INTERNATIONAL STANDARD

ISO
13111-1

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

Part 1:
General information and use case definitions

Systèmes intelligents de transport (ITS) — Utilisation de la station ITS personnelle à l'appui de la fourniture du service ITS aux voyageurs —

Partie 1: Informations générales et définition des cas d'utilisation

Contents

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 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 the following URL: 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.

Introduction

This document specifies the interface to support a variety of applications based on the personal ITS station and data exchange between the stations being defined in the related standards or specifications in TC 204 such as vehicle ITS station, central ITS station, roadside ITS station, etc.

Applications supporting ITS service provisions and multimedia use via the personal ITS station need to harmonize with existing or developing standards or technical reports in the concerned areas. These applications would be implemented using vehicle information, driver advisory, warning systems, entertainment systems, traffic information, public transport information, slow transport system (non-motorized travel) information and multi-modal navigation service based on the communication architecture and protocol defined in ISO/TR 13185 and other related standards.

Besides ISO/TR 13185, the following standards are subject to analysis in regard to their applicability to supporting ITS service provisions and multimedia use via personal ITS stations:

— ISO 14819 defines TTI messages via traffic message coding (RDS-TMC) using ALERT-C;

— ISO/TS 18234 and ISO/TS 24530 defines TTI via Transport Protocol Experts Group (TPEG);

— ISO 19132, ISO 19133 and ISO 19134 define the conceptual schema of location base service, tracking and navigation service, and multi-modal navigation service;

— ISO 15031 defines emissions-related diagnostic data supported by vehicles in all countries requiring OBD compliance;

— ISO 27145;

— ISO 22900-2 defines the Modular Vehicle Communication Interface (MVCI) D-PDU API to separate the protocol data unit (PDU) from vehicle specific protocols;

— ISO 22901 defines the Open Diagnostic data eXchange (ODX) format which is an XML-based standard for describing diagnostic related ECU data. This standard is becoming the vehicle manufacturer's choice to document vehicle system diagnostic data and protocol information;

— ISO 22902 is a multimedia and telematics standard based on AMI-C specifications and reference documents for automotive industry. The important logical element of the architecture is a vehicle interface;

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

— ISO 29284 defines 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 defines the support of interoperability among DSRC applications through the use of standardized message sets, data frames and data elements.

This document defines the personal ITS stations applications such as public transport information services, slow transport (non-motorized travel as bicycle and walking) information service, multi-modal navigation services, etc.

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

Part 1:
General information and use case definitions

1 Scope

This document defines the general information and use cases of the applications based on the personal ITS station to provide and maintain ITS services to travellers including drivers, passengers and pedestrians. The ITS applications supported by this document include multi-modal transportation information service and multimodal navigation service which are based on personal ITS stations in various application scenarios as follows.

— Slow transport information service and navigation service such as pedestrians, bicycles and disabled (wheelchair accessible) navigation, as well as internal traffic navigation inside the local transport area.

— Transfer information service. The considered application environment includes the transfer information service in a transfer node such as the integrated transportation hub, bus stations, car parking lot, an indoor transfer area, etc.

— Multi-modal traffic information service. Types of traffic information include real-time road traffic information, public transport operating information, service information for pedestrians' road network and service information for transfer node such as integrated transportation hub, bus stations, car parking lot, an indoor transfer area, etc.

— Multi-modal navigation service. Includes static and dynamic multi-modal routing and re-routing service, as well as real-time guidance service with voice/image/text/map drawings.

— Communities activities: For example, a team travel when a group of vehicles (or bicycles) track the lead vehicle on the way to the same destination.

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 13185-2, *Intelligent transport systems — Vehicle interface for provisioning and support of ITS services — Part 2:Unified gateway protocol (UGP) requirements and specification for vehicle ITS station gateway (V-ITS-SG) interface*

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 terminological databases for use in standardization at the following addresses:

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

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

3.1.1
bluetooth
BT
communication protocol for exchanging data over short distances

3.1.2
communications access for land mobiles
CALM
specification of a common architecture, network protocols and communications interface definitions to enable continuous or quasi continuous communications between vehicles and the infrastructure, or between vehicles, using wireless telecommunications media that are available in any particular location, and have the ability to migrate to a different available media where required

3.1.3
central ITS station
C-ITS-S
implementation of an ITS station a central ITS subsystem

3.1.4
eco lamp
lamp implemented on the dashboard or nomadic device to guide the driver to drive the vehicle in the most economical way, i.e. a green lamp/symbol will indicate high fuel efficiency driving or travelling at a constant speed while a red lamp/symbol will indicate low fuel efficiency, i.e. strong acceleration or sudden braking

3.1.5
event log file
data record with multiple event data stored with time stamp

3.1.6
ITS service
service provided by a set of *ITS-S application* (3.1.8)

3.1.7
ITS station
ITS-S
entity in a communication network, comprised of application, facilities, networking and access layer components specified in ISO 21217 that operate within a bounded secure management domain

3.1.8
ITS-S application
functionality in an *ITS-S* (3.1.7) that uses ITS-S services to connect to one or more other ITS-S applications

3.1.9
ITS-S gateway
gateway functionality provided in the facilities layer of an *ITS-S* (3.1.7)

3.1.10
ITS-S router
routing functionality provided in an *ITS-S* (3.1.7)

3.1.11
ITS-S service
communication functionality offered by an *ITS-S* (3.1.7) to an *ITS-S application* (3.1.8)

3.1.12
multi-modal LBS
service, query, or process whose return or other property is dependent on the location of the client requesting the service and/or of some other thing, object, or person using various modes of transport for daily activities.

3.1.13
multi-modal navigation
navigation for complex transport includes public transport, walking and driving.

