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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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Phone: +41 22 749 01 11
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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 document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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

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

This third edition cancels and replaces the second edition (ISO 14813-1:2015), which has been technically revised.

The main changes are as follows:

— the list of services has been reorganized (to reduce redundancy) and updated:

— in Clauses 7 to 16 some services have been added and others deleted, whilst others have been modified to reflect the continual evolution of ITS; this has been reflected in Table 2;

— in Clauses 7 to 16, the structure of the description of each service has been revised to create a more consistent representation of the services;

— as a result of the above changes, the Introduction and content of Clauses 1 to 5 have been updated;

— a mapping of the services to the US ITS reference architecture reference [Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT)], has been provided in Annex A;

— a mapping of the services to the European ITS Framework Architecture (FRAME), has been provided in Annex B.

A list of all parts in the ISO 14813 series can be found on the ISO website.

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

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Introduction

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 surface transport systems domain, but ITS is also beginning to appear in other domains, such as maritime and rail transport. 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 addresses services in the following areas of the surface transport systems 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 surface transport systems domain;

— variable road pricing strategies for freight and personal travel;

— response activities and coordination related to emergencies and natural disasters;

— national security needs related to transportation infrastructure;

— cooperative-ITS (sometimes referred to as “connected vehicles” or “connected vehicle/highway systems”).

Services in some of these areas also interface with more generalized activities and environments outside the surface transport systems domain. For example, it is possible for road pricing and revenue systems activities to interface with electronic commerce (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 that specific national standards related to civil defence, emergency communications, and other procedures be addressed. These interfaces, while largely outside the scope of ISO/TC 204, are nevertheless critical external influences on the functionality of the various services supported by ITS service domains and groups.

This document has been developed to define ITS service domains, service groups and services into which ISO/TC 204 documents can be mapped for a more structured context. This structure can then assist in the identification of areas that are not yet fully addressed by the documents created and managed by ISO/TC 204.

To this end, the ITS service domains, ITS service groups and ITS services presented in this document serve as a framework for developing ITS-related concepts of operation, which in turn lead to the definition of the appropriate requirements, ITS architectures and standards necessary to deploy specific ITS services. As the range of transportation activities that utilize ITS tools has broadened, the ITS service domains and ITS service groups included in previous editions of this document have been revised.

In order to establish the relationship and interdependencies of the various ITS services, it is beneficial to firstly determine the ITS service domains and the groups that reside within them in the current perception of the scope of the ITS sector. Although these ITS service domains and groups build upon those used in existing US, European Union, Japanese and other international ITS implementations, they can also provide a common descriptive basis for comparing these implementations, as well as others under development throughout the world. It is possible to use a sub-set of the ITS services described in this document as the basis for a particular ITS implementation. It is also possible to add specific ITS services not found in this document that are particular to an ITS implementation so that the stakeholders get the services that they want.

Figure 1 illustrates the hierarchy of ITS service domains and ITS service groups and the ITS services that they include. The ITS service domains that apply to ITS are listed in 6.1 together with a definition of the nature of the activities provided. Each of these ITS service domains is then covered by separate clauses of this document, each of which includes the descriptions of its own ITS service groups and ITS services. The ITS service groups describe more specific activities that are part of the ITS service domain and the ITS services provide the more detailed description of what is provided within each ITS service group.

