

# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 14296

ISO/TC 204

Secretariat: ANSI

Voting begins on:  
2014-11-12

Voting terminates on:  
2015-02-12

---

---

## 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*

ICS: 35.240.60;03.220.01

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/3c44ab5b-68b0-416b-9418-93cbc796423b/iso-14296-2016>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.



Reference number  
ISO/DIS 14296:2014(E)

© ISO 2014

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/3c44ab5b-68b0-416b-9418-93cbc796423b/iso-14296-2016>

### Copyright notice

This ISO document is a Draft International Standard and is copyright-protected by ISO. Except as permitted under the applicable laws of the user's country, neither this ISO draft nor any extract from it may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, photocopying, recording or otherwise, without prior written permission being secured.

Requests for permission to reproduce should be addressed to either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Reproduction may be subject to royalty payments or a licensing agreement.

Violators may be prosecuted.

# Contents

	Page
Foreword.....	iv
Introduction.....	v
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Conformance</b> .....	<b>1</b>
<b>4 Terms and definitions</b> .....	<b>1</b>
<b>5 Symbols (and abbreviated terms)</b> .....	<b>5</b>
<b>6 Requirements</b> .....	<b>5</b>
6.1 Introduction.....	5
6.2 Application requirements.....	5
6.3 Functional requirements.....	5
<b>7 Logical data model</b> .....	<b>16</b>
7.1 Overall model.....	16
7.2 Transportation package.....	17
7.3 Cartographic package.....	46
7.4 Service and POI package.....	52
7.5 Address location package.....	53
7.6 Dynamic information package.....	55
7.7 Relationship of the road data between levels.....	56
<b>Annex A (normative) Abstract test suite</b> .....	<b>59</b>
<b>Annex B (informative) Description of UML expression elements</b> .....	<b>60</b>
<b>Annex C (normative) Basic set of applications definition</b> .....	<b>62</b>
<b>Annex D (informative) Overview of the target example services (Japanese examples) for Driving support</b> .....	<b>64</b>
<b>Annex E (normative) Relationship between Basic set of applications and Driving support services (Japanese example)</b> .....	<b>82</b>
<b>Annex F (informative) Use case of Multi-Modal Travel Support service</b> .....	<b>83</b>
<b>Bibliography</b> .....	<b>91</b>

## 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](http://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](http://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 Foreword — Supplementary information).

The committee responsible for this document is ISO/TC 204, *Intelligent transport systems*.

iTeh STANDARD PREVIEW  
(standard number)  
Full standard available at  
<https://standards.iteh.ai/catalog/standards/sud/3c44abbb-68b0-416b-9418-93cbc7964221/iso-14296-2014>

## Introduction

The purpose of this proposal 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 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 proposal 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.

The scope of ISO/TS 17931 is within the scope of NP14296 which was approved in April, 2011. However, in order to meet the schedule requirement of Mandate M/453 issued by European Commission, TS 17931 was published as the Local Dynamic Map component of this International Standard. This International Standard fully supports the ISO/TS 17931.

This International Standard defines the Logical Data Model for Multi-Modal navigation system, however 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](#).

iTeh STANDARD PREVIEW  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/68b0-416b-9418-93cbc796423b/iso-14296-2014>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/3c44ab5b-68b0-416b-9418-93cbc796423b/iso-14296-2016>

# 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 Modelling 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 are 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.

### 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 IS 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 semantically 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



**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**

software application 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

**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: Services 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

**4.36****stop point**

position where passengers gets in or off a (public transport) vehicles

**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](#). 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 E](#).

**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.

## 6.3.2 Map Display

### 6.3.2.1 General description

The Map Display function is used to display a map of a specified geographic area. An application may display maps to the end-user. The application may also accept end-user input that references the Map Display (such as from a point and click device).

### 6.3.2.2 Functional description

An application may display points, features, lines features, areas features, cartographic text and symbols for a specified geographic area. This may include roads, physical features, administrative boundaries, and names for all of these. Text and symbols can be positioned on a display to annotate this map.