3.1.14
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

3.1.15
network-based multi-hopping
multi-hopping from *ITS-S* (3.1.7) to ITS-S performed by a networking protocol

3.1.16
personal ITS station
P-ITS-S
implementation of an *ITS station* (3.1.7) 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

3.1.17
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.

3.1.18
slow transport system
non-motorized travel
transport system via pedestrians and bicycles

3.1.19
vehicle ITS station
V-ITS-S
implementation of an *ITS station* (3.1.7) with a vehicle ITS subsystem

3.1.20
vehicle state of capability log file
VSOCLogFile
data record with multiple data snapshots including a pre-selected data set providing a vehicle capability status for the vehicle's electronic system(s)

3.2   Abbreviated terms

BT   bluetooth

CALM   communications access for land mobiles

DLL   dynamic link library

DSRC   dedicated short-range communications

DTC   diagnostic trouble code

GUI   graphical user interface

ITS-S   intelligent transport system-station

LL   logical link

ND   nomadic device

OBE   on-board equipment

PDU   protocol data unit

RMI   repair and maintenance information

RSE   roadside equipment

VIN   vehicle identification number

V-ITS-SG   vehicle-intelligent transport system-station gateway

VSOC   vehicle state of capabilities

4   Conventions

This document is based on the conventions discussed in the OSI Service Conventions (ISO/IEC 10731:1994) as they apply for communication services. The XML-based vehicle data transfer protocol is applicable to OSI layers 4, 5, 6 and 7.

5   Document overview and structure

This document set provides the application requirements to support the implementation of the personal ITS station in accordance with the related standard.

— ISO 13111-1

    This document provides an overview of the document set and structure along with the use case definitions and a common set of resources (definitions, references) for use by all subsequent parts.

— ISO 13111-2

    This document specifies data exchange schema between personal ITS station and the other stations. We shall reflect the general requirements derived from the use cases as specified in ISO 13111-1.

Because it is difficult to enumerate specific details of the protocol for all sorts of application, ISO 13111-2 only defines the general protocol.

If there are more specific and more complete descriptions of the details of the protocol based on the specific implementing application, we shall submit a new work item proposal.

For example, in protocol requirements and specifications for personal ITS station in the case of transfer service in the integrated transport hub, we shall propose a new standard work item that consistent with the general schema defined in ISO 13111-2.

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    │  use case definitions │                      │ And specification for personal│
    │                       │                      │        ITS station        │
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    │ specification for          │             │        applications       │
    │ personal ITS station in the│             │                           │
    │ case of transfer           │             │                           │
    │ service in the integrated  │             │                           │
    │ transport hub              │             │                           │
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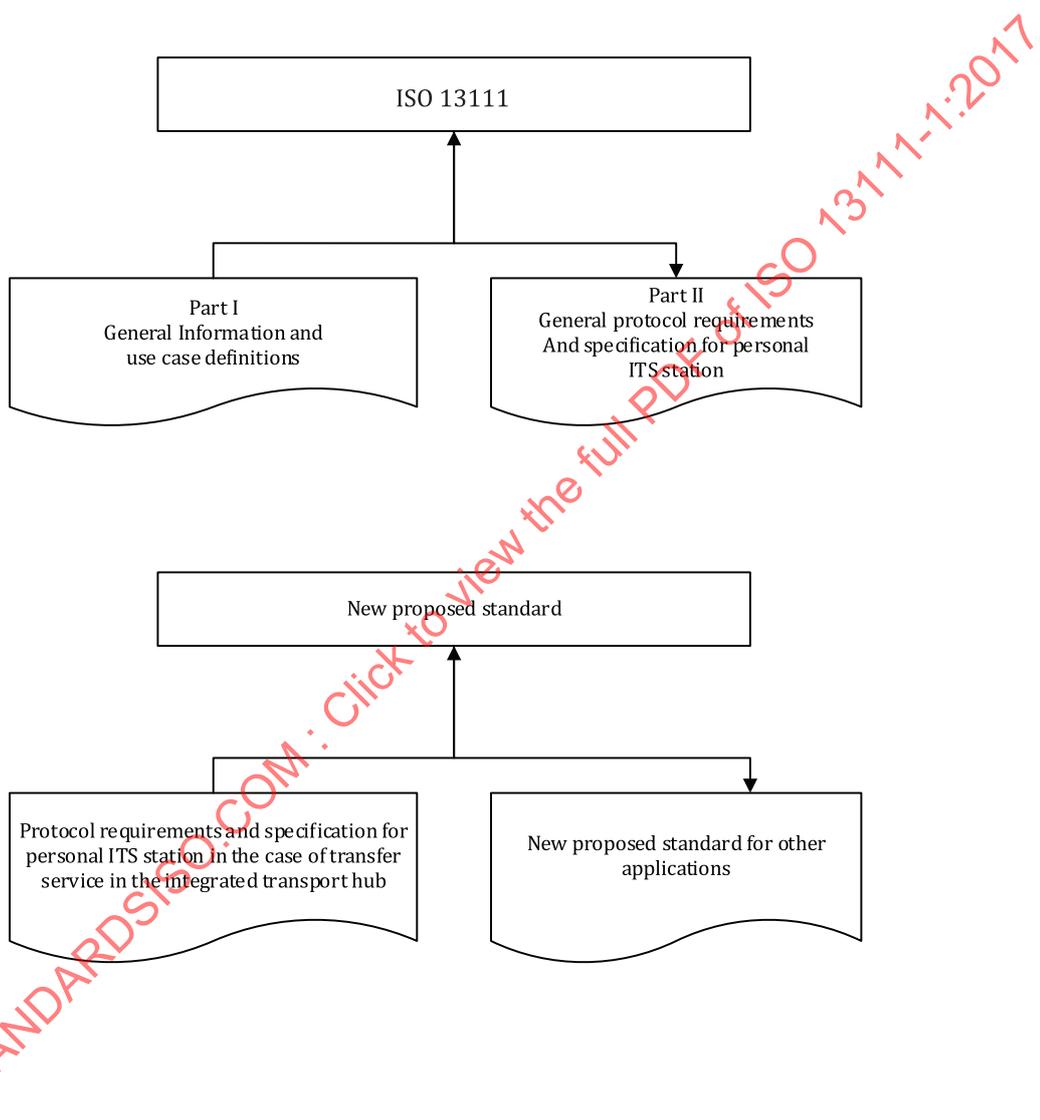
Figure 1 — Document structure

