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Inteligentni transportni sistemi - Lokalni dinamični zemljevid (ISO/DIS 18750:2024)

Intelligent transport systems - Local dynamic map (ISO/DIS 18750:2024)

Intelligente Verkehrssysteme - Lokale dynamische Karte (ISO/DIS 18750:2024)

Système de transports intelligents - Carte locale dynamique (ISO/DIS 18750:2024)

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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 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 ISO/TC 204, *Intelligent transport systems*.

This third edition cancels and replaces the second edition (ISO 18750:2018), which has been technically revised to

— remove the second title to align with the unchanged scope;

— update the ASN.1 module to support minor version changes;

— align the ASN.1 module with latest developments of other ASN.1 modules – this alignment does not introduce technical changes in the module;

— update titles of references.

Introduction

An essential property of cooperative intelligent transport systems (C-ITS), see ISO TR 17465-1,[17] is the sharing of data between different ITS applications providing different ITS services to the users. This approach replaces the traditional approach where each application is operated in an isolated environment, i.e. referred to as "silo - approach". The C-ITS approach enables synergies in components of an ITS station unit, e.g. sharing of communication tools, improves overall performance and reliability, and reduces overall cost. In order to protect the interests of the various ITS applications, C-ITS implements the concept of an ITS station operated as a bounded secured managed domain.

The sharing of data between applications is achieved by subscribe/publish mechanisms, where at least two mechanisms are distinguished, i.e. one allowing ITS-S application processes to subscribe to standardized messages from ITS message sets (direct forwarding upon reception of such messages in an ITS station unit), and one using a local dynamic map (LDM) as repository of standardized data objects. Such data objects stored in an LDM are named LDM Data Objects (LDM-DOs). LDM-DOs provide self-consistent information on real objects existing at a given geo-location during a given lifetime-interval. Authorized ITS-S application processes may add LDM-DOs to an LDM, and may retrieve LDM-DOs from an LDM. Retrieval of LDM-DOs may be performed in queries and by means of subscription. A subscription will result in automatic notifications of selected LDM Data Objects either in defined time intervals, or event driven.

This document introduces the usage of LDMs, and specifies the LDM for global usage in C-ITS.

Initial implementations of LDMs were in the EU research projects CVIS[40] and Safespot[42].

Intelligent transport systems — Local dynamic map

1 Scope

This document:

- describes the functionality of a "Local Dynamic Map" (LDM) in the context of the "Bounded Secured Managed Domain" (BSMD);
- specifies:
  - general characteristics of LDM Data Objects (LDM-DOs) that may be stored in an LDM, i.e. information on real objects such as vehicles, road works sections, slow traffic sections, special weather condition sections, etc. which are as a minimum requirement location-referenced and time-referenced;
  - service access point functions providing interfaces in an ITS station (ITS-S) to access an LDM for:
    - secure add, update and delete access for ITS-S application processes;
    - secure read access (query) for ITS-S application processes;
    - secure notifications (upon subscription) to ITS-S application processes;
    - management access:
      - secure registration, de-registration and revocation of ITS-S application processes at LDM;
      - secure subscription and cancellation of subscriptions of ITS-S application processes;
  - procedures in an LDM considering:
    - means to maintain the content and integrity of the data store;
  - mechanisms supporting several LDMs in a single ITS station unit.

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/IEC 8824-1, *Information technology — Abstract Syntax Notation One (ASN.1) — Part 1: Specification of basic notation*

ISO/IEC 8825-2, *Information technology — ASN.1 encoding rules — Part 2: Specification of Packed Encoding Rules (PER)*

ISO/IEC 9646-7, *Information technology — Open Systems Interconnection — Conformance testing methodology and framework — Part 7: Implementation Conformance Statements*

ISO 21217, *Intelligent transport systems — Station and communication architecture*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21217 and ISO 24534-5, and the following apply.

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

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

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

3.1
International Atomic Time
time since 00:00:00 UTC, 1 January, 2004, identical with UTC except that no leap seconds need to be added

3.2
LDM Area of Interest
location requirement used in the filter process of queries and automatic notifications

3.3
LDM Area of Maintenance
information on the operational location area of an LDM used by LDM maintenance

Note 1 to entry: ETSI EN 302 895[30] restricts the LDM Area of Maintenance to "geographical area specified by the LDM for LDM maintenance".

