
**Intelligent transport systems —
Indoor navigation for personal and
vehicle ITS station —**

**Part 1:
General information and use case
definition**

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*Systemes de transport intelligents — Navigation interne pour station
personnelle et vehicule ITS —*

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

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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*.

ISO 17438 consists of the following parts, under the general title *Intelligent transport systems — Indoor navigation for personal and vehicle ITS stations*:

— *Part 1: General information and use case definition*

The following parts are planned:

— *Part 2: Requirements and specifications for indoor map data format*

— *Part 3: Requirements and specifications for indoor positioning reference data format*

— *Part 4: P/V and central ITS stations interface requirements and specifications for indoor positioning and map data*

Introduction

This part of ISO 17438 defines requirements and specifications for the indoor map data format, positioning reference data, and interface between the P/V ITS station and central ITS station to support indoor navigation.

Applications supporting indoor navigation for personal and vehicle ITS stations need to obtain indoor map data and positioning reference data through the existing ITS station components.

The following standards are subject to analysis regarding their applicability in supporting indoor navigation service provision.

- ISO/TR 10992, *Intelligent transport systems — Use of nomadic and portable devices to support ITS service and multimedia provision in vehicles*
- ISO 14825, *Intelligent transport systems — Geographic Data Files (GDF) — GDF5.0*
- OGC 10-191r1, *Requirements and Space-Event Modelling for Indoor Navigation*
- OGC 12-019, *OGC City Geography Markup Language (CityGML) Encoding Standard*
- CEN/TS 00278207, *Identification of Fixed Objects in Public Transport*
- ISO 24099, *Navigation data delivery structures and protocols*

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Intelligent transport systems — Indoor navigation for personal and vehicle ITS station —

Part 1: General information and use case definition

1 Scope

This part of ISO 17438 specifies the indoor navigation system architecture including additional components that are added to the existing ITS system and use cases in providing indoor navigation to various types of users including drivers, passengers, and pedestrians using personal and vehicle ITS stations.

- The personal and vehicle ITS station in the role of end user terminal running indoor navigation functionality.
- Indoor map containing indoor geometry, network topology, and POI data reflecting characteristics of indoor space.
- Indoor positioning reference data containing information of positioning infrastructure: WiFi AP, RFID Reader, Bluetooth AP, etc.
- Data providers to provision the indoor map or indoor positioning reference data.
- Indoor data server registry to provision the information of indoor data server.
- Indoor positioning functionality in the personal and vehicle ITS station using indoor positioning reference data.
- Indoor positioning functionality in the central ITS station using indoor positioning reference data.
- Interface between the P/V ITS station and central ITS station to communicate indoor map data and indoor positioning reference data.

This part of ISO 17438 includes “General Information”, which provides a general overview and structure of each part of ISO 17438. It also specifies “Use Cases” related to the indoor navigation for personal and vehicle ITS stations.

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/TR 10992, *Intelligent transport systems — Use of nomadic and portable devices to support ITS service and multimedia provision in vehicles*

3 Terms, definitions, symbols, and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 10992 and the following apply.

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3.1.1

indoor navigation

location-based service to guide user to destination using *indoor map data* (3.1.3) and the current location of the user in *indoor space* (3.1.2)

3.1.2

indoor space

area limited to an artificial structure (building, tunnel, etc.) and not available to conventional satellite-based positioning systems such as GPS

3.1.3

indoor map data

data to present information about *indoor space* (3.1.2)

Note 1 to entry: It includes indoor geometry, network topology, and POI data.

3.1.4

indoor positioning reference data

group of information that can be used to determine a P/V ITS station or user's position

Note 1 to entry: Detailed compositions vary depending on the positioning technologies, such as WiFi, RFID, etc.