6 Architecture components and P-ITS-S configuration

6.1 ITS communication architecture components

The ITS communication architecture is a communication system designed for ITS and made of four physically separated subsystem components:

— the vehicle subsystem component (Vehicle Station);

— the personal subsystem component (Personal Station),

— the roadside subsystem component (Roadside Station),

— the central subsystem component (Central Station).

Each of the four components described in Figure 2 contains the ITS subsystem components and usually a vehicle gateway connecting the ITS Station to a legacy system. The vehicle shall require a vehicle gateway connected to the vehicle station and to the vehicle manufacturer's proprietary vehicle network which is defined in ISO 13185.

Figure 2 illustrates the communication system designed for ITS.

a) Personal-ITS-Station – personal subsystem component.

b) Vehicle-ITS-Station – vehicle subsystem component connected to vehicle domain architecture designed by vehicle manufacturer via the V-ITS-SG.

c) Roadside-ITS-Station – roadside subsystem component.

d) Central-ITS-Station – central subsystem component.
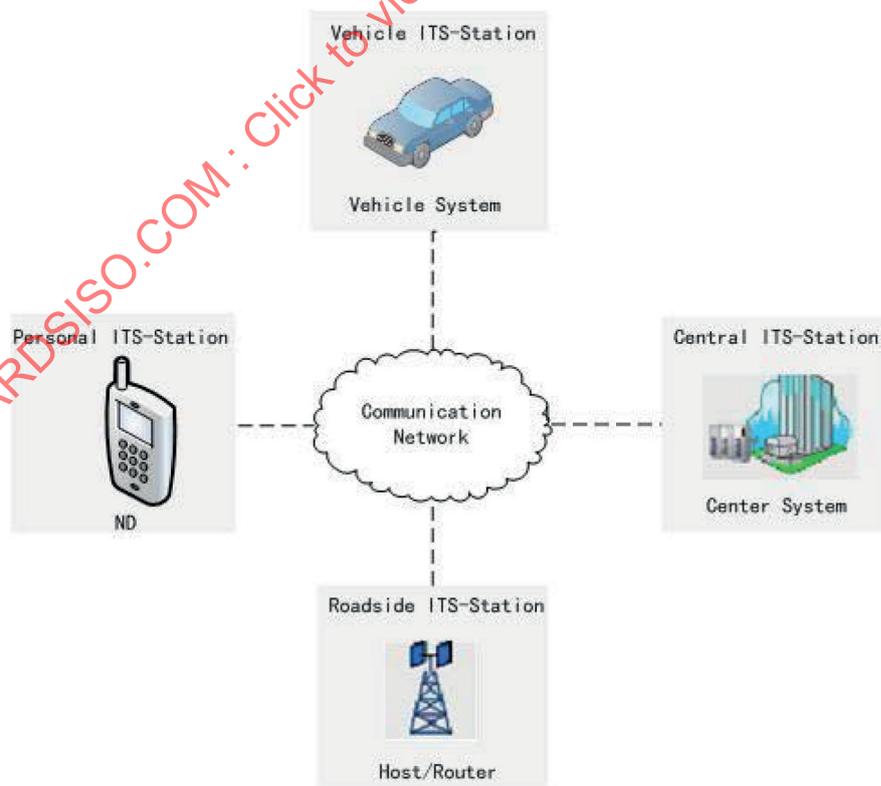
Figure 2 — ITS communication architecture

Figure 3 illustrates the connection between the personal and the other ITS station through the ITS stations router which support the CALM architecture.
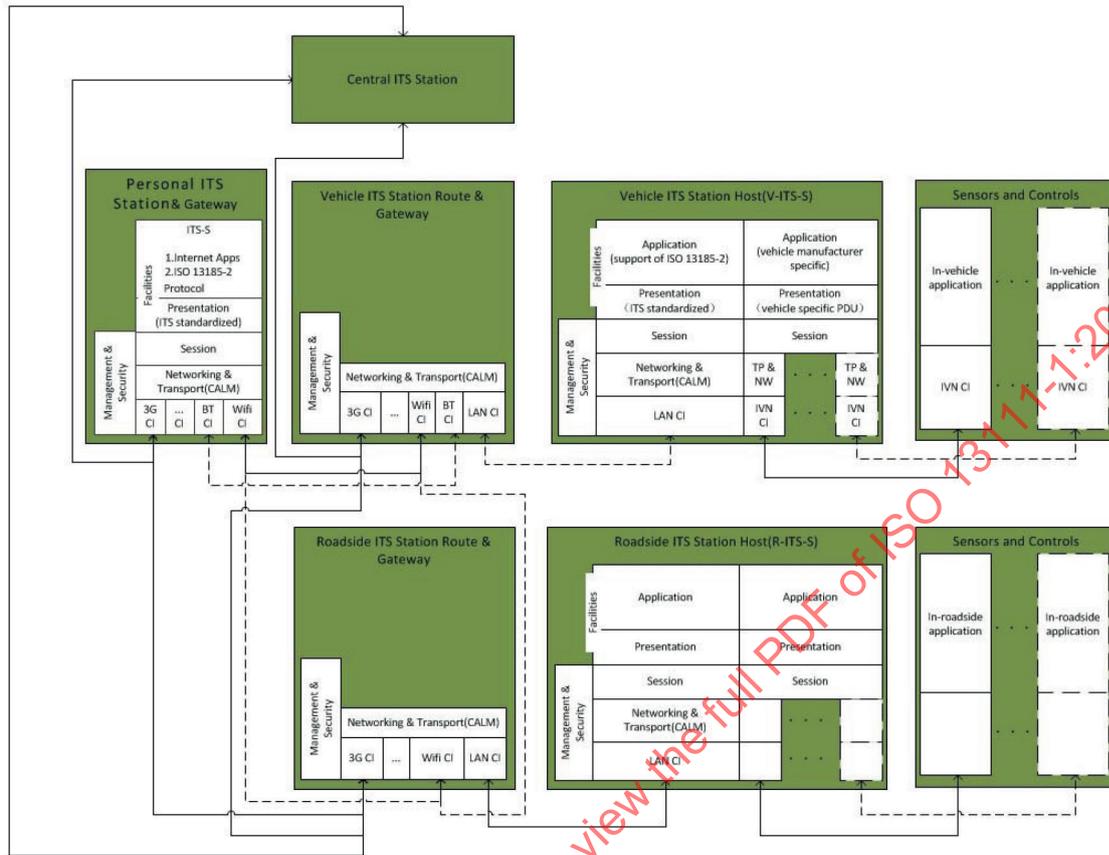
Figure 3 — Connection between P-ITS-S and the other ITS-S based on CALM architecture

