
**Intelligent transport systems —
Cooperative systems — Globally
unique identification**

*Systèmes intelligents de transport — Systèmes coopératifs —
Identification unique au niveau global*

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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).

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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 first edition cancels and replaces ISO/TS 17419:2014, which has been technically revised to become an International Standard.

Introduction

Classification and management of ITS applications in a global context covers more than just the ITS applications themselves. It also covers elements of the environment in which ITS applications are instantiated.

Intelligent Transport Systems (ITS) provide ITS services to users by execution of ITS applications which typically requires communications between ITS station application processes residing in ITS station units (ITS-SU). Communications includes messages dedicated to ITS applications, and messages from ITS message sets.

Following the definition in TS 102 860[20], ITS applications and ITS application classes are referred to as ITS application objects. ITS application objects are uniquely identified by the registered “ITS Application Identifier” (ITS-AID) specified in this document.

NOTE 1 An ITS application class groups ITS applications together that provide the same type of service, e.g. “Electronic Fee Collection” (EFC), but operate in different contexts. Prior to start of service provisioning the applicable context is negotiated. The definition of ITS application classes is based on the concept of the DSRC Application entity as introduced in ISO 15628[21], which is identified by a DSRCApplicationEntityID; negotiation of the applicable context is performed by BST/VST exchange.

In ETSI TS 102 860[20], ITS message sets were referred to as ITS application objects. This definition is not adopted in this document due to the very different nature of ITS message sets and ITS application objects. ITS message sets are uniquely identified by the registered “ITS Message Set Identifier” (ITS-MsgSetID) specified in this document.

This document is an extension towards more general and global applicability of ETSI TS 102 860[20]. This document introduces the term “ITS-S object” as a general reference to ITS application objects, ITS message sets and other objects which may require globally unique identification and registration.

NOTE 2 Examples of other ITS-S objects are ITS-S communication protocols and ITS-S security protocols.

Management of ITS-S objects is specified in the ISO 24102 series (all parts)[9]-[12][14] and in ISO 17423[2]. This document focuses on some management aspects related to authorized and controlled operation of ITS-S objects, which requires considerations of ITS-S object identifiers, e.g. ITS-AID, ITS-MsgSetID, ITS-SUID, ITS-SCUID, addresses and protocol identifiers used in the communication protocol stack of an ITS-S, and others.

This document replaces ISO/TS 17419 without change of scope.

Intelligent transport systems — Cooperative systems — Globally unique identification

1 Scope

This document

- describes and specifies globally unique addresses and identifiers (ITS-S object identifiers) which are both internal and external to ITS stations and are used for ITS station management,
- describes how ITS-S object identifiers and related technical parameters are used for classification, registration and management of ITS applications and ITS application classes,
- describes how ITS-S object identifiers are used in the ITS communication protocol stack,
- introduces an organizational framework for registration and management of ITS-S objects,
- defines and specifies management procedures at a high functional level,
- is based on the architecture of an ITS station specified in ISO 21217:2014 as a Bounded Secured Managed Domain (BSMD),
- specifies an ASN.1 module for the identifiers, addresses, and registry records identified in this document, and
- specifies an ASN.1 module for a C-ITS Data Dictionary containing ASN.1 type definitions of general interest.

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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 8824-1:2015, *Information technology — Abstract Syntax Notation One (ASN.1): Specification of basic notation — Part 1*

ISO 21217:2014, *Intelligent transport systems — Communications access for land mobiles (CALM) — Architecture*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 21217:2014 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

authorization

prescription that a particular behaviour shall not be prevented

Note 1 to entry: Unlike a permission, an authorization is an empowerment.

ISO 17419:2018(E)

Note 2 to entry: From Reference [21].

3.2

ITS application

instantiation of an ITS service that involves an association of two or more complementary ITS-S application processes

[SOURCE: ISO 21217:2014, 3.9, modified — the Note 1 to entry is deleted]

3.3

ITS application class

ITS application designed for operation in different contexts involving real-time negotiation of the appropriate context

Note 1 to entry: The functional concepts of “application class” and “application context” were introduced in ISO 15628. ITS application class is used, e.g. in ISO 22418. An example of an application class can be found in ISO 14906.

