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Intelligent transport systems (ITS) — The use of personal ITS stations to support ITS service provision for travellers —

Part 2: General requirements for data exchange between ITS stations

Systèmes de transport intelligents (ITS) — Utilisation d'une station ITS personnelle pour la fourniture de services ITS aux voyageurs —

Partie 2: Exigences générales pour l'échange de données entre station ITS personnelle et autres stations 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).

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

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

A list of all parts in the ISO 13111 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.

Introduction

This document defines the data exchange protocol between personal ITS stations and other ITS stations which are used to implement the use case defined in ISO 13111-1.

This document defines protocol based on the data exchange message (DXM) at application level between personal ITS stations and other ITS stations, such as vehicle ITS stations, central ITS stations, roadside ITS stations, etc.

Applications supporting ITS service provisions and multimedia use via personal ITS stations need to harmonize with existing or developing documents in the relevant areas. These applications can be implemented using vehicle information, driver advisory systems, warning systems, entertainment systems, traffic information, public transport information, slow transportation system (non-motorized travel) information and multimodal navigation services based on the communication architecture and protocol defined in ISO/TR 13185-1 and other related documents listed below:

— the ISO 13185 series, defining the vehicle interface for provisioning and support of ITS services;

— ISO 19132, ISO 19133 and ISO 19134, defining the conceptual schema of location-based services, tracking and navigation services, and multimodal navigation services;

— the ISO 15031 series, defining emissions-related diagnostic data supported by vehicles in all countries requiring on-board diagnostics (OBD) compliance;

— ISO 22900-2, defining the modular vehicle communication interface (MVCI) diagnostic protocol data unit (D-PDU API) to separate the protocol data unit (PDU) from vehicle-specific protocols;

— the ISO 22902 series,[1)] defining provisions for multimedia and telematics based on automotive multimedia interface collaboration (AMI-C) specifications and reference documents for the automotive industry. The important logical element of the architecture is a vehicle interface;

— ISO 22837, defining the reference architecture for probe vehicle systems and a basic data framework for probe data;

— the ISO 27145 series, defining diagnostic data (emissions-related systems, future safety-related systems, etc.) to be supported by vehicles in all countries implementing the GTR (Global Technical Regulation) into their local legislation;

— ISO/TS 29284, defining the standardization of information, communication and control systems in the field of urban and rural surface transport, including intermodal and multimodal aspects thereof, traveller information, traffic management, public transport, commercial transport, emergency services and commercial services in the ITS field;

— SAE J2735, defining the support of interoperability among dedicated short-range communication (DSRC) applications through the use of standardized message sets, data frames and data elements.

1) Withdrawn.

Intelligent transport systems (ITS) — The use of personal ITS stations to support ITS service provision for travellers —

Part 2: General requirements for data exchange between ITS stations

1 Scope

This document defines the data exchange protocol used to implement use cases for applications based on the personal ITS station defined in ISO 13111-1, which provides and maintains ITS services to travellers, including drivers, passengers and pedestrians.

The ITS applications supported by this document include multimodal transportation information services and multimodal navigation services that are based on personal ITS stations in various application scenarios defined in ISO 13111-1.

The use case implementations described in this document refer to the architecture defined in ISO 21217 and ISO 13184.

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 15031-2, *Road vehicles — Communication between vehicle and external equipment for emissions-related diagnostics — Part 2: Guidance on terms, definitions, abbreviations and acronyms*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 15031-2 and the following apply.

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/

3.1.1
central ITS station
C-ITS-S
implementation of an ITS station in a central ITS subsystem

3.1.2
ITS service
service provided by a set of ITS station applications

3.1.3
ITS station
ITS-S
entity in a communication network, comprised of application, facilities, networking and access layer components as specified in ISO 21217, that operate within a bounded secure management domain

3.1.4
ITS-S application
functionality in an ITS station that uses ITS station services to connect to one or more other ITS station applications.

3.1.5
ITS-S service
communication functionality offered by an ITS station to an ITS station application

3.1.6
nomadic device
ND
device that provides communications connectivity via equipment such as cellular telephones, mobile wireless broadband (WIMAX, HC-SDMA, etc.), WiFi, etc. and includes short range links, such as Bluetooth, Zigbee, etc. to connect nomadic devices to the motor vehicle communications system network

3.1.7
personal ITS station
P-ITS-S
implementation of an ITS station with a personal ITS subsystem

Note 1 to entry: P-ITS-S is used to send the information of each user (drivers, passengers and pedestrians) to the other ITS station, and receives messages from other ITS stations which will be processed and presented on the user's terminal device according to the ITS station services and/or applications being executed.

3.1.8
roadside ITS station
R-ITS-S
system that receives and processes vehicular and pedestrian information within a certain zone and determines the situation, in order to provide safety warning and parking guide services to vehicles and pedestrians

Note 1 to entry: The system is installed at the roadside.

3.1.9
slow transportation system
non-motorized travel
transport system via pedestrians and bicycles

3.1.10
vehicle ITS station
V-ITS-S
implementation of an ITS station with a vehicle ITS subsystem

3.2 Abbreviated terms

AMI-C automotive multimedia interface collaboration

ASN.1 abstract syntax notation one

D-PDU diagnostic protocol data unit

DSRC dedicated short-range communication

DXM	data exchange message
GTR	Global Technical Regulation
ITS	intelligent transport systems
ITS-S	intelligent transport system-station
MVCI	modular vehicle communication interface
OBD	on-board diagnostics
P2C	product to consumer
P2R	product to retail
PDU	protocol data unit
POI	point of interest
POS	position
UC	use case
V-ITS-S	vehicle ITS station
V-ITS-SG	vehicle ITS station gateway

4 General requirements

The service consists of a request and response message. The data transmitted in request and response message are structured in ASN.1 in accordance with Annex A.

5 Use case implementations

5.1 Use case clusters overview

Table 1 provides an overview of use cases (UCs).

Table 1 — Use case clusters

No.	Title of use case cluster	Brief description
1	Slow transport information service: Get positioning information by accessing a roadside station through the P-ITS-S and R-ITS-S interaction interface	The use cases shall describe the data exchange between the P-ITS-S and R-ITS-S. UC 1.1—Requesting available positioning service UC 1.2—Requesting positioning information UC 1.3—Requesting positioning service from C-ITS-S UC 1.4—Requesting to turn ON/OFF the positioning service UC 1.5—Requesting/receiving roadside information

Table 1 *(continued)*

No.	Title of use case cluster	Brief description
2	Slow transport information service: Requesting slow transport and local transport information service	The use cases shall describe the slow transport information service and local transport service. UC 2.1—Requesting to download and update local transport network data UC 2.2—Requesting slow transport navigation information [pedestrian, bicycles, and information to support those with disabilities such as decreased personal mobility or decreased vison (amblyopia)] UC 2.3—Requesting to search surrounding facilities UC 2.4—Requesting/receiving surrounding commercial information
3	Slow transport information service: Requesting the safety evacuation passageway or emergency service	The use cases shall describe the evacuation information and emergency service for a P-ITS-S user. UC 3.1—Requesting the safety evacuation passageway UC 3.2—Requesting emergency service UC 3.3—Sending the rescue information UC 3.4—Receiving the rescue information UC 3.5—Closing the state of emergency
4	Transfer information service: Transfer information service in the parking lot	The use cases shall describe the transfer information service in the parking lot via P2C or P2R interaction interface. UC 4.1—Requesting/receiving the surrounding parking information UC 4.2—Requesting/receiving the surrounding real-time traffic information UC 4.3—Requesting the parking facility information UC 4.4—Requesting indoor navigation in a parking lot UC 4.5—Requesting the car location in the parking lot UC 4.6—Requesting pedestrian routing to the car location
5	Transfer information service: Requesting the transfer information service in an integrated transportation hub	The use cases shall describe the transfer information service in an integrated transportation hub for specific flight, train and/or bus lines. UC 5.1—Requesting/receiving the arrival and departure time UC 5.2—Requesting the station or platform for specific flight, train and/or bus lines UC 5.3—Requesting the transfer route UC 5.4—Requesting the express security channel
6	Multimodal traffic information service: Traffic and public transport information service via P2C or P2R interaction interface	The use cases shall describe the public transport service via P2C or P2R interaction interface. UC 6.1—Requesting public transport information UC 6.2—Requesting road traffic information UC 6.3—Requesting/Receiving real-time public transport information UC 6.4—Requesting/Receiving real-time transfer information

Table 1 *(continued)*

No.	Title of use case cluster	Brief description
7	Multimodal navigation service: Trip planning for travellers with a personal ITS station	The use cases shall describe the trip planning for travellers with a personal ITS station. UC 7.1—Requesting to search point of interest (POI) UC 7.2—Requesting trip and/or route planning UC 7.3—Request route information (routing, traffic information, waypoint, destination and eco-driving) UC 7.4—Requesting to modify the trip or re-routing UC 7.5—Requesting past trip information (route, arrival time) UC 7.6—Requesting multimodal navigation information
8	Multimodal navigation service: Vehicle service through the P2V interaction interface	The use cases shall describe the interface of the vehicle information service when a P-ITS-S connects to a V-ITS-S through the V-ITS-SG defined in the ISO 13185 series. UC 8.1—Requesting vehicle status UC 8.2—Requesting vehicle basic information UC 8.3—Requesting vehicle equipment status UC 8.4—Requesting remote control UC 8.5—Requesting mirror link
9	Communities activities: Share location through the interaction interface between the personal stations	The use cases shall describe the interaction interface between the personal ITS stations. UC 9.1—Requesting to open the location information UC 9.2—Requesting to participate in a location-based activity UC 9.3—Requesting data or information sharing UC 9.4—Requesting help UC 9.5—Removing the linkage/cancelling the session
10	Communities activities: Team travel	The use cases shall describe team travel when a group of vehicles (or bicycles) follows the lead vehicle on the way to the same destination. UC 10.1—Requesting team information UC 10.2—Requesting to join a team UC 10.3—Requesting to track the lead vehicle UC 10.4—Close the tracking or quit the team

5.2 Use case implementations

5.2.1 Get positioning information by accessing a roadside station through the P-ITS-S and R-ITS-S interaction interface

5.2.1.1 UC 1.1 — Requesting available positioning service

Table 2 provides a definition of UC 1.1 — Requesting available positioning service.

Table 2 — Definition of UC 1.1 — Requesting available positioning service

Use case	**Type of service**	Slow transport information service	ND in a given environment can get the local available positioning service.
	Cluster	1) Get positioning information by accessing a roadside station through the P-ITS-S and R-ITS-S interaction interface	
	Name	UC 1.1 Requesting available positioning service	
	Actor	P-ITS-S, R-ITS-S	
Message	**Subclause**	**Name**	**Description**
	6.1.1	`available_position_service`	requesting position service
	6.1.2	`position_service_list`	show position service list

5.2.1.2 UC 1.2 — RequestingPositioning information

Table 3 provides a definition of UC 1.2 — Requesting positioning information.

Table 3 — Definition of UC 1.2 — Requesting positioning information

Use case	**Type of service**	Slow transport information service	ND in a given environment can get the surrounding positioning information.
	Cluster	1) Get positioning information by accessing a roadside station through the P-ITS-S and R-ITS-S interaction interface	
	Name	UC 1.2 Requesting positioning information	
	Actor	P-ITS-S, R-ITS-S	
Message	**Subclause**	**Name**	**Description**
	6.1.1	`available_position_service`	search available position service through R-ITS-S
	6.1.3	`selected_position_service`	position service has selected
	6.1.4	`position_info_collection`	collect position information

5.2.1.3 UC 1.3 — Requesting positioning service from C-ITS-S

Table 4 provides a definition of UC 1.3 — Requesting position service from C-ITS-S.

Table 4 — Definition of UC 1.3 — Requesting positioning service from C-ITS-S

Use case	**Type of service**	Slow transport information service	ND in a given environment can get the surrounding positioning information. P-ITS-S sends the request to C-ITS-S or R-ITS-S. Then C-ITS-S or R-ITS-S returns the current location information to the P-ITS-S.
	Cluster	1) Get positioning information by accessing a roadside station through the P-ITS-S and R-ITS-S interaction interface	
	Name	UC 1.3 Requesting positioning service from C-ITS-S	
	Actor	P-ITS-S, R-ITS-S, C-ITS-S	
Message	**Subclause**	**Name**	**Description**
	6.1.5	`position_service_CITS`	send user ID and position service to C-ITS-S
	6.1.6	`current_position_info`	get current position information

5.2.1.4 UC 1.4 — Requesting to turn ON/OFF positioning service

Table 5 provides a definition of UC 1.4 — Requesting to turn ON/OFF positioning service.

Table 5 — Definition of UC 1.4 — Requesting to turn ON/OFF positioning service

Use case	**Type of service**	Slow transport information service	When the ND does not want to use location information, P-ITS-S may close(open)positioning service.
	Cluster	1) Get positioning information by accessing a roadside station through the P-ITS-S and R-ITS-S interaction interface	
	Name	UC 1.4 Requesting to turn ON/OFF positioning service	
	Actor	P-ITS-S	
Message	**Subclause**	**Name**	**Description**
	6.1.7	`return_status`	return the status before requesting

5.2.1.5 UC 1.5 — Requesting/receiving roadside information

Table 6 provides a definition of UC 1.5 — Requesting/receiving roadside information.

Table 6 — Definition of UC 1.5 — Requesting/receiving roadside information

Use case	**Type of service**	Slow transport information service	Individual users request to search the roadside information from P-ITS-S. Then, P-ITS-S sends the request to R-ITS-S which returns the roadside information and P-ITS-S receives the roadside information.
	Cluster	1) Get positioning information by accessing a roadside station through the P-ITS-S and R-ITS-S interaction interface	
	Name	UC 1.5 Requesting/receiving roadside information	
	Actor	P-ITS-S, R-ITS-S	
Message	**Subclause**	**Name**	**Description**
	6.1.8	`roadside_request`	request the roadside information
	6.1.9	`roadside_info_list`	show roadside information list

5.2.2 Requesting slow transport and local transport information service

5.2.2.1 UC 2.1 — Requesting to download and update local transport network data

Table 7 provides a definition of UC 2.1 — Requesting to download and update local transport network data.

Table 7 — Definition of UC 2.1 — Requesting to download and update local transport network data

Use case	**Type of service**	Slow transport information service	Individual users in the slow transport services area request to download and update local transport network data from the P-ITS-S. The P-ITS-S sends the request to the central intelligent transport systems; then it returns the data information about the current position.
	Cluster	2) Requesting slow transport and local transport information service	
	Name	UC 2.1 Requesting to download and update local transport network data	
	Actor	P-ITS-S, R-ITS-S	
Message	**Subclause**	**Name**	**Description**
	6.2.1	`local_transportnetwork`	show the local transport network
	6.2.2	`get_datapackage`	download data package