There are many existing International Standards for the communication between the vehicle station and personal station for bi-directional vehicle data transfer.

It is necessary to review and determine the suitability of the existing International Standards for nomadic devices and existing vehicle communication network access standards.

6.2 Overview of application scenario

This document shall specifies use cases and requirements for provision of the ITS services based on the Personal-ITS-Station connected to other stations.

Five types of schema are described for the application of a personal ITS station in Table 1.

Table 1 — Schema of the use case

No	Type of use case	application	Schema				
			P2V	P2R	P2P	P2C	P2X
1	Slow transport information service	Positioning service		X		X	X
2		Slow transport information service				X	
3		Evacuation information and emergency service		X		X	X
4	Transfer service	Transfer information in parking lot		X		X	X
5		Transfer in an integrated transportation hub		X		X	X

Table 1 *(continued)*

No	Type of use case	application	Schema				
			P2V	P2R	P2P	P2C	P2X
6	Multi-modal traffic information service	Public transport information		X		X	
7		Road traffic information		X		X	
8		Real-time public transport information		X		X	
9		Real-time transfer information		X			
10	Multi-modal navigation service	Search POI				X	
11		Trip planning, routing and navigation	X			X	
12		Vehicle information	X			X	X
13	Community activities	Share location			X	X	X
14		Share POI			X	X	X
15		Team travel (tracking the leading car)			X	X	X

NOTE 1   P2V: the available interaction or interoperation when a Personal Station connects to the Vehicle Station.

NOTE 2   P2R: access to a Roadside-ITS-Station by a Personal-ITS-Station where they connect to each other directly.

NOTE 3   P2P: application between two Personal Stations.

NOTE 4   P2C: a Central Station interface for Personal Station to obtain all kinds of available ITS services.

NOTE 5   P2X: a P-ITS-S connects to the other station via a Central Station or access Central Station via the other stations.

6.3 P-ITS-S configurations

Above the traffic information and vehicle information, the ITS service will be extended to support slow transport systems to include peds and bikes, transfer node services, local transport networks, emergency services, vision impaired and disabled services when a user with his P-ITS-S is far away from the vehicle or even the road. These applications in ITS provisions are based on the connection to the server platform of the Central Station. The communication configurations such as bluetooth, WiFi, 2-3G, FM and DAB/DVB are needed in the different application scenarios of the Personal Station.

The support for an open access method shall need to move from proprietary systems to a flexible, standardized system. The XML-based vehicle data transfer protocol's open access method accommodates ISO standards depending on various applications like eCall, multimedia control, probe data collection, diagnostics, etc.

In these application scenarios, a P-ITS-S consists of the positioning modular, communication modular, application software and hardware. In some specific cases, the hardware of a P-ITS-S may include several different connected devices and a gateway is used to support the access between them. In some other cases, a gateway is not necessary for P-ITS-S in its applications.

7 Use case overview and principles

7.1 Basic principles for use case definitions

Basic principles have been established as guidelines to define the use cases.

The use case clusters shall describe the interaction between the P-ITS-S, V-ITS-S, C-ITS-S and R-ITS-S. The users of the P-ITS-S include vehicle owners, vehicle drivers, vehicle and public transport passengers, pedestrians and bicycle-travellers. In emergency service procedures, the victims and rescuer become the user of the Personal Station. The information or message of the ITS application for a personal ITS station may come from a Vehicle Station, a Central Station, a Roadside Station or even another personal ITS station. The access to a Vehicle Station via a V-ITS-SG installed in a vehicle with connection to the electronic systems has been described in ISO 13185.

The participants in the supply chain for the ITS service and applications concerned with the V-ITS-SG such as the Vehicle Station product supplier, the V-ITS-SG product supplier, customer (e.g. vehicle owner), vehicle manufacturer and diagnostic tool suppliers are also described in ISO 13185. The other participants in the supply train of the ITS service and applications include telematics service provider, traffic information service provider, broadcast and communication service provider, road owner, etc.

7.2 Use case clusters

This subclause provides an overview about the different use case categories. The use cases are grouped into use case clusters.