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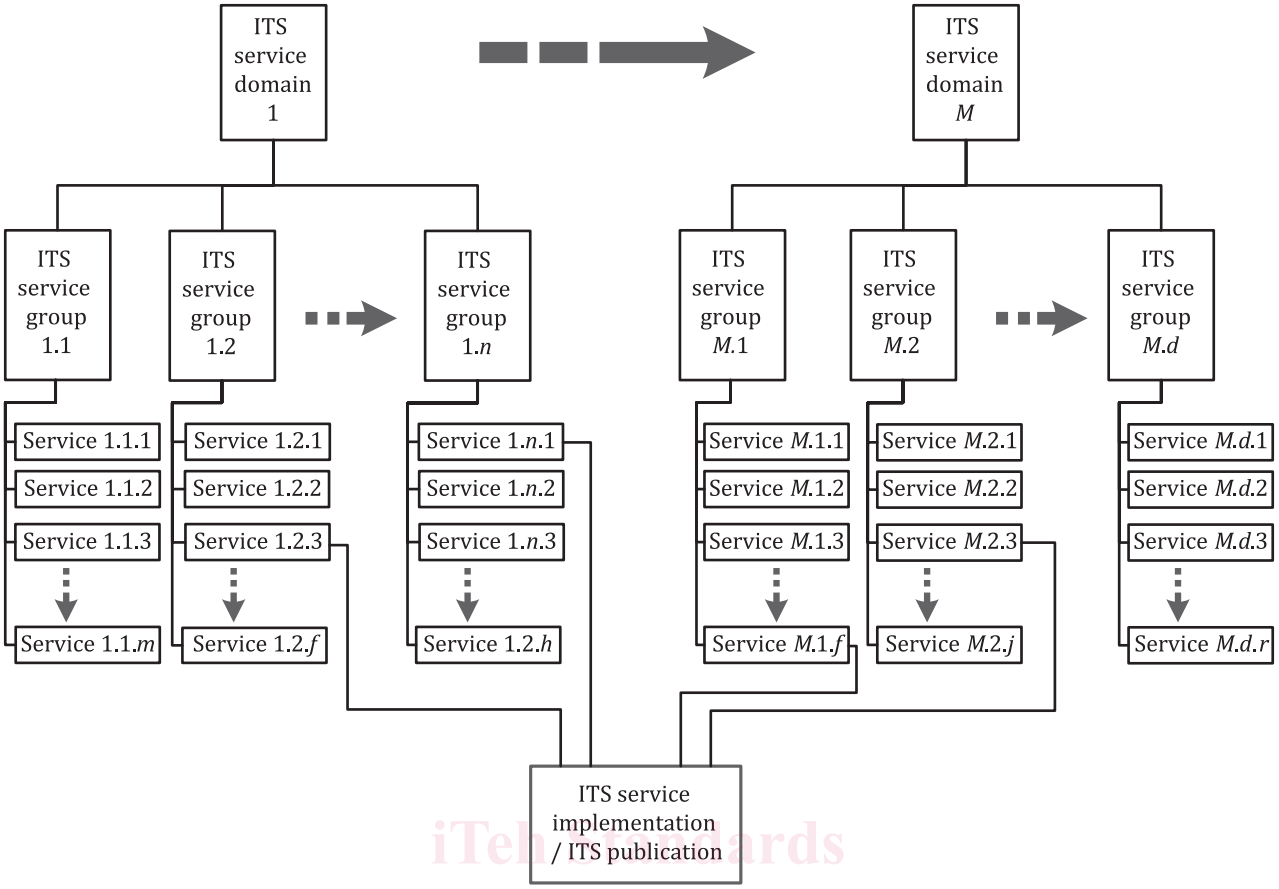

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Figure 1 — ITS services — Hierarchy of definitions for ITS reference architecture

Currently there are many instantiations of ITS service implementations around the world, with some of them being used as the basis for several International Standards. This document embraces ITS services from the following sources:

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— ITS service implementations from several parts of the world, including the US and the European Union;

— other ISO/TC 204 and CEN/TC 278 working groups.

Many ITS service implementations 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. Table 1 provides a high-level comparison between some of terms used in these two ITS architectures that are relevant to this document.

Table 1 — High-level comparison of ITS architecture terms

ISO 14813-1 (this document)	US Architecture	FRAME Architecture
Actor	Terminator	Terminator
ITS service domain	ITS Service Area	ITS Service Group
ITS service group	N/A	ITS Service Topic
ITS service	ITS Service Package	ITS Service

Full documentation of all possible approaches to ITS implementations is not feasible due to the high level of resources that would be necessary to carry this out. Indeed, full documentation and description of all possible approaches is undesirable as an item for standardization. Instead, a defined and consistent approach is required to facilitate reuse and interoperability.

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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 document provides a description of the primary services that have been internationally defined to promote consistency among implementations. Implementations can provide any of these services in combination with any other services that are appropriate. This document organizes ITS services by defining service groups, which are placed into one of several service domains. Each service group contains one or more individual services, each of which is described.

This document is intended for use by at least two groups of people involved in the ITS sector:

a) those who are looking for ideas about the services that ITS implementations can provide, and

b) those who are developing International Standards.