3.1.5

indoor positioning

process of deciding location of P/V ITS station in the *indoor space* (3.1.2)

3.1.6

indoor-outdoor seamless navigation

route guidance service between indoor and outdoor environments and/or vice versa

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3.2 Abbreviated terms

GPS	Global Positioning System
OGC	Open Geospatial Consortium
PND	Personal Navigation Device
POI	Point Of Interest
P/V	Personal/Vehicle
RFID	Radio Frequency Identification
RG	Route Guidance
RP	Route Planning
TBT	Turn By Turn
XML	Extensible Mark-up Language

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4 General information

4.1 Document overview and structure

ISO 17438 provides all documents and references required to support the implementation of indoor navigation. ISO 17438 consists of the following documents.

— Part 1: General information and use case definitions

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

- Part 2: Requirements and specifications for indoor map data format

This part specifies all technical requirements and provides a materialized specification for map exchange when a P/V ITS station downloads indoor map data from central ITS station.

- Part 3: Requirements and specifications for indoor positioning reference data format

This part specifies all technical requirements in regards to the indoor positioning reference data format; these technical requirements are used to determine the locations of P/V stations with reference to the corresponding indoor map data.

- Part 4: Requirements and specifications for interface between P/V and central ITS stations

This part specifies the interface requirements for map and indoor positioning reference data related to the personal, vehicle, and central ITS stations.

[Figure 1](#) shows the document structure of the “Indoor navigation for P/V ITS stations” document set.

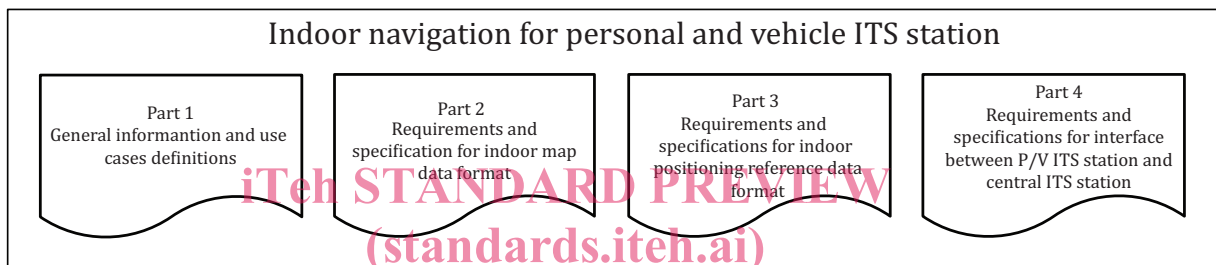


Figure 1 — Document structure
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4.2 Purpose of this part of ISO 17438

The main purposes of this part of ISO 17438 are to

- a) identify the requirements for indoor navigation,
- b) identify the usability of existing International Standards for indoor navigation,
- c) identify additional tasks required to develop the specification of indoor map and indoor positioning reference data format, and
- d) identify additional tasks required to develop common software interfaces between P/V ITS station and central ITS station.

4.3 Indoor navigation system architecture

By default, indoor navigation system architecture follows the existing ITS communication architecture with additional indoor navigation functionality. Therefore, the following four basic components are also included in the indoor navigation architecture:

- the vehicle subsystem component (Vehicle Station);
- the mobile subsystem component (Personal Station);
- the roadside subsystem component (Roadside Station);
- the central subsystem component (Central Station).

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However, in the indoor navigation system architecture, the vehicle station and personal station share the same functionalities and roles from the perspective of a mobile user. Therefore, in this part of ISO 17438, the two components will be referred to as a combined component called “P/V ITS Station”.

To offer indoor navigation functionality, additional necessary elements are defined as follows:

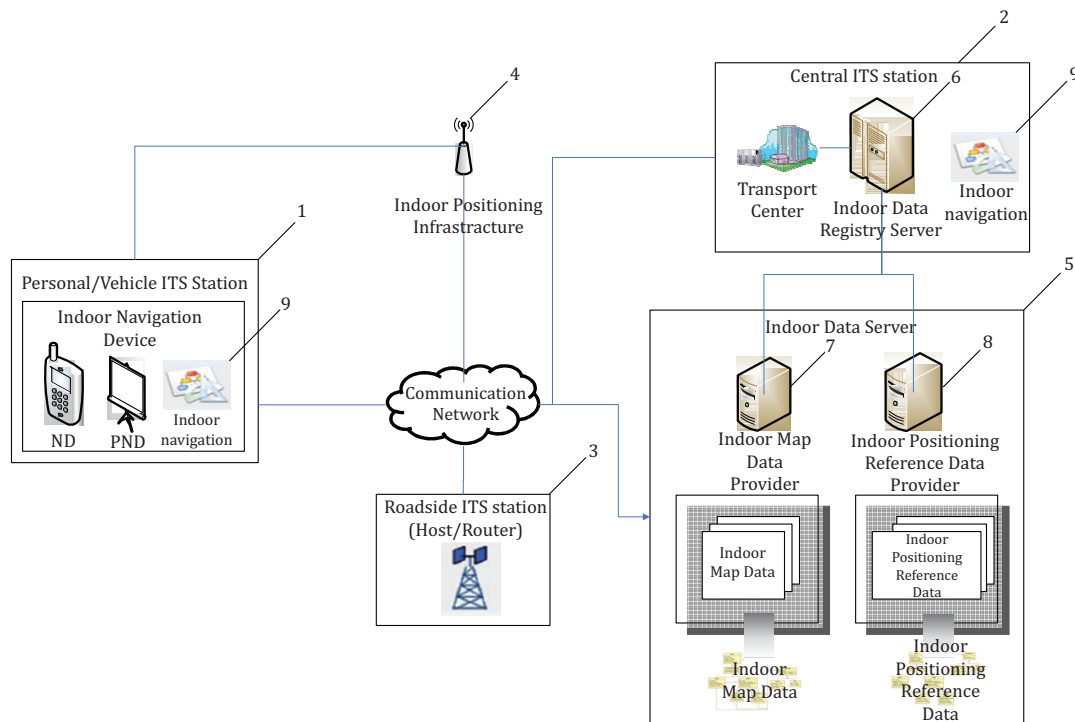
- the indoor map data;
- the indoor positioning reference data;
- the indoor map data provider;
- the indoor positioning reference data provider with indoor positioning engine;
- the indoor data server registry;
- the indoor navigation function modules in the personal, vehicle, and central ITS stations;
- the indoor positioning infrastructure.

[Figure 2](#) shows the indoor navigation system designed for ITS.

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Key

- 1 P/V ITS Station – Mobile subsystem component and Vehicle subsystem component
- 2 Central ITS Station – Central subsystem component
- 3 Roadside ITS Station – Roadside subsystem component
- 4 Indoor Positioning Infrastructure – Indoor positioning subsystem component
- 5 Indoor Data Server – Local data server component
- 6 Indoor Data Server Registry – Management subsystem component for indoor map and indoor positioning reference data
- 7 Indoor Map data Provider – Indoor map gathering subsystem component
- 8 Indoor Positioning Reference data Provider – Indoor positioning reference data gathering subsystem component
- 9 Indoor navigation – Function module for indoor navigation

Figure 2 — Indoor navigation architecture

The indoor navigation system consists of four components added to the existing system. The first component is the indoor data server, which generates and provides indoor map data and indoor positioning reference data for indoor navigation applications. Providers of indoor map data and indoor positioning reference data could be different even for the same indoor space, since there are numerous buildings and structures and providers have their own specialities. Hence, indoor map data and indoor positioning reference data shall be separately managed by the data servers.

The second component is the indoor data server registry in the central ITS station, which manages metadata for indoor map data. When indoor map data are requested by a P/V ITS station, the indoor data server registry, whose URL is already known to the P/V ITS station, replies to the P/V ITS station with the URL of an indoor map data provider managing the requested indoor map data. The P/V ITS station then connects to the indoor map data provider to retrieve the necessary data. The indoor positioning reference data can also be provided in the same way.

There are many indoor map data and indoor positioning reference data providers, so a standard format for indoor map data and indoor positioning reference data are required to increase the interoperability of the constructed indoor map data and indoor positioning reference data.