Table 2 — Use case clusters

No	Title of use case cluster	Brief description
1	Slow transport information service: Get positioning information by accessing a Roadside Station though 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. — Requesting available positioning service — Requesting positioning information — Requesting positioning service from C-ITS-S — Requesting to turn ON/OFF the positioning service — Requesting/Receiving roadside information
2	Slow transport information service: Requesting slow transport and local transport information service	The use cases shall describe the slow transport service and local transport service. — Requesting to download and update local transport network data — Requesting slow transport navigation information (pedestrian, bicycles and information to support those with disabilities such as decreased personal mobility or decreased vision (amblyopia) — Requesting to search surrounding facilities — Requesting/Receiving surrounding commercial information
3	Slow transport information service: Requesting the safety evacuation passageway or emergency service	The use cases shall describe evacuation information and emergency service for a P-ITS-S user. — Requesting the safety evacuation passageway — Requesting emergency service — Sending the rescue information — Receiving the rescue information — Closing the state of emergency
4	Transfer information service: in the parking lot via P2C or P2R interaction interface	The use cases shall describe the transfer information service in the parking lot via P2C or P2R interaction interface. — Requesting/receiving the surrounding parking information — Requesting/Receiving the surrounding real-time traffic information — Requesting the parking facility information — Requesting the indoor navigation in a parking lot — Requesting the car location in the parking lot — Requesting pedestrian routing to the car location

The detailed definition of each use case is defined in Clause 8.

8 Use case definitions

8.1 UC1 Access a roadside station through the P-ITS-S and R-ITS-S interaction interface

8.1.1 Requesting available positioning service modes

Table 3 — Requesting available positioning service modes

Use case name	Requesting available positioning service
Actor	P-ITS-S, R-ITS-S
Goal	Getting available positioning service
Use case input	— user ID — location information
Use case output	Return the positioning service list
Brief description	ND in an environment can get the local available positioning service

8.1.2 Requesting positioning information

Table 4 — Requesting positioning information

Use case name	Requesting positioning information
Actor	P-ITS-S, R-ITS-S
Goal	Requesting the surrounding positioning information supported by ND
Use case input	— user ID — location information — option from the positioning service list which can be used by ND
Use case output	Return the positioning information collection
Brief description	ND in an environment can get the surrounding positioning information. Information of: — signal ID — signal strength — signal location — other data

8.1.3 Requesting positioning service from C-ITS-S

Table 5 — Requesting positioning service from C-ITS-S

Use case name	Requesting positioning service from C-ITS-S
Actor	P-ITS-S, R-ITS-S, C-ITS-S
Goal	Requesting positioning service from C-ITS-S

Table 5 *(continued)*

Use case input	— user ID
	— option from the positioning service modes list which can be used by ND
Use case output	Return the current location information
Brief description	ND in an 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 will return the current location information to the P-ITS-S.
	Information of:
	— longititude
	— latitude
	— zone information
	— other location relative information

8.1.4 Requesting to turn ON/OFF positioning service

Table 6 — Requesting to turn ON/OFF the positioning service

Use case name	Requesting to turn ON/OFF the positioning services
Actor	P-ITS-S
Goal	Requesting ON/OFF positioning services
Use case input	No input
Use case output	Return the success/failure status.
Brief description	When ND does not want to use location information, P-ITS-S may close (open) positioning services

8.1.5 Requesting/Receiving roadside information

Table 7 — Requesting/Receiving roadside information

Use case name	Requesting/Receiving roadside information
Actor	P-ITS-S, R-ITS-S
Goal	Getting roadside information
Use case input	— user ID
	— type
	— user position
Use case output	Get the list of the roadside information
Brief description	Individual users will be requesting to search the roadside information from P-ITS-S. Then, P-ITS-S sends the request to R-ITS-S which will return the roadside information and P-ITS-S will receive the roadside information.
	List of:
	— temperature
	— humidity
	— wind speed
	— safe driving information
	— other information

8.2 UC2 Slow transport and local transport information services

8.2.1 Requesting to download and update local transport network data

Table 8 — Requesting to download and update local transport network data

Use case name	Requesting to download and update local transport network data
Actor	P-ITS-S, C-ITS-S
Goal	Downloading and updating local transport network data based on user position
Use case input	— user ID — user position — version number
Use case output	Get the data package
Brief description	Individual users in the slow transport services area will be requesting to download and update local transport network data from the P-ITS-S. Then, P-ITS-S sends the request to the center intelligent transport systems; then it will return the data information about the current position. Information of: — surrounding map — part facility information — shopping basic information — road information — other relative information — commercial details(map, brief, goods, history, history pictures, history culture, origin of goods, videos, etc.) — scenic details (map, text description, voices, videos, history pictures, culture, etc.) — details in the indoor — other text and multimedia information — version information

8.2.2 Requesting slow transport navigation information

Table 9 — Requesting slow transport navigation information

Use case name	Requesting slow transport navigation information (pedestrian, bicycles and information to support those with disabilities such as decreased personal mobility or decreased vision (amblyopia). Updating system configuration
Actor	P-ITS-S, C-ITS-S
Goal	Calculating the optimal path from the current position to the destination in the slow transport areas, including indoors, outdoors, stairs, etc.

Table 9 *(continued)*

Use case input	— user ID — user position — destination information
Use case output	Get the optimal navigation path that is composed of the basic description of paths and the list of roads
Brief description	Individual users in the slow transport services area will be requesting the slow transport navigation information from P-ITS-S. Then, P-ITS-S sends the request to the centre intelligent transport systems and will return the optimal navigation path. Path of: — basic description of paths(total distance etc.) — basic description of roads (road positions, road attributes etc.)