3.4
LDM Permissions
information on how a specific ITS-S application process may use an LDM

3.5
LDM Data Object
location-referenced and time-referenced representation of a real object that is self-explanatory without any further context information

3.6
LDM Data Object ID
identifier of an LDM Data Object which is unique in an LDM

3.7
LDM Data Dictionary
dictionary of LDM Data Object Types

3.8
LDM Data Object Type
identifier of the type of information contained in an LDM Data Record

3.9
Location Validity
information indicating a location at which an LDM Data Object is valid

3.10
Time Validity
information indicating a time interval during which an LDM Data Object is valid

3.11
LDM Time of Interest
time requirement used in the filter process of queries and automatic notifications

3.12
Local Dynamic Map
entity consisting of LDM Data Objects, services and interfaces for manipulating these LDM Data Objects

3.13
location reference
uniquely identifiable description of position or area in the real world

Note 1 to entry: ISO 14812[30] provides the definition "description of a spatial location in the real world according to a defined reference system" to the terms 'spatial reference' and 'ITS spatial reference', and assigned this definition also to the term 'location reference'. This definition from ISO 14812 is not appropriate for this document

3.14
metadata
data about data

Note 1 to entry: The term "metadata" is ambiguous as it is used for fundamentally different concepts. Structural metadata is information related to the design and specification of data structures; it is also referred to as "data about the containers of data". Descriptive metadata is information on instances of data, i.e. the data content; it is also referred to as "data about data content".

3.15
Time of Creation
time when an LDM Data Record was created and updated

3.16
Time of Deletion
time when an LDM Data Record may be deleted and will no longer be considered by the LDM search functionality

3.17
Time of Generation
time when the content of the LDM Data Object information field was created

Note 1 to entry: This is different to the time, when the LDM Data Object was written into an LDM.

4 Symbols and abbreviated terms

BSMD	Bounded Secured Managed Domain
BSME	Bounded Secured Managed Entity
IAT	International Atomic Time
ICS	Implementation Conformance Statement
ITS	Intelligent Transport Systems
ITS-SCU	ITS Station Communication Unit
ITS-SU	ITS Station Unit
IUT	Implementation Under Test
LDM	Local Dynamic Map
LDM-DD	LDM Data Dictionary
LDM-DT	LDM Data Type
LDM-DAT	LDM Data Attribute Type
LDM-DATID	LDM-DAT Identifier
LDM-DTID	LDM-DT Identifier

NoO	Notification of Obligations
OoT	Obligation of Trust
PMI	Privilege Management Infrastructure
SAO	Signed Acceptance of Obligations
SUT	System Under Test
TPEG	Transport Protocol Experts Group
UTC	Universal Time Coordinated

5 Architectural environment

This clause contains informative descriptions of the architectural environment of an LDM.

5.1 Local Dynamic Map

A Local Dynamic Map (LDM) is an entity consisting of LDM Data Objects, services and interfaces for manipulating these LDM Data Objects (LDM-DO). LDM-DOs are distinguished by means of their LDM Data object Type (LDM-DT). LDM-DTs are specified by registration in an LDM Data Dictionary (LDM-DD). The concept of the LDM-DD is specified in Annex B.

NOTE In ISO TR 17424,[18] LDM-DOs are classified into Type 1 (static permanent data objects, e.g. cartographic data)[2], Type 2 (static transitory data objects, e.g. temporary parking lot on the road), Type 3 (dynamic transitory data objects, e.g. works location), and Type 4 (highly dynamic data objects, e.g. location, orientation and speed of surrounding vehicles). This classification is not used in this document.

An LDM-DO provides information on real objects (cars, road events, ...) that exist at a defined location, e.g. in a defined geo-area, and within a defined time interval. In the uppermost simple case the information provided by an LDM-DO is just its type, its geo-location, and its time interval of validity. Such information may be received in an ITS station unit via different channels such as:

— DATEX II,[34] TPEG,[38] RDS-TMC (legacy systems);

— CEN / ETSI / ISO / SAE ITS Message sets EN/ISO 19091,[19] ISO/TS 19321,[20] ETSI EN 302 637-2,[28] ETSI EN 302 637-3,[29] SAE J2735[39];

composed of different sets of attributes, and presented in different formats (encodings). ITS-S application processes capable to receive this information perform a mapping on LDM-DOs and a translation of attribute formats into the common format given by the LDM-DTs.

