fee shall take place through the collection of the actual toll that has been incurred. This may be achieved using one of the following mechanisms:

- By the driver inserting cash into a roadside device to pay the toll and being given change if any is owed;
- By the driver using a credit or debit card at a roadside device to pay the toll;
- Through a human that physically collects the toll, usually from a toll booth.

The common characteristic of all these mechanisms is that the vehicle is required to stop to enable the transaction to take place.

This service shall be available in conjunction with any of the other fee (toll) collection services described in the Annex and shall not be the only service available. Its principal users will be visitors to the road network who would otherwise have no need for the regular use of these other services, particularly those for which the vehicle does not have to stop.

Annex H (normative)

Road transport related personal safety services domain

H.1 Introduction

This domain covers the protection of the personal safety of transport users including pedestrians and individuals using road transportation facilities.

This domain includes the following service groups:

1. Public travel security – see [H.2](#) et seq.;
2. Safety enhancements for vulnerable road users – see [H.3](#) et seq.;
3. Safety enhancements for disabled road users – see [H.4](#) et seq.;
4. Safety provisions for pedestrians using intelligent junctions and links – see [H.5](#) et seq.

H.2 Public travel security

H.2.1 Introduction

The public travel security service group includes the surveillance and monitoring systems for public transport facilities, car parks and on-board public transport vehicles. This group shall support services in which a distress call is automatically sent when specified conditions are encountered or manually initiated. This also covers the use of security systems designed to protect public transport vehicle operators.

H.2.2 Constituent Services

H.2.2.1 Silent alarm

This service shall enable an alarm in a public transport vehicle to be generated without any audible indication being output. It shall be possible for visual indication(s) to be output produced and for details of the alarm to be output to the driver of the public transport vehicle and also sent to the centre from which the operation of the vehicle is being managed. If audible indications of alarms have been cancelled then any audible responses from the vehicle's operations centre shall be silent as well.

It shall be possible for the lack of audible indication of an alarm (silent alarm) to be re-instated and/or cancelled by the driver of the public transport vehicle. The re-instatement and/or cancelling of any audible responses shall be possible as well. It shall be possible for this to be independent of the re-installation and/or cancelling of the audible alarm indication.

H.2.2.2 Emergency call/mayday alert for public transport

This service shall enable drivers of Public Transport vehicles and/or their passengers to initiate an emergency call, or raise a mayday alert. The call or alert shall be sent directly to the centre from which the Public Transport service is being managed, and must be capable of being sent even if the Public Transport vehicle has been involved in an incident. Drivers shall be able to initiate an emergency call or raise a mayday alert without leaving their positions in the Public Transport vehicle that they are driving and for acknowledgement of the call or alert to be provided to the driver.

It shall be possible for passengers to initiate either the emergency call or the mayday alert both from inside Public Transport vehicles and from other parts of the Public Transport network, e.g. stops and service interchanges. It shall be possible for the passenger to be provided with an indication that their call or alert has been received. The mechanisms available to passengers shall be easy to find and be suitable for those with disabilities. Where these mechanisms are provided in Public Transport vehicles, an indication of their use shall be provided to the driver.

H.2.2.3 Intrusion detection

This service shall automatically detect that somebody broke into a public transport vehicle or that such a vehicle has been stolen. With the help of on-board systems the service shall automatically generate and send a warning message to a dedicated service centre and/or to the centre that is responsible for the operation of the public transport vehicle to enable appropriate measures to be taken. It shall be possible for these to include the immediate determination of the damage so that an investigation can be initiated. The operation of this service shall not be apparent to anyone in the public transport vehicle, unless the dedicated service or public transport operations centre requires it.

H.2.2.4 Public transport surveillance

This service shall provide surveillance facilities for use in monitoring the operation of public transport facilities and services. It shall be possible for the surveillance to be provided in any or all of the following areas:

- Public transport vehicles;
- Roadside locations used by public transport vehicles to pick up and set down passengers (bus stops);
- Public transport terminals, i.e. a collection of bus stops that are usually located away from the main traffic flow and to which other types of vehicles are not permitted access;
- Public transport operations centres, i.e. the centres from which the operation of public transport services are managed.

The service can be provided by the public transport operating organisation for its own benefit, or by a group of such organisations, or by a public authority, e.g. local or city council. It shall also be possible for the service to be part of a more comprehensive security system provided by a public authority that provides surveillance in other places such as public squares, retail outlets, offices, etc.

Regardless of how the service is provided it shall be possible for the surveillance data to be recorded and stored for later access. It shall be possible for both this stored data and the “live” real-time data to be made available for viewing and inspection by a suitable police authority.

H.3 Safety enhancements for vulnerable road users

H.3.1 Introduction

This service group covers the enhancement of safety levels for vulnerable road user groups, particularly the elderly, the disabled and other groups such as road maintenance workers, cyclists (powered and unpowered) and pedestrians. The services in this group include those that provide automatic warnings for pedestrians and drivers at crossings, vehicle speed warning and presence detection systems and automatic advice to drivers by vulnerable road users (e.g. presence of road maintenance workers).

H.3.2 Constituent Services

H.3.2.1 Non-motorized vehicle and pedestrian monitoring

This service shall enable the movement of pedestrians and users of non-motorised vehicles through the road network, including places where they are able to cross the normal flow of road traffic. It shall

enable both vehicle drivers and pedestrians to be warned of the imminent arrival or presence of the other at road crossings, to enable them to take the most appropriate action to ensure the safety of everybody, including changing the priority of pedestrians at road crossings and/or a change to the time period during which pedestrians can cross the road.

H.3.2.2 Vehicle monitoring and management

This service shall enable the speeds and presence to be monitored for vehicles that are moving through the road network. The data is then used to aid the use of pedestrian crossings and to give advanced warning to road maintenance workers that vehicles are approaching their working environment. Warnings shall also be provided to drivers of the presence of road maintenance workers in the part of the road network that is in the predicted forward trajectory of the vehicle.

H.4 Safety enhancements for disabled road users

H.4.1 Introduction

This service group covers the enhancement of safety levels for road user groups (particularly pedestrians with physical impairment). These enhancements shall include measures such as the monitoring of the arrival of specialised conveyances at road crossings and the issue of warnings to drivers of their presence.

H.4.2 Constituent Services

H.4.2.1 Intersection monitoring of specialized conveyances

This service shall enable the monitoring of specialised conveyances used by some disabled road users. Some examples of these conveyances include wheel chairs, carts and motorised scooters (sometimes called "mobility scooters"). The monitoring includes location, current status and direction of travel and shall be used to provide warning to their users of the presence of other road users and pedestrians. This shall particularly apply at road crossings used by pedestrians.

H.4.2.2 Driver warnings for specialized conveyances

This service shall enable drivers to be warned of the presence of specialised conveyances used by some disabled road users. Some examples of these conveyances include wheel chairs, carts and motorised scooters (sometimes called "mobility scooters"). The warnings provided to drivers shall include an indication of the current and predicted location of such conveyances in the part of the road network that is in the predicted forward trajectory of their vehicles.

H.5 Safety provisions for pedestrians using intelligent junctions and links

H.5.1 Introduction

This service group covers the provision of monitoring and warning systems to be provided at junctions in the road network. These junctions shall include modal, multi-modal or inter-modal crossings, those that are signal controlled and non-signalized. The purpose is, to enhance pedestrian safety through the provisions of warning messages.

- a) Clarification of right of way rules
- b) On-board echo of warning signs
- c) Presence of oncoming vehicles
- d) Warning of imminent signal phase change