8.2.3 Requesting to search the surrounding facilities

Table 10 — Requesting to search the surrounding facilities

Use case name	Requesting to search the surrounding facilities
Actor	P-ITS-S, C-ITS-S
Goal	Getting the surrounding facilities information in the slow traffic areas
Use case input	— user ID — facility type — facility key — user position
Use case output	Get the list of the surrounding facilities information
Brief description	Individual users in the slow transport services area will be requesting to search the facilities from P-ITS-S. Then, P-ITS-S sends the request to the centre intelligent transport systems and will return the surrounding facilities. List of: — facility ID — facility name — facility position — facility type — facility description

8.2.4 Requesting/Receiving surrounding commercial information

Table 11 — Requesting/Receiving surrounding commercial information

Use case name	Requesting/Receiving surrounding commercial information
Actor	P-ITS-S, C-ITS-S
Goal	Getting the surrounding commercial information in the slow traffic areas

Table 11 *(continued)*

Use case input	— user ID
	— type
	— user position
	— user preferences
Use case output	Get the list of the surrounding commercial information
Brief description	Individual users in the slow transport services area will be requesting to search the commercial information to P-ITS-S. Then, P-ITS-S sends the request to the centre intelligent transport systems which will return the surrounding commercial information or will receive the commercial information.
	List of:
	— commercial name
	— participants
	— contents
	— limited conditions
	— time
	— other information

8.3 UC3 Evacuation information and emergency service for a P-ITS-S user

8.3.1 Requesting the safety evacuation passageway

Table 12 — Requesting the safety evacuation passageway

Use case name	Requesting the safety evacuation passageway in a local area such as tunnel, parking lot, some indoor place, etc.
Actor	P-ITS-S, C-ITS-S
Goal	Calculating the optimal path f rom the current position to the pre-defined shelter via the safety evacuation passageway in the slow transport areas, including indoors, outdoors, stairs, etc.
Use case input	— user ID
	— user position
	— destination information
Use case output	Get the optimal navigation path that is composed of the safety evacuation passageway and some link road to the pre-defined shelter (refuge)
Brief description	Individual users of the P-ITS-S send the request to the centre intelligent transport systems and it will return the optimal navigation path which consists of
	— location of the pre-defined shelter,
	— safety evacuation passageway to the shelter, and
	— basic description of total roads to the shelter from the current position.

8.3.2 Requesting emergency service

Table 13 — Requesting/Receiving emergency service

Use case name	Requesting emergency service
Actor	P-ITS-S, C-ITS-S
Goal	Send emergency information
Use case input	— user ID — emergency type — emergency content — sending object
Use case output	Return sending status
Brief description	An ND sends emergency information when it connects to the authorized centre system

8.3.3 Sending rescue information

Table 14 — Sending rescue information

Use case name	Sending rescue information
Actor	P-ITS-S, C-ITS-S
Goal	Sending rescue information
Use case input	— user ID — location information — sending object
Use case output	Return sending status
Brief description	Connection between two NDs or one ND and C-ITS-S

8.3.4 Receiving rescue information

Table 15 — Receiving rescue information

Use case name	Receiving rescue information
Actor	P-ITS-S, C-ITS-S
Goal	Receiving rescue information from C-ITS-S or P-ITS-S
Use case input	— user ID — rescue type — rescue content
Use case output	Return the success/failure status
Brief description	When C-ITS-S or P-ITS-S sends rescue information, an ND can receive the information

8.3.5 Closing the state of emergency

Table 16 — Closing the state of emergency

Use case name	Closing the state of emergency
Actor	P-ITS-S, C-ITS-S
Goal	Closing the state of emergency

Table 16 *(continued)*

Use case input	— user ID
	— emergency status
Use case output	Return the success/failure status
Brief description	When C-ITS-S sends the status that the emergency has been processed, an ND can receive the information and close the current system state of emergency

8.4 UC 4 Transfer information service in the parking lot

8.4.1 Requesting/Receiving surrounding parking information

Table 17 — Requesting/Receiving surrounding parking information

Use case name	Requesting/receiving surrounding parking information
Actor	P-ITS-S, C-ITS-S, V-ITS-S, R-ITS-S
Goal	Get surrounding parking information
Use case input	Request for information about a connected C-ITS-S, V-ITS-S or R-ITS-S.
	— user ID
	— user position
	— destination(position or place name)
Use case output	Get the list of surrounding parking information
Brief description	Individual users travelling by car and about to arrive will be looking for empty parking spaces. After requesting the surrounding parking information from the P-ITS-S, P-ITS-S sends the request to C-ITS-S, V-ITS-S, or R-ITS-S. These ITS Stations will return information about the current state of empty parking spaces and P-ITS-S will receive information.
	List of:
	— parking name
	— parking position
	— total parking spaces
	— empty parking spaces
	— distance to destination
	— other data

8.4.2 Requesting/Receiving surroundings real-time traffic information

Table 18 — Requesting/Receiving surroundings real-time traffic information

Use case name	Requesting/Receiving surroundings real-time traffic information
Actor	P-ITS-S, C-ITS-S, V-ITS-S, R-ITS-S
Goal	Get surroundings real-time traffic information

Table 18 *(continued)*

Use case input	— user ID
	— user position
Use case output	— the surroundings real-time traffic map
	— or list of surroundings real-time traffic information
Brief description	Individual users travelling by car and about to leave will be requesting the surrounding real-time traffic information from the P-ITS-S, then P-ITS-S sends the request to other P-ITS-S, C-ITS-S, V-ITS-S, and R-ITS-S. Other ITS Stations will return the real-time traffic information about the current position and time. There are two data forms, one is the real-time traffic map, and the other is the surrounding real-time traffic data list, and P-ITS-S will receive the information.
	List of:
	— road ID
	— traffic state (heavy, general, flow, etc.)
	— current speed
	— traffic jam location (relative to the road ID)
	— other data