5.2 LDM in an ITS-S

The local dynamic map (LDM) specification provided in this document is designed for the architectural environment of an ITS station operated as a Bounded Secured Managed Domain (BSMD) specified in ISO 21217 and illustrated in Figure 1.

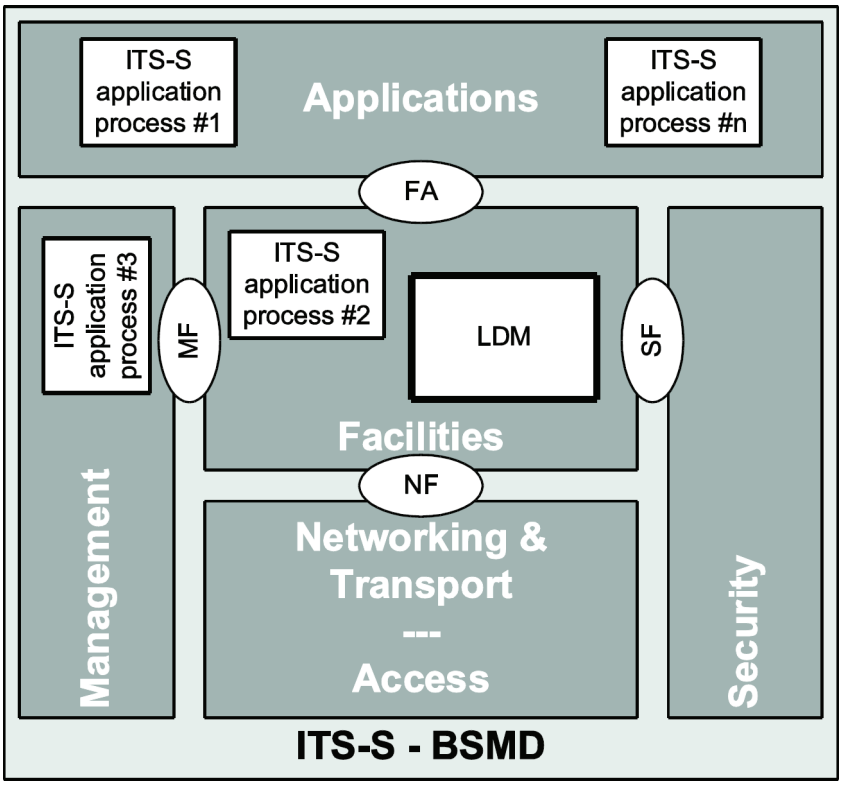

Figure 1 — LDM in an ITS-S operated as a Bounded Secured Managed Domain (BSMD)

The LDM functionality specified in Clause 6 is located in the ITS-S facilities layer. An LDM interfaces with ITS-S application processes specified in ISO 21217. The interface functionality is specified in 6.6.2 by means of functions of services of the FA-SAP and the MF-SAP; both Service Access Points (SAPs) offer identical functions for this purpose. The generic services of FA-SAP and MF-SAP are specified in ISO 24102-3[11].

5.3 LDM in an ITS-SU

Various examples of supported implementation configurations are illustrated in Figure 2, Figure 3, Figure 4, and Figure 5.

Figure 2 illustrates a "single-box" configuration of an ITS station unit (ITS-SU) with a single LDM.

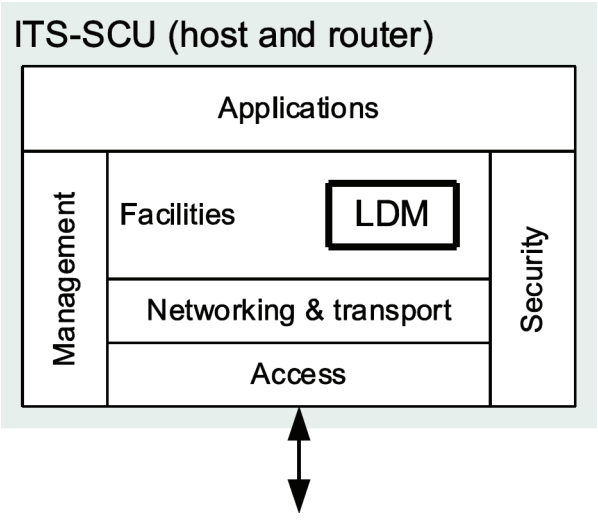

Figure 2 — Implementation configuration example a)

Figure 3 illustrates a "single-box" configuration of an ITS-SU with two LDMs.

