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Intelligent transport systems — Cooperative systems — Globally unique identification

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

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Foreword

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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 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[7], 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.

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.

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

3.7
ITS message set
collection of one or more uniquely identified ITS messages

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

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-AOOID	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

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 units[1)] (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.

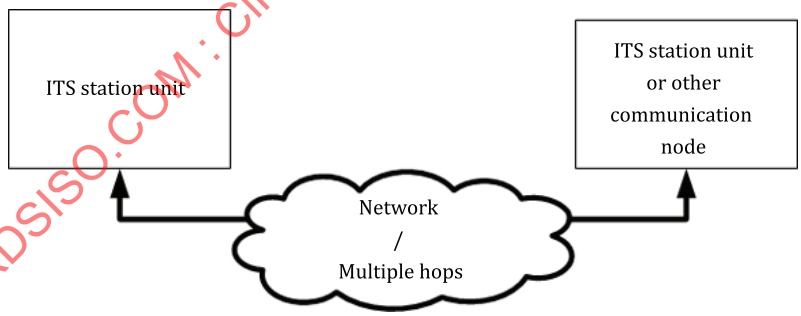

Figure 1 — Simplified ITS peer-to-peer communication architecture

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.

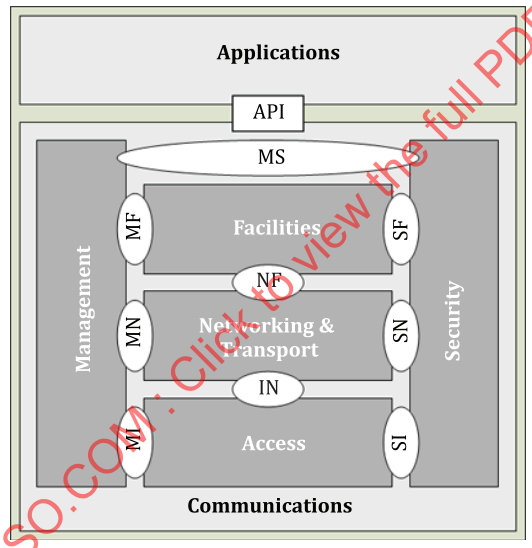

Figure 2 — ITS station architecture [ISO 21217:2014]

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

application are distinguished by an ITS-S application process identifier (ITS-SAPID) specified in 7.1.3, i.e. a sub-identifier unique for a given ITS-AID.

One essential feature of the ITS-S reference architecture is that ITS-S application processes need not necessarily concern themselves with the underlying communication protocols. They only need to be able to inform the ITS-S management of their functional requirements for communications as described in ISO 17423[2].

An instance of an ITS-S application process installed in an ITS-SU is uniquely identified by an ITS-S Application Process Instance Identifier (ITS-SAPIID) specified in 7.1.17.

5.6.2 ITS application class

The concept of an ITS application class as introduced in ISO 15628[7] (cf. DSRCApplicationEntity) is based on identifying a set of different protocols that serve the same functional purpose, e.g. Electronic Fee Collection (EFC).

An ITS application class is identified by an ITS-AID, see 5.6.1. The mutually exclusive characteristics provided by an ITS application class for different contexts of usage are distinguished by an ITS Application Context Identifier (ITS-ACID). Negotiation of the applicable context is part of the application behaviour, and may also be performed in a general standardized way, e.g. in service advertisement specified in ISO/TS 16460[1], ISO 24102-5[13].

NOTE The term "ITS application class" is introduced in this document primarily for compatibility with legacy systems ISO 15628[7]. The most popular ITS application class is the "Electronic Fee Collection" (EFC) application (ITS-AID=1) based on the European DSRC, where the mutually exclusive characteristics are given by the different EFC protocols used by road operators. The applicable EFC protocol is negotiated by BST/VST exchange prior to service provisioning.

5.6.3 ITS message sets

An ITS message set is a collection of ITS messages associated with an entity that is responsible for maintenance of the set. The messages of a given set are uniquely distinguishable, e.g. by a message identifier being unique for the given message set. Details of message identifiers are out of scope of the present document.

Transmission and reception of messages from an ITS-S message set may be performed by ITS-S application processes, e.g. ITS-S applications, ITS-S facility applications.

Messages from ITS message sets may be processed in the ITS-S facilities layer for the purpose of dissemination as specified e.g. in ISO/TS 17429[4] and ISO 18750[5].

An ITS message set is identified by an "ITS Message Set Identifier" (ITS-MsgSetID) specified in this document. ITS-MsgSetIDs are assigned by a registration authority.

5.7 Communications

5.7.1 Addressing in the communication protocol stack

Packets exchanged between ITS-S application processes need to carry information on the source and the destination (end points) of these packets in the ITS-S facilities layer. Such address information for source and destination applies at the NF-SAP in Figure 2. The well-known concept of port numbers is used for this purpose.

NOTE Ports are elements of transport protocols. Typically port numbers are dedicated to a specific transport protocol, i.e. the same number can have different meanings in different transport protocols. Port numbers for ITS transport protocols such as FNTP are referred to as "ITS Port Numbers" (ITS-PN).

Source and destination end points may be either globally unique, well-known ITS-PNs, or dynamically assigned ITS-PNs as specified in this document.

While globally unique network protocol identifiers, network addresses, data link layer protocol identifiers are essential ITS communications, they are outside the scope of this document. Examples of such identifiers are given in Table 2.

Table 2 — Addresses and identifiers in communication protocols

Identifier or address	Purpose
Facility layer service identifier	Registered identifiers for ITS-S facility layer services as specified in ISO/TS 17429[4].
IPv6 prefix	ITS-SUs contain routers that may get a global IPv6 prefix that uniquely identifies the router (and the station-internal network behind such a router) in the Internet.
IPv6 addresses	ITS-SCUs (hosts and routers) may get globally unique IPv6 addresses that uniquely identify them in the Internet.
Ethertype identifiers	Ethertype identifiers are specified for usage in the length/type field specified in IEEE 802.3.[19] They are used to select upper layer (networking) protocols.
MAC addresses	MAC addresses are specified in IEEE 802[18] and are comprised of a global and local sub-space. The global sub-space uniquely identifies a communication interface.

5.7.2 ITS-S management

Although the ITS-S management entity is located inside the block "Communications" in Figure 2, it also manages ITS-S applications residing in the block "Applications", i.e. the ITS-S application entity specified in ISO 21217:2014, via MX-SAP service primitives specified in ISO 24102-3[11].

A set of functional communication requirements from ITS-S applications and related management procedures is described in ISO 17423[2]. Related management procedures to identify suitable communication protocol stacks are standardized in ISO 24102-6[14]. Some of the related identifiers and parameters are presented in Table 3.

5.7.3 ITS-S Security

The ITS-S security entity provides "atomic" security services to the ITS-S. Although functions of the SX-SAP service primitives presented in ISO 24102-3[11] are generally specified in several standards, detailed specifications that are needed to achieve security and trust are deeply dependent on implementation, and cannot be standardized.

5.8 Identifiers and addresses summary

Table 3 illustrates globally unique addresses and identifiers relevant for ITS for which a registry is needed. Details of these identifiers and addresses are specified in 7.1.

Table 3 — Addresses and identifiers of ITS-S objects

Address/identifier	Purpose
ITS-AID	An ITS application identifier is used to uniquely identify an ITS application object, i.e. an ITS application or an ITS application class. It is used e.g. to advertise services (cf. the service advertisement specified in ISO 24102-5[13]), and for secure installation and real-time operation of ITS-S applications in an ITS-SU. ITS-S applications have an ITS-AID assigned to them prior to installation in an ITS-SU.
ITS-AOOID	An ITS application object owner identifier is used to uniquely identify an owner of specifications of ITS application objects.
ITS-ATT	An ITS access technology type, see ISO 21218[8], is identified by ITS-ATT. ITS-ATT originally was specified in ISO 21218 with name MedType.

Table 3 *(continued)*

Address/identifier	Purpose
ITS-FlowTypeID	An ITS-FlowTypeID is used to uniquely identify an ITS flow type. An ITS flow type is a set of communication requirements and objectives specified in ISO 17423[2] and used by the ITS-S path and flow management specified in ISO 24102-6[14] to select an optimum ITS-S communication profile.
ITS-LCHID	An ITS logical channel identifier is used to uniquely identify an ITS logical channel in the ITS-S communication profile selection process specified in ISO 17423[2].
ITS-MsgSetID	An ITS message set identifier is used to uniquely identify an ITS message set. ITS-S applications may construct PDUs using messages from any registered ITS message set, and may also consume such messages through publish/subscribe mechanisms in ITS-SUs specified in ISO/TS 17429[4].
ITS-MSOID	An ITS message set owner identifier is used to uniquely identify an owner of specifications of ITS message sets.
ITS-PN	An ITS port number is used to uniquely identify, for an ITS transport protocol for localized communications such as FNTP specified ISO/TS 16460[1] and ISO 29281-1[15], or GeoNetworking specified in the multi-part standard ETSI EN 302 636[23], an entity in an upper OSI layer, e.g. in the ITS-S facilities layer.
ITS-PRID	An ITS policy region identifier is used to uniquely identify an ITS policy region (ITS-PR) in the ITS-S communication profile selection process specified in ISO 17423[2]. Different types of policy regions may be distinguished.
ITS-ProtID	An ITS-ProtID is used to uniquely identify a non-parameterized ITS (communications) protocol that may reside in an ITS-SU.
ITS-ProtStckID	An ITS-ProtStckID is used to uniquely identify a non-parameterized communications protocol stack; used in ISO 17423[2].
ITS-RRID	An ITS regulatory region identifier is used to uniquely identify an ITS regulatory region (ITS-RR) in the ITS-S communication profile selection process specified in ISO 17423[2]. The following types of regulatory regions are identified: — radio regulation; — security regulation; — privacy regulation; — traffic regulation.
ITS-S-APDID	An ITS-S application process developer identifier is used to uniquely identify a developer of ITS-S application processes.
ITS-SAPID (ApplicationID)	ITS-SAPID is used in an ITS-SU to uniquely identify an ITS-S application process. Originally it was introduced in ISO 24102-1 with the name ApplicationID.
ITS-S-APPID	An ITS-S application process provisioner identifier is used to uniquely identify an ITS-S-APP.
ITS-SCU-CMCID	A globally unique identifier of a user of an ITS-SCU-CMC. Usage of this identifier is specified in ISO 24102-2[10].
ITS-SCUID	An ITS station communication unit identifier is used to uniquely identify an ITS-SCU.
ITS-SecAlgID	A security algorithm identifier is used to uniquely identify a security algorithm in communications.
ITS-SEMID	An ITS-S equipment manufacturer identifier is used to uniquely identify a manufacturer of ITS-S equipment.
ITS-SUID	An ITS station unit identifier is used to uniquely identify an ITS-SU.
ITS-SU-UID	A globally unique identifier of a user of an ITS-SU. Usage of this identifier is outside the scope of this document.

6 GCMA organizational framework

6.1 Overview

The organizational framework of "Global Classification and Management of ITS Applications" (GCMA) involves a number of entities listed in Table 1 and the relationships between these entities. The purpose of this framework is to allow for certification and validation of entities uniquely identified by identifiers and addresses, and to enable operation of ITS-S application processes in an ITS-SCU based on the principles of a BSMD as specified in ISO 21217:2014. This framework provides the means to instantiate the following services:

a) Registration of globally unique identifiers presented in Table 3 as illustrated in 6.2 for ITS-AID.

b) Certification of ITS-S equipment, i.e. ITS-SUs and ITS-SCUs, and issuance of certificates as illustrated in 6.3.

c) Certification of ITS-S application processes[2)] as illustrated in 6.4.

d) Issuance of ITS-SCU credentials as illustrated in 6.5.

e) Issuance of certificates for real-time operation of ITS-S application processes as illustrated in 6.6.

f) Installation of ITS-S application processes in an ITS-SCU as illustrated in 6.7.

6.2 Registration of globally unique identifiers

Figure 3 shows entities and functional relationships involved in the registration of ITS application objects and their identifiers (ITS-AIDs).

NOTE 1 The numbers (x) in Figure 3 indicate the logical sequence of actions.