8.4.3   Requesting parking facility information

Table 19 — Requesting parking facility information

Use case name	Requesting parking facility information
Actor	P-ITS-S, C-ITS-S, V-ITS-S, R-ITS-S
Goal	Getting parking facility information
Use case input	— user ID
	— facility type
	— facility key
	— user position
Use case output	Get the list of the surrounding facility basic information
Brief description	Individual users at the time of travel by car, having arrived at parking facility, will be requesting the parking facility information from the P-ITS-S. Then, P-ITS-S sends the request to C-ITS-S or R-ITS-S. C-ITS-S or R-ITS-S will return the surrounding facility information.
	Information of:
	— parking ID
	— facility name
	— facility position
	— facility type
	— facility brief

8.4.4 Requesting indoor navigation in a parking lot

Table 20 — Requesting indoor navigation in a parking lot

Use case name	Requesting indoor navigation in a parking lot
Actor	P-ITS-S, C-ITS-S, V-ITS-S, R-ITS-S
Goal	Calculating the optimal path from the current location to the destination (empty parking spaces, parking entrance and parking exit, etc.)
Use case input	— user ID — user position — destination information
Use case output	Get the optimal navigation path that is composed of the basic description of paths and the list of roads
Brief description	Individual users traveling by car and arriving soon will be requesting the parking navigation information from P-ITS-S. Then, P-ITS-S sends the request to C-ITS-S and R-ITS-S. C-ITS-S and R-ITS-S will return the optimal navigation paths. Paths of: — basic description of paths(total distance, etc.) — roads list of: — road position — road attributes (road name, road length, road type, etc.)

8.4.5 Requesting the car location in the parking lot

Table 21 — Requesting the car location in the parking lot

Use case name	Requesting the car location in the parking lot
Actor	P-ITS-S, R-ITS-S, C-ITS-S
Goal	Requesting the car location in the parking lot
Use case input	— user ID — vehicle ID
Use case output	Return the car location information
Brief description	ND sends the request to C-ITS-S or R-ITS-S that will return the car location information Information of: — longititude — latitude — zone information — other location relative information

8.4.6 Requesting pedestrian routing to the car location

Table 22 — Requesting pedestrian routing to the car location

Use case name	Requesting pedestrian routing to the car location
Actor	P-ITS-S, C-ITS-S
Goal	Calculating the optimal path from the current position to the car location in the parking lot including indoors, outdoors, stairs, etc.

Use case input	— user ID
	— vehicle ID
	— user position
	— vehicle location
Use case output	Get the optimal navigation path from the current position to the car location
Brief description	Users request the slow transport navigation information from P-ITS-S. Then, P-ITS-S sends the request to the centre intelligent transport systems and will return the optimal navigation path.
	Path of:
	— user position
	— vehicle location
	— basic description of pedestrian roads (road positions, road attributes etc.)

8.5 UC5 Requesting the transfer information in an integrated transportation hub

8.5.1 Requesting/Receiving the arrival and/or departure time

Table 23 — Requesting/Receiving the arrival and/or departure time

Use case name	Requesting/Receiving the arrival and departure time
Actor	P-ITS-S, C-ITS-S, R-ITS-S
Goal	Get the arrival and departure time of the specific public transport in this hub
Use case input	— user ID
	— type of the public transport
	— no. or code of the specific public transport being searched
Use case output	Get the arrival and/ or departure time
Brief description	Users of the P-ITS-S send the request to C-ITS-S or R-ITS-S and return the arrival and/or departure time of the specific public transport.
	— arrival time
	— departure time

8.5.2 Requesting the station or platform of specific flight, train and/or bus lines

Table 24 — Requesting location of specific f light, train and/or bus lines

Use case name	Requesting location of specific f light, train and/or bus lines
Actor	P-ITS-S, C-ITS-S, R-ITS-S
Goal	Calculating from a public transport way (line) to another public transport way (line); the optimal transfer path

Use case input	— user ID
	— name of the hub or station or terminal
	— code or No. of the aircraft f light, train or bus line
Use case output	Get the location of specific Flight, train and/or bus lines, such as boarding/arriving gate in airport, platform in the railway station, etc.
Brief description	Users of the P-ITS-S send the request to C-ITS-S or R-ITS-S and return the arrival and/or departure location of the specific public transport.
	Location of:
	— arrival location (flight arriving gate, train stop platform, or bus stop)
	— departure location (flight boarding gate, departure platform, or bus stop)

8.5.3 Requesting the transfer route

Table 25 — Requesting transfer route information

Use case name	Requesting public transport transfer information
Actor	P-ITS-S, C-ITS-S, R-ITS-S
Goal	Calculating the optimal transfer path from a public transport station (line) to another public transport station (line)
Use case input	— user ID
	— start transfer node
	— end transfer node
Use case output	Get the optimal transfer path that is composed of the basic description of paths and the list of roads
Brief description	Individual users travelling by public transport will be requesting the public transport transfer information from P-ITS-S. Then, P-ITS-S sends the request to other P-ITS-S, C-ITS-S, and R-ITS-S. Other P-ITS-S, C-ITS-S and R-ITS-S will return the optimal public transport transfer path.
	Path of:
	— basic description of paths (total distance etc.)
	— basic description of roads (road positions, road attributes, etc.)

8.5.4 Requesting the express security channel

Table 26 — Requesting the express security channel

Use case name	Requesting the express security channel
Actor	P-ITS-S, C-ITS-S, R-ITS-S
Goal	Requesting the express security channel and calculating optimal transfer path from current location to the departure location through the express security channel

Use case input	— user ID
	— no. of the public transport
Use case output	Get the express security channel and optimal transfer path that is composed of the basic description of paths and the list of roads.
Brief description	Individual users travelling by public transport will be requesting the public transport transfer information from P-ITS-S. Then, P-ITS-S sends the request to other P-ITS-S, C-ITS-S and R-ITS-S. Other P-ITS-S, C-ITS-S and R-ITS-S will return the optimal public transport transfer path.
	Path of:
	— location of the express security channel
	— basic description of paths (total distance, etc.)
	— basic description of roads (road positions, road attributes, etc.)