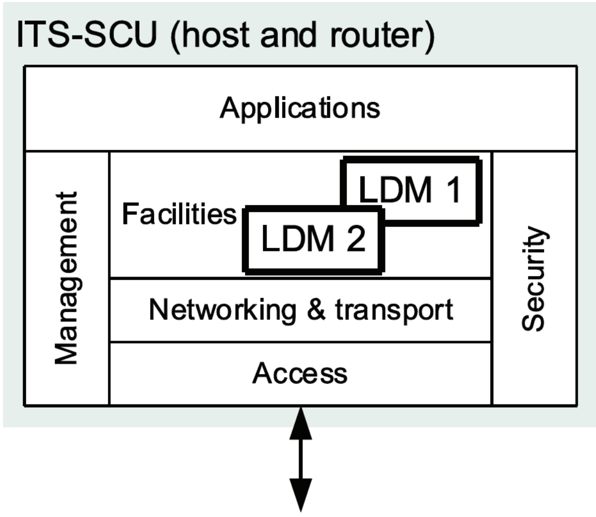

Figure 3 — Implementation configuration example b)

Figure 4 illustrates a configuration of an ITS-SU with two ITS station communication units (ITS-SCU). One of these ITS-SCUs has a host-only role specified in ISO 21217 and contains a single LDM. The other ITS-SCU has a router-only role specified in ISO 21217 and does not contain an LDM.

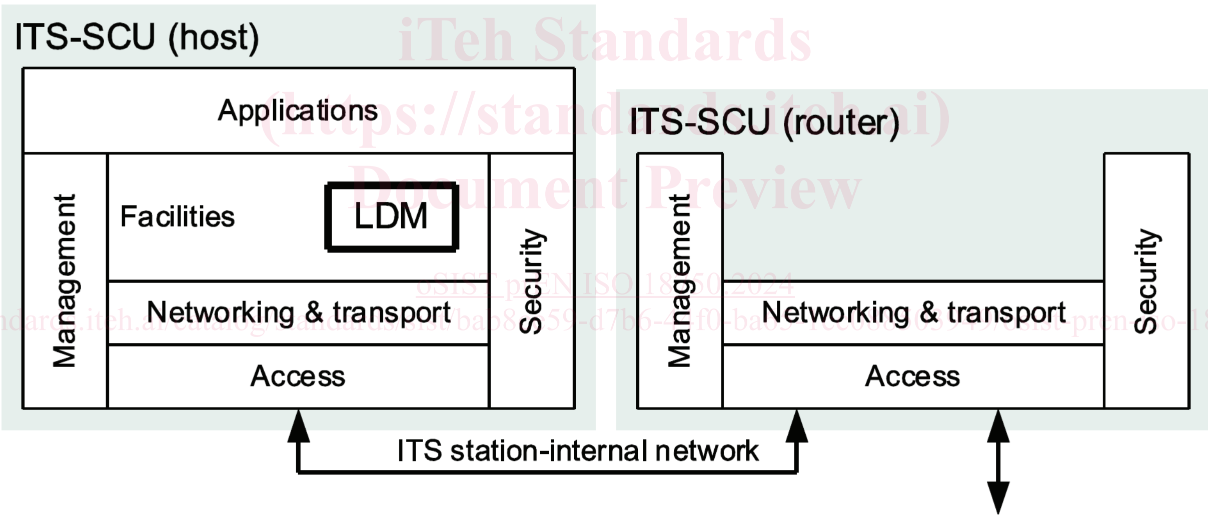

Figure 4 — Implementation configuration example c)

Figure 5 illustrates a configuration of an ITS-SU with two ITS station communication units (ITS-SCU). One of these ITS-SCUs has a host-only role specified in ISO 21217 and contains a single LDM. The other ITS-SCU has a host-and-router role specified in ISO 21217 and contains also an LDM.