3.4

ITS application identifier

globally unique, registered number identifying an ITS application object

3.5

ITS application object

ITS application or ITS application class

3.6

ITS message

message designed for an ITS-related purpose

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3.7

ITS message set

collection of one or more uniquely identified ITS messages

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3.8

ITS message set identifier

globally unique, registered identifier of an ITS message set

3.9

ITS protocol stack identifier

globally unique, registered identifier of a non-parameterized communications protocol stack

3.10

ITS registration authority

entity authorized to register ITS-S object identifiers

3.11

ITS service

functionality provided to users of intelligent transport systems designed, e.g. to increase safety, sustainability, efficiency, and comfort

[SOURCE: ISO 21217:2014, 3.11.]

3.12

ITS trusted authority

entity authorized to issue ITS-S object security credentials

3.13

ITS-S application process

element in an ITS station that performs information processing for a particular application, and may use ITS-S services to transmit and receive information[SOURCE: ISO 21217:2014, 3.19, modified — “uses” replaced by “may use”].

3.14**ITS-S application process provisioner**

functionality in an ITS-SU offering ITS-S application processes for download and installation to other ITS-SUs

3.15**ITS-S communication protocol**

protocol used in a communication protocol stack of an ITS-S

3.16**ITS-S communication protocol stack**

consistent set of ITS-S communication protocols enabling communications between an ITS-SCU and other nodes which may be identified by a registered globally unique reference number

Note 1 to entry: See ISO 17423[2].

3.17**ITS-SCU configuration management centre**

entity that retains information about capabilities of ITS-SCUs, status of objects in ITS-SCUs, and supports management and update of this information

3.18**ITS-S object**

entity used in ITS related to ITS-S management that may require a globally unique identifier

Note 1 to entry: Examples of ITS-S objects include ITS-SU, ITS-SCU, ITS application object, ITS message set, ITS-S communication protocol, ITS flow type.

3.19**ITS-S object identifier**

identifier of an ITS-S object

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3.20**ITS-S object owner**

entity responsible for the specification (design), maintenance and registration of an ITS-S object

3.21**ITS-S service**

communication functionality of an ITS-S that provides the capability to connect to other nodes

[SOURCE: ISO 21217:2014,3.37.]

3.22**ITS-S unit**

implementation of an ITS station

[SOURCE: ISO 21217:2014, 3.38.]

3.23**permission**

rule that a particular behaviour is allowed to occur

Note 1 to entry: From ITU-T X.911[21].

3.24**policy**

set of rules related to a particular purpose, expressed as an obligation, an authorization, a permission or a prohibition

Note 1 to entry: From ITU-T X.911[21].

3.25

prohibition

prescription that a particular behaviour shall not occur

Note 1 to entry: From ITU-T X.911[21].

3.26

registration

assignment of an unambiguous name to an object in a way which makes the assignment available to interested parties

Note 1 to entry: From ITU-T X.911[22].

3.27

registration authority

entity such as an organization, a standard or an automated facility that performs registration of one or more types of objects

Note 1 to entry: From ITU-T X.911[22].

3.28

regulation

<document> written instrument containing rules having the force of law

3.29

regulation

<process> process of the promulgation, monitoring, and enforcement of rules defined in 'regulation (document)', established by primary and/or delegated legislation

3.30

regulator

agency responsible for exercising autonomous authority over some area of human activity

3.31

violation

behaviour contrary to a rule

Note 1 to entry: From ITU-T X.911[21].

4 Symbols and abbreviated terms

ARCP	Application Requirements for selection of Communication Profiles
BSMD	Bounded Secured Managed Domain
BST	Beacon Service Table
CEN	Commission Européenne de Normalization
C-ITS	Co-operative Intelligent Transport Systems
ETSI	European Telecommunications Standards Institute
GCMA	Global Classification and Management of ITS Applications
IANA	Internet Assigned Numbers Authority
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force

