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Intelligent transport systems — Cooperative ITS — Dictionary of in-vehicle information (IVI) data structures

Systèmes ~~de transport~~ intelligents ~~—~~de transport — Coopérative STI ~~coopératifs~~ — Dictionnaire de structures de données ~~pour l'information~~d'informations dans ~~le véhicule~~les véhicules (IVI)

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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 document 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 drawnISO draws attention to the possibility that some of the elementsimplementation of this document may beinvolve the subjectuse of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights. ISO in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. 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 onof 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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 278, *Intelligent transport systems* (ITS), in collaboration with Technical Committee ISO/TC 204, *Intelligent transport systems*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This secondthird edition cancels and replaces the firstsecond edition (ISO/TS 19321:2015)2020), which has been technically revised.

The main changes compared to the previous edition are as follows::

- The Scope has been edited.
- Several containers have been renamed or newly introduced and an "Automated Vehicle Container" has been added to better manage automated vehicles.

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— The abstract syntax notation one (ASN.1) code in Annex A has been captured separately. This edition is backwards compatible with the previous edition in that it adds information elements (e.g. data elements and data frames) to the IVI Structure by using ASN.1 extensions. The ASN.1 extension feature ensures that implementations of the previous edition can correctly parse IVI Structures compliant with this edition and process the information specified in the previous edition without needing knowledge about the extensions.

— The former Annex B has been replaced with new visual examples.

— C-Roads and Eco-AT documents have been added to the Bibliography.

— Data types are imported from ISO 14823-1 which are backwards compatible with the first edition of this document.

— Data types are imported from editions of ISO 17573-3 and ETSI/TS 102 894-2, which are backwards compatible with the first and second edition of this document.

— additional explanations have been added in 5.2.2;

— the Infrastructure Support Container and related data frames and data elements have been added;

— the data frame `SegmentExtended` has been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.htmlwww.iso.org/members.html.

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Introduction

In a Cooperative Intelligent Transport System (C-ITS), presenting information related to the traffic situation or regulation of a road to the driver of a vehicle is an important component of road operations. The road operators are responsible for road setup, operation, signage, and maintenance for traffic management and road safety, and in some countries, also for the enforcement of road laws. For road operators, efficient transport of vehicles on roadways ensures a safe and predictable trip for all road users. Road operators, together with equipment manufacturers, whether of vehicles or of roadside equipment, contribute to how road information is properly presented to drivers.

So far, one defined C-ITS method for notifying road users of road and/or traffic situations and events is by transmission of messages such as Cooperative Awareness Messages (CAM), Decentralized Environment Notification Messages (DENM), or Basic Safety Messages (BSM).

This document supports mandatory and advisory road signage such as contextual speeds and road works warnings. In-vehicle information can be sent by an ITS station (ITS-S) and either corresponds to physical road signs such as static or variable road signs or does not correspond to physical road signs (a virtual sign~~)),~~ or corresponds to road works. In-vehicle information (IVI) does not include identification of road events as already provided by DENM.

This document provides a toolbox of information elements for IVI. It can be used ~~to fulfil~~for fulfilling the requirements of the service provider considering the needs of the receiving ITS-S. The container concept provides a way for an ITS-S to manage the relevant IVI information, determine where the IVI is relevant, and to provide details for the application of the IVI. The description of data elements encompasses the data syntax and semantics, i.e. a definition of data format and content, together with a description of how to use those data elements.

This document is of an enabling nature. It does not specify which information is necessary for a certain service, but it supports those IVI information elements that it can be necessary to be transmitted to a receiving ITS-S to carry out a certain service. Usage of the IVI information elements depends on the specific context and application of IVI for a specific service and usage is established as mandatory or optional only for messaging purposes, not for application purposes. In order to fulfil the requirements of a specific service, the IVI ~~Structure~~structure can be appropriately profiled.

This document refers to ISO 14823-1 as one system of standardized codes for existing road signs codes.

NOTE ISO 14823-1 does not contain codes for specific national or regional signs that are not commonly used, and it does not represent a catalogue of road sign pictograms for all applicable nations.

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Intelligent transport systems — Cooperative ITS — Dictionary of in-vehicle information (IVI) data structures

1 Scope

This document specifies the in-vehicle information (IVI) data structures that are required by different intelligent transport system (ITS) services for exchanging information between ITS stations (ITS-S). A general, extensible data structure is specified, which is split into structures called containers to accommodate current-day information. Transmitted information includes IVI such as contextual speed, road works warnings, vehicle restrictions, lane restrictions, road hazard warnings, location-based services, and re-routing. The information in the containers is organized in sub-structures called data frames and data elements, which are described in terms of itstheir content and its syntax.

The data structures are specified as communications agnostic. This document does not provide the communication protocols. This document provides scenarios for usage of the data structure, e.g. in case of real time, short-range communications.

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 639-1:2002, *Codes*:2023, *Code for the representation of names of individual languages — Part 1: Alpha-2 code and language groups*

ISO 14823-1:, *Intelligent transport systems — Graphic data dictionary — Part 1: Specification*

ISO/TS 17573-3:, *Electronic fee collection — System architecture for vehicle-related tolling — Part 3: Data dictionary*

ISO/TS 19091:2019, *Intelligent transport systems — Cooperative ITS — Using V2I and I2V communications for applications related to signalized intersections*

ETSI/TS 102 894-2, *Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary; Release 2*

SAE J2540/2, *International Traveler Information Systems (ITIS) Phrase Lists*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminologicalterminology databases for use in standardization at the following addresses:

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

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

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3.1
application data unit
data unit exchanged between ITS station application instances

3.2
container
group of *data frames* ~~(3.4)~~(3.4) and *data elements* ~~(3.3)~~(3.3) semantically belonging together in one place in the *in-vehicle information* ~~(3.8)~~(3.8) structure

3.3
data element
~~**DE**~~
data type that contains one single datum

[SOURCE: ETSI/TS 102 894-2]

3.4
data frame
data type that contains more than one *data element* ~~(3.3)~~(3.3) in a predefined order

[SOURCE: ETSI/TS 102 894-2]

3.5
detection zone
part of the road network that is passed by a vehicle in approach of the *relevance zone* ~~(3.17)~~(3.16)

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3.6
digital map database
structured set of digital and alphanumeric data portraying geographic locations and relationships of spatial features

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[SOURCE: ISO 17572~~-~~-1:~~2015, 2.1.10~~2022, 3.9, modified — Note 1 to entry has been ~~deleted~~removed.]

3.7
driver awareness zone
parts of the road network in which a message is presented to inform drivers about upcoming situations

3.8
in-vehicle information
information contained in the in-vehicle information data structure that is required by different intelligent transport system services

3.9
in-vehicle signage
intelligent transport system service that provides static, as well as dynamic, road sign and message sign information to drivers

3.10
intersection
crossing and/or connection of two or more *roads* ~~(3.14)~~(3.14)

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