INTERNATIONAL STANDARD

ISO 14296

First edition
2016-02-15

Intelligent transport systems — Extension of map database specifications for applications of cooperative ITS

Systèmes intelligents de transport — Extension des spécifications de base de données cartographiques aux applications collaboratives des SIT

Reference number
ISO 14296:2016(E)

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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 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*.

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Introduction

The purpose of this International Standard is to extend the existing specifications for map databases in order to provide greater support for applications and/or application developments of cooperative ITS that may use Local Dynamic Map.

The functional requirements and data model for in-vehicle navigation are already defined in ISO/TS 20452. However, the map-related functional requirements, data model, and data elements needed for Local Dynamic Map for Cooperative ITS have not yet been defined.

This International Standard can help developers of applications for Cooperative ITS by broadening its applicability. Such applications will benefit by the availability of a standardized data model and data elements. The resulting work will shorten developers' time-to-market for new products and services.

In order to meet the schedule requirements of Mandate M/453 "Standardisation mandate addressed to CEN, CENELEC and ETSI in the field of Information and Communication Technologies to support the interoperability of Co-operative systems for Intelligent Transport in the European Community" issued by the European Commission, ISO/TS 17931 was published as the Local Dynamic Map component of this International Standard.

This International Standard includes all of the contents of ISO/TS 17931.

This International Standard defines the Logical Data Model for Multi-Modal navigation system. It does not define the data model for individual navigation service except for in-vehicle navigation.

This International Standard uses UML to express specific circumstances; the graphical elements are used to express specific constraints and structural relationships. A full definition can be found in ISO/IEC 19501:2005. However, a short introduction of elements is given in Annex B.

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Intelligent transport systems — Extension of map database specifications for applications of cooperative ITS

1 Scope

This International Standard provides the map-related functional requirements, data model (logical data model/logical data organization), and data elements for those applications of cooperative ITS that require information derived from map databases.

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 14825:2011, *Intelligent transport systems — Geographic Data Files (GDF) — GDF5.0*

ISO/IEC 19501:2005, *Information technology — Open Distributed Processing — Unified Modeling Language (UML) Version 1.4.2*

ISO/TS 20452:2007, *Requirements and Logical Data Model for a Physical Storage Format (PSF) and an Application Program Interface (API) and Logical Data Organization for PSF used in Intelligent Transport Systems (ITS) Database Technology*

3 Conformance

Data structures shall be provided as specified in Clause 7.

Any data structure claiming conformance with this International Standard shall pass the requirements presented in the abstract test suite in Annex A.

UML Expressions for diagrams in this International Standard shall be compliant with ISO/IEC 19501:2005.

4 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 14825 and ISO/TS 20452 and the following apply.

4.1
Address Location
application category that deals with the task of expressing a real-world position in terms of the PSF data representation

4.2
application category
basic sub-function within the set of functionality for cooperative ITS support

Note 1 to entry: This International Standard identifies eight application categories: Positioning, Route Planning, Route Guidance, Map Display, Address Location, Services and POI Information Access, cooperative ITS including Driving support, Multi-Modal Travel.

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4.3
display point
0-dimensional type of cartographic feature

4.4
geocoding
determination of a link or node based on address information describing and/or naming a location

4.5
intersection
GDF level 2 representation of a crossing which bounds a road or a ferry as a complex feature composed of one or more GDF level 1 junctions, Road Elements and enclosed traffic areas

4.6
itinerary
plan of a journey, including the route and the places visited

4.7
junction
navigable feature which is either a named GDF junction or named GDF intersection, and that relates a named navigable feature to a set of links and nodes and a place

4.8
landmark
point, line or area feature that can be used to clarify the directions generated to describe a route

Note 1 to entry: It can be associated to a node or a link.

Note 2 to entry: A landmark cannot be in the Services, Administrative Areas, or Public Transportation Feature themes of the GDF; however a facility in which a service is located can be a landmark.

4.9
layer
sub-set of map data resulting from a subdivision of data of the same coverage area based on contents (similar to ISO 14825 GDF layer) and which is typically related to one or only a few of the application categories

EXAMPLE District name, which is one of the data items for Route Guidance applications, is included in a layer.

4.10
level
sub-set of map data resulting from classification of data of the same semantic contents based on the level of details/density, related to the concept of different map scales

Note 1 to entry: Level 0 is considered the lowest level (greatest detail); higher levels are numbered level 1, level 2, etc.

EXAMPLE Map Display data can be organized into 6 levels representing different zoom scales.