ISO	International Standards Organization
ITS	Intelligent Transport Systems
ITS-ACID	ITS Application Context Identifier
ITS-AID	ITS Application Identifier
ITS-AOOD	Application Object Owner (designer) Identifier
ITS-ATT	ITS Access Technology Type
ITS-FlowTypeID	ITS Flow Type Identifier
ITS-LCH	ITS Logical Channel
ITS-LCHID	ITS Logical Channel Identifier
ITS-MsgSetID	ITS Message Set Identifier
ITS-MSOID	ITS Message Set Owner Identifier
ITS-NTSDU	ITS Station Networking and Transport layer Service Data Unit
ITS-PN	ITS Port Number
ITS-PR	ITS policy region
ITS-PRID	ITS-PR Identifier
ITS-ProtID	ITS Protocol Identifier
ITS-ProtStckID	ITS Protocol Stack Identifier
ITS-RR	ITS Regulatory Region
ITS-RRID	ITS Regulatory Region Identifier
ITS-S	ITS Station
ITS-SAPID	ITS-S Application Process Identifier
ITS-SAPIID	ITS-S Application Process Instance Identifier
ITS-S-APDID	ITS-S Application Process Developer Identifier
ITS-S-APP	ITS-S application Process Provisioner
ITS-S-APPID	ITS-S Application Process Provider Identifier
ITS-SAPSSID	ITS-S Application Process Sink Source Identifier
ITS-SCU	ITS Station Communication Unit
ITS-SCU-CMC	ITS-SCU Configuration Management Centre
ITS-SCU-CMCID	ITS-SCU-CMD Identifier
ITS-SCUID	ITS-SCU Identifier
ITS-SecAlgID	ITS Security Algorithm Identifier

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ITS-SEMID	ITS Station Equipment Manufacturer Identifier
ITS-S-FSID	ITS-S Facilities layer Service Identifier
ITS-SU	ITS Station Unit
ITS-SUID	ITS-SU Identifier
ITS-SU-UID	ITS-SU User Identifier
LDM	Local dynamic map
VST	Vehicle Service Table

5 Management issues

NOTE This is an informative clause.

5.1 General

In this document, application management refers to objects and procedures, both internal and external to the platforms on which the applications are installed, which are used to ensure the efficacy and authenticity of these applications and these platforms. Platforms in this context are ITS station communication units¹⁾ (ITS-SCUs) and applications are ITS-S application processes as specified in ISO 21217:2014. Application management procedures involve protocols for exchanging information between the various entities involved in application management, and these procedures are described at a functional level in this document. These procedures are to be used for authorizing and authenticating the use of ITS-S application entities over communication networks as described in ISO 21217:2014 and in 5.2.

Entities related to ITS application management in the global context and their roles identified and / or specified in this document are listed in [Table 1](#).

Table 1 — Entities and their roles

Entity	Role
ITS-S object	Entity used in ITS related to ITS-S management that may be identified by a globally unique identifier. EXAMPLE ITS application objects, ITS message sets, ITS-S communication protocols, ITS-S units, ITS-S communication units.
ITS-S object owner	Entity which is responsible for the specification (design), maintenance and registration of ITS-S objects. EXAMPLE Standards development organizations, industry special interest groups such as the “Society of Automotive Engineers” (SAE).
ITS application object	Entity that provides an ITS service to the user as specified in ISO 21217:2014. EXAMPLE ITS applications and ITS application classes.
ITS message set	Set of ITS messages designed for an ITS-related purpose as specified in ISO 21217:2014.
ITS-S communication protocol	Protocol used in a communication protocol stack of an ITS-S
ITS-S unit (ITS-SU)	Physical instantiation of an ITS station specified in ISO 21217:2014. An ITS-SU may consist of one single ITS-SCU, or several ITS-SCUs interconnected via an ITS station internal network. An ITS-SU is also referred to as “Bounded Secured Managed Entity” as specified in ISO 21217:2014.

1) An ITS-SU may consist of several physical units called ITS-SCUs as specified in ISO 21217:2014.

Table 1 (continued)

Entity	Role
ITS-S communication unit (ITS-SCU)	Physical unit in an ITS-SU containing a part or all of the functionality of an ITS-S as specified in ISO 21217:2014.
ITS-S equipment manufacturer	Manufacturer of ITS-SUs or ITS-SCUs.
ITS-S application process developer	Developer (manufacturer) of ITS-S application processes for usage in ITS-SUs.
ITS-S application process provisioner	Entity that offers ITS-S application processes for download to an ITS-SCU.
ITS-SCU configuration management centre	Entity that retains information about the capabilities of ITS-SUs, status of objects in ITS-SUs, and supports management and update of this information.
Certification authority (Certification laboratory)	Entity in charge of checking ITS-SCUs, implementations of ITS-S communication protocols, and ITS-S application processes for compliance to standards or specifications defined in an ITS release.
ITS registration authority	Entity in charge of registering ITS-S objects referenced by globally unique identifiers.
ITS trusted authority	Entity in charge of providing ITS-S object security credentials such as keys and certificates for hardware and software.