The Map Display function provides cartographic data that can be used to display a map of any application specified arbitrarily-oriented rectangle in the database. The data consist of the following database entities to support a variety of map drawing styles: Cartographic Features, Cartographic Text and Symbols.

The application may allow the map to be zoomed in or out. The application may display different levels of detail on a Map Display based on the zoom level. The application may allow the map to be rotated and scrolled. When scrolling, if detailed data are not available, the application may automatically zoom the map out to a level where data are available. The application may allow the end-user to access additional information by selecting objects on the display. The application may display multiple windows. Generating map images and managing displays are beyond the scope of this function.

To facilitate data access speed, this application groups cartographic data into levels. The higher levels contain only the more significant cartographic features. The set of cartographic data are also selectable by level.

### 6.3.2.3 Requirements for data model

Map Display provides the following methods of accessing data:

- R-1. via the Cartographic Features, Cartographic Text and Symbols for an application-specified rectangle, level and feature type;
- R-2. via the coordinates for application-specified Cartographic Features;
- R-3. via attributes for Cartographic Features, such as: feature type, name, and functional classification;
- R-4. via the complete or partial Cartographic Features associated with application-specified Transportation Elements;
- R-5. via the area (size) of an application-specified Area Feature;
- R-6. via the ability to retrieve additional information for Point, Line and Area Features which are associated with Cartographic Features which may have been selected from the displayed map;
- R-7. via the Cartographic Text associated with a Cartographic Feature;
- R-8. via the Symbol associated with a Cartographic Feature;
- R-9. via returning the Cartographic Features and Cartographic Text in “draw-order”. For example, if water is drawn before bridges, water features should be returned before bridge features.
- R-10. When no map data are available for an area requested by a function, the function may distinguish between the case of “off the map” and the case of “no data at this location at this level”.

- R-11. The API shall allow a pre-fetch area of interest to be specified by a rectangle and application specified *level* for retrieving Map Display data.
- R-12. displays a map at the current location of the navigation system;
- R-13. displays a marker on the map indicating the navigation system's current location;
- R-14. scrolls the displayed map as the navigation system moves, maintaining the position of the marker indicating the navigation system's current location;
- R-15. displays a map at any location selected by the end-user. The end-user may specify the location as an Address, an Intersection, a service, or by cursor position on the display;
- R-16. provides latitude and longitude, street address, and other information for a point indicated by the cursor on the display;
- R-17. highlights a route on the display;
- R-18. highlights the point on a displayed map of a particular routing manoeuvre.
- R-19. Several levels of data are required for cartographic data, corresponding to different map scale ranges. At the higher levels, the drawing detail for line features and area features is generalized.
- R-20. Access is required for data from all GDF Feature Themes, as well as attributes and conditions.
- R-21. Map Display data shall be organized into parcels.
- R-22. In order to allow easy identification of parcels, parcels shall be rectangular.
- R-23. Links crossing parcel boundaries shall be cut at the parcel boundary.
- R-24. In order to minimize the number of parcels accessed, any link crossing into a parcel, with or without a node or intermediate point in that parcel, shall be represented in that parcel.

### 6.3.3 Positioning

#### 6.3.3.1 General description

The Positioning function is used to determine vehicle location, for example latitude and longitude of a road network entity and for Map Matching. Map Matching is the method of determining where the navigation system has moved in the road network based on the navigation system's previous location and data about the navigation system's motion from external inputs. It corrects the geo-localization on the routes.

#### 6.3.3.2 Functional description

"Positioning" seeks a position and orientation of a navigation system relative to the transportation network with respect to the map data representing the real world. An application may dynamically determine the navigation system's current position while the navigation system is in motion. Map Matching can continue "in the background" even while other functions are being performed so the navigation system always "knows where it is", with an accuracy depending on the map-matching. Map Matching algorithms are beyond the scope of this document.

#### 6.3.3.3 Requirements for data model

For the purpose of Positioning, the following functions shall be provided:

- R-25. a single set of coordinates for an application-specified Point Feature in the Roads and Ferries theme;