8.6 UC6 Traffic and public transport information services

8.6.1 Requesting public transport navigation information

Table 27 — Requesting public transport navigation information

Use case name	Requesting public transport navigation information
Actor	P-ITS-S, C-ITS-S, R-ITS-S
Goal	Calculating from the start station to the end station; the public transport paths
Use case input	— user ID
	— start station
	— end station
Use case output	Get the optimal public transport paths
Brief description	Individual users travelling by public transport will be requesting the public transport navigation from P-ITS-S. Then, P-ITS-S sends the request to other P-ITS-S, C-ITS-S and R-ITS-S. Other P-ITS-S, C-ITS-S and R-ITS-S will return the optimal public transport navigation paths.
	Path of:
	— basic description of paths (total distance, etc.)
	— basic description of roads (road positions, road attributes, etc.)
	— station description
	— station position
	— station attributes (station name, line name, etc.)

8.6.2 Requesting road traffic information

Table 28 — Requesting road traffic information

Use case name	Requesting road traffic information
Actor	P-ITS-S, C-ITS-S
Goal	Requesting road traffic information

Use case input	— user ID
	— road name or planned route
Use case output	Get the road traffic information
Brief description	W hen users travel by taxi and mix with other public transport and use road traffic information to estimate the travel time for the total journey, C-ITS-S will return the optimal public transport transfer path.
	Information of:
	— traffic jam
	— traffic f low
	— traffic event/accident
	— travel time

8.6.3 Requesting/Receiving real-time public transport information

Table 29 — Requesting/Receiving real-time public transport information

Use case name	Requesting/Receiving real-time public transport information
Actor	P-ITS-S, C-ITS-S, R-ITS-S
Goal	Requesting the reach state of a public transport vehicles in a station
Use case input	— user ID
	— station information
Use case output	Get the list of the reach state of a public transport vehicles in a station
Brief description	Individual users travelling by public transport will be requesting the public transport real-time information from P-ITS-S. Then, P-ITS-S sends the request to other P-ITS-S and C-ITS-S. Other P-ITS-S and C-ITS-S will return the reach state of a public transport vehicle in a station or will receive the information.
	List of:
	— expected time of arrival
	— public transport vehicles attribute (line name, line type, etc.)

8.6.4 Requesting/Receiving real-time transfer information

Table 30 — Requesting/Receiving real-time transfer information

Use case name	Requesting/Receiving real-time transfer information
Actor	P-ITS-S, C-ITS-S
Goal	Get the surrounding real-time transfer information

Use case input	— user ID
	— user position
Use case output	— the surroundings real-time transfer map
	— or list of the surroundings real-time transfer information
Brief description	Individual users travelling by public transport will be requesting the surrounding real-time transfer information from the P-ITS-S. Then, P-ITS-S sends the request to other P-ITS-S and C-ITS-S. Other P-ITS-S and C-ITS-S will return the real-time transfer information about the current position and time. There are two data forms, one is the real-time transfer map, the other is the surrounding real-time transfer data list and P-ITS-S will receive the information.
	List of:
	— tranfer road ID
	— people flow
	— traffic jam location (relative to the transfer road ID)
	— other data

8.7 UC7 Trip planning for travellers with a P-ITS-S

8.7.1 Requesting to search POI

Table 31 — Requesting to search POI

Use case name	Requesting to search POI
Actor	P-ITS-S, C-ITS-S
Goal	Getting the POI information for choosing the destination
Use case input	— user ID
	— type of POI
	— searching area
	— user position
Use case output	Get the list of the POI information
Brief description	Users will be requesting to search POI from P-ITS-S which sends the request to the centre intelligent transport systems and will return the PO inside the search area.
	List of:
	— POI ID
	— POI name
	— POI position
	— POI type
	— POI description

8.7.2 Requesting trip and/or route planning

Table 32 — Requesting trip and/or route planning

Use case name	Requesting trip and/or route planning
Actor	P-ITS-S, C-ITS-S
Goal	Planning route
Use case input	— user ID — planning route content — location information — sending object
Use case output	Return requesting status
Brief description	An ND requests planning route when it connects to the authorized centre system

8.7.3 Requesting route information

Table 33 — Requesting route information

Use case name	Request route information
Actor	P-ITS-S, C-ITS-S
Goal	Requesting route information
Use case input	— user ID — route information — route planning — traffic information — waypoint — destination information — environmental information — requesting object — requesting status
Use case output	Return requesting status
Brief description	An ND requests route planning when it connects to the authorized centre system

8.7.4 Requesting to modify the trip or rerouting

Table 34 — Requesting to modify the trip or rerouting

Use case name	Requesting to modify the trip or rerouting
Actor	P-ITS-S, C-ITS-S
Goal	Requesting to modify the trip or rerouting (route changing)

Table 34 *(continued)*

Use case input	— user ID
	— route changing information
	— route planning
	— destination information
	— location information
	— request object
	— request status
Use case output	Return requesting status
Brief description	An ND requests modifying route when it connects to the authorized centre system

8.7.5 Requesting past trip information

Table 35 — Requesting past trip information

Use case name	Requesting past trip information
Actor	P-ITS-S, C-ITS-S
Goal	Request to send the past trip
Use case input	— user ID
	— request to send the past trip
	— route planning
	— arrive time
	— request object
	— request status
Use case output	Return requesting status
Brief description	An ND requests sending the past trip when it connects to the authorized centre system

8.7.6 Requesting multi-modal navigation information

Table 36 — Requesting multi-modal navigation information

Use case name	Requesting multi-modal navigation information
Actor	P-ITS-S, C-ITS-S
Goal	Calculating the optimal path from the current position to the destination in the multi-modal traffic areas