5.2 ITS communications architecture

As illustrated in [Figure 1](#), regardless of the complexity of the networks employed, communication between “ITS station units” (ITS-SUs), and between ITS-SUs and other types of ITS communication nodes, is on a peer-to-peer basis. The distinguishing feature of ITS-SUs is that of trust and authentication as discussed in [5.5.1](#). The need for trust and authentication arises from the deployment of critical safety-of-life and property applications. This leads to the definition of an ITS station as a “Bounded Secured Managed Domain” (BSMD) as specified in ISO 21217:2014, and the requirement for a “Public Key Infrastructure” (PKI) for trust assertion and certificate management.

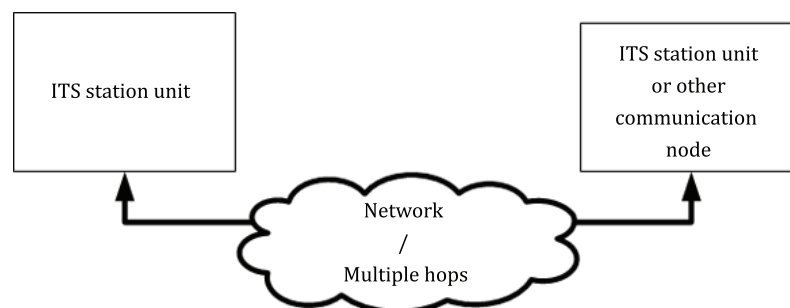


Figure 1 — Simplified ITS peer-to-peer communication architecture

5.3 PKI architecture

A public-key infrastructure (PKI) is a system for the creation, storage, distribution, and revocation of digital certificates which are used to verify that a particular public key and associated rights belong to a certain entity. The PKI creates digital certificates which map public keys to entities and their rights, securely stores these certificates in a central repository, and revokes them if needed.

5.4 Regulations and policies

Application management procedures shall comply with applicable regulation and use applicable policies. A policy is a set of rules related to a particular purpose. Such a rule can be expressed as an obligation, an authorization, a permission, or a prohibition. A regulation is an enforceable policy. Regulations apply

for a specific regulatory domain and are produced and maintained by regulators. Policies apply for a specific policy domain.

The need and applicability for regulations and policies in ITS is identified in this document for the following purposes:

- radio frequency allocation and usage;
- privacy issues;
- traffic operations and management.

A regulatory region is uniquely identified by an ITS Regulatory Region Identifier ITS-RRID.

A policy region is uniquely identified by an ITS Policy Region Identifier ITS-PRID.

5.5 ITS station

5.5.1 ITS station architecture

The architecture of the ITS station (ITS-S) specified in ISO 21217:2014 is illustrated in [Figure 2](#).

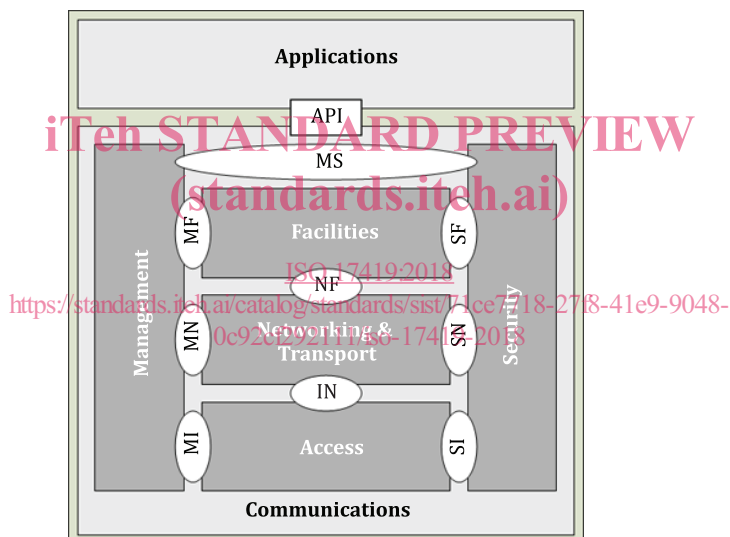


Figure 2 — ITS station architecture [ISO 21217:2014]

The term ITS-S refers to functionalities rather than a physical unit. Six functional blocks of an ITS-S are distinguished in [Figure 2](#):

- “Applications”:
- ITS-S applications
- “Communications”:
- Data plane
- “Access”: ITS-S access layer, i.e. OSI layers one and two.
- “Networking & Transport”: ITS-S networking and transport layer, i.e. OSI layers three and four.
- “Facilities”: ITS-S facilities layer, i.e. OSI layers five, six and seven.
- Management plane

- “Management”: ITS-S management entity
- “Security”: ITS-S security entity

These functional blocks are assumed to interact with each other within a BSMD. Implementation and maintenance of these functional blocks in a standards conformant manner creates ITS-SUs and ITS-SCUs that can be trusted to operate according to the policies and procedures assigned to them by trusted authorities. It is precisely the attribute of trust within the ITS domain that distinguishes ITS-SUs Bounded Secured Managed Entities (BSMEs) from all other communication nodes. As a managed domain, elements of the ITS-S need to be aware of and interact with the ITS-S management entity. As a secured domain, installation (e.g. “plug-and-play”) of an element of an ITS-S such as an ITS-S application, communication interface, or a communication protocol shall be performed in a controlled and secure manner, applying the procedures for registration of identifiers of ITS-S objects and the authentication of registered elements at time of installation.

ITS-S applications interact with the “Communications” block via an “Application Programming Interface” (API). This interaction may address either protocols in the ITS-S facilities layer of the data plane, or protocols in the ITS-S management entity or ITS-S security entity.

ITS-S access and ITS-S networking and transport layers are used by ITS-S facilities layer services and ITS-S applications to transmit and receive ITS-NTSDUs as described in ISO 21217:2014.

A specific combination of an ITS-S networking and transport layer protocol (residing in an instantiation of the ITS-S networking and transport layer), a “Communication Interface” (CI) (residing in an instantiation of the ITS-S access layer), an ITS-S facilities layer protocols (optional) and related necessary management and security protocols (optional) is referred to as an ITS-S communication protocol stack specified in ISO 17423[2]. An ITS-S communication profile, which is a parameterized ITS-S communication protocol stack specified in ISO 17423[2] is associated with a communication path specified in ISO 24102-6[14]. An ITS-S application process may use more than one ITS-S communication profile, e.g. one ITS-S communication profile for each of its distinct communication sources (flows). Further details on the automatic selection of ITS-S communication profiles are found in ISO 17423[2].

5.5.2 Instantiations of an ITS station

The functionality of an ITS-S may be implemented in one or several “ITS-S Communication Units” (ITS-SCU) as explained in ISO 21217:2014. For example, an ITS-S can be implemented by connecting units containing ITS-S router functionality and ITS-S host functionality using a local network (called an ITS station-internal network). An implementation of an ITS station is referred to as an “ITS-S unit” (ITS-SU).

An ITS-SU may be uniquely identified by an ITS-SUID.

An ITS-SCU is assigned to one “ITS-SCU Configuration Management Centre” (ITS-SCU-CMC). The purpose of the ITS-SCU-CMC is to manage the configuration of ITS-SCUs. Related ITS-S remote management procedures are specified in ISO 24102-2[10].

5.6 Applications and messages

5.6.1 ITS application

An ITS application is an instantiation of an ITS service that involves at least one ITS-S application process, and may involve an association of two or more complementary ITS-S application processes as described in ISO 21217:2014. ITS-S application processes may perform information dissemination by implementing groupcast (broadcast or multicast) services, or by exchange of packets with peer ITS-S application processes as part of a communication session, or may use data being available inside an ITS-SU, e.g. provided by a Local Dynamic Map (LDM) specified in ISO 18750[5], or provided by a publish-subscribe mechanism specified in ISO/TS 17429[4].

An ITS application is identified by an “ITS Application Identifier” (ITS-AID) specified in 7.1.2. ITS-AIDs are assigned by a Registration authority. ITS-S application processes belonging to the same ITS