For the first group, this document provides service descriptions that can act as the catalyst for more detailed descriptions. The level of detail can differ from one ITS implementation to another, depending on whether or not a national ITS architecture is involved, and whether or not this architecture is based directly on services, or on groups of functions. The service descriptions in this document are pitched at a high-level as too much detail can be prescriptive and reduces flexibility.

For standards developers, this document is applicable to Technical Committees who are developing International Standards for the ITS sector. This document is designed to provide information and explanations of services that can form the basis and reason for developing standards.

Due to its nature, this document is largely advisory and informative with minimal requirements. It is designed to assist the integration of services into a cohesive reference architecture, thereby promoting interoperability and the use of common data definitions. Specifically, services defined within the service groups can be the basis for defining “use cases”, “user needs” or "user service requirements” depending on the methodology being used to develop the resultant ITS architecture functionality. They can also assist with defining applicable data within data dictionaries, and applicable communications and data exchange standards.

2 Normative references

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

ISO/TS 14812, *Intelligent transport systems — Vocabulary*

ISO 14817-3, *Intelligent transport systems — ITS data dictionaries — Part 3: Object identifier assignments for ITS data concepts*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14812 and the following apply.

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

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

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

3.1
actor
entity that fulfils a role

3.2
application
mechanism for delivering some or all parts of an ITS service

3.3
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

[SOURCE: ISO 15638-18:2017, 3.17, modified — permitted terms have been removed.]

3.4
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

3.5
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 that the victim needs be taken to a hospital.

3.6
electric vehicle
vehicle that is powered by its own on-board battery and does not use an internal combustion engine of any type

3.7
ITS service group
one or more similar or complementary ITS services provided to ITS users

3.8
ITS service domain
specific application area which comprises one or more ITS service groups

3.9
ITS stakeholder
individual or organization 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: An ITS stakeholder's involvement can be through use, manufacture of products, provision of services, or regulation.

3.10
ITS user
individual who directly or indirectly receives output from and/or provides input to the transaction of an ITS service

Note 1 to entry: These individuals can be human, external systems or another source of data, e.g. detection equipment.

3.11
navigation
ITS service which provides directional information to an individual during a trip

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3.12
mass
mass of a given heavy vehicle as measured by equipment affixed to the regulated vehicle

[SOURCE: ISO 15638-12:2014, 4.33]

3.13
route guidance
service which utilizes directional information, destination or real-time data to select an appropriate route, either prior to or during a trip

4 Abbreviated terms

ANPR	automatic number plate recognition
AVL	automatic vehicle location
C-ITS	cooperative ITS
CN	communications network
EFC	electronic fee collection
EV	electric vehicle
ETC	electronic toll collection
GVW	gross vehicle weight
HAZMAT	hazardous materials
HOV	high occupancy vehicle
ITS	intelligent transport systems
LPN	licence plate number
MaaS	mobility as a service
MOD	mobility on demand
OBE	on-board equipment
PT	public transport
RUC	road user charging
TARV	telematics applications for regulated commercial freight vehicles
WIM	weigh-in-motion

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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 called "service domains". These service domains have as their focus one or more groups of ITS users, such as travellers, road network operators, drivers (both

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of all vehicles and of selected types), or those who move freight. They are the highest level of abstraction in an ITS architecture.

ITS services do not represent the technology 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 organizational structures used in different geographical areas.

There is no prescribed relationship between ITS service domains and the areas of common functionality that are included in different ITS architectures. Sometimes a relationship can 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 document.

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." 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 the services contained within.

a) Each "ITS service group" is oriented to a specific activity related to management or information of the surface transport systems 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.

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5.1.3 Characteristics of ITS services

Within this document, an ITS service consists of a product or activity that can be provided to an ITS user. Thus, ITS services are considered as the elemental building blocks of any ITS architecture and the ITS implementations based upon its contents. ITS services are described in a way that is independent of the technologies that will be needed to deliver them. In fact, it is entirely possible that the technologies needed by an ITS service do not exist and thus the ITS service can provide the motivation for future ITS-related research and development activities. The language used in ITS service descriptions is non-technical so that they can be understood by a wide variety of ITS users, including those without any knowledge of the capabilities that ITS can provide.

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. Nevertheless, users can add to or replace some of the specific services described in this document in order to reflect particular location and/or jurisdictional and/or societal requirements. Whenever this is done, the names of these new or replacement services are not permitted to conflict or replicate the names of services used in this document.

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

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