4.11
link
directed topological connection between two nodes, composed of an ordered sequence of one or more segments and represented by an ordered sequence of zero or more shape points

4.12
Local Dynamic Map
conceptual data store which is embedded in an ITS station and which contains topographical, positional and status information

4.13
Map Display
application category that deals with graphical information presentation

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4.14
Multilink
ordered aggregation of links which are at the same level, connected in sequence, share the same functional classification, form of way, direction of travel, and perhaps additional PSF-builder-specified characteristics, such that each link is contained in exactly one Multilink

4.15
Multi-Modal Travel Service
application category that provides information on a trip from an origin to a destination using alternative modes of transportation or a combination of transport modes for one trip

Note 1 to entry: This service may include navigation.

4.16
Multi-Modal Travel Support
application function for Multi-Modal Travel Service

4.17
parcel
database partitioning unit, corresponding to a certain coverage area and associated with one level and containing data of one or more layers

Note 1 to entry: A parcel contains (at least) all nodes with positions enclosed by or located on the outline of its coverage area plus (parts of) all links attached to these nodes.

Note 2 to entry: It can be partitioned such that the amount of data of one parcel is nearly the same as that of another.

4.18
place
named area which can be used as part of Address Location

4.19
Point of Interest
POI
destination and/or site of interest to travellers, usually non-commercial by nature

4.20
polygon
2-dimensional type of cartographic feature

4.21
polyline
1-dimensional type of cartographic feature

4.22
Positioning
application category that deals with the determination of vehicle location and map-matching

4.23
position-on-the-link
position on the road or road side used to identify the access point between the road network and entrance or exit of facilities such as station, bus stop and building

4.24
rectangle
unit of geographic space, defined by two parallels of min/max latitude and by two meridians of min/max longitude, that represents the coverage area of the map data enclosed by or located on the outline of the rectangle

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4.25
regular parcel
parcel shaped like a rectangle

Note 1 to entry: Regular parcels on the same generalization level are not intended to overlap.

4.26
reverse geocoding
determination of the address description of a link or node (i.e. determination of an upwards path across the place tree)

4.27
road
GDF level 2 feature composed of one, many or no Road Elements and joining two Intersections, serving as the smallest independent unit of a road network at GDF level 2

4.28
route
ordered list of route links, or of stop points respectively, defining a single path through the transport network, with a direction

4.29
Route Guidance
application category that deals with the generation of graphical, textual, and/or audio instructions for following a planned route

4.30
route link
oriented link between two route Points defining a unique path through the transport network

4.31
Route Planning
application category that deals with the determination of routes between specified points

4.32
segment
straight section of a link connecting either two successive shape points, or a shape point and a node, or two nodes in case the link does not contain shape points

4.33
service
data model entity for a commercial activity of interest to travellers as a destination and/or orientation that is associated with Road Element(s) or place(s), by which it can be accessed

Note 1 to entry: Service is further described by attributes including (at least) name and type; it can be associated with other services by parent/child relationships (many to many).

Note 2 to entry: Service is used synonymously with POI within the logical data model.

4.34
Service and POI Information Access
application category that deals with the provision of POI information to the navigation application

Note 1 to entry: Service and POI Information Access is one of the eight application categories.

4.35
shape point
position along a link used to more accurately represent its geometric course, bounded by exactly two segments

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4.36
stop point
position where passengers get in or off a (public transport) vehicle

4.37
symbol
icon associated with a cartographic feature

5 Symbols and abbreviated terms

ADAS	Advanced Driver Assistance System
BSA	Basic set of applications
DB	Database
GDF	Geographic Data File
ITS	Intelligent Transport System
ITS-RSU	Intelligent Transport System - Road Side Unit
LDM	Local Dynamic Map
LDO	Logical Data Organization
POI	Point of Interest
PSF	Physical Storage Format

6 Requirements

6.1 Introduction

This clause defines application requirements and functional requirements.

6.2 Application requirements

This International Standard supports BSA of cooperative ITS systems, Driving support services, and navigation services for in-vehicle and Multi-Modal Travel.

BSA of cooperative ITS systems are defined in Annex C. Driving support services are defined in Annex D. The relationship between BSA of cooperative ITS systems and driving support services are defined in Annex E and Multi-Modal Travel services are defined in Annex F.

6.3 Functional requirements

6.3.1 Overview

Six application categories (Map Display, Positioning, Route Planning, Route Guidance, Service/POI Information Access and Address Location) for navigation functionality are the same as those defined in ISO/TS 20452:2007. Cooperative ITS (including driving support) and Multi-Modal Travel Support functions are newly defined by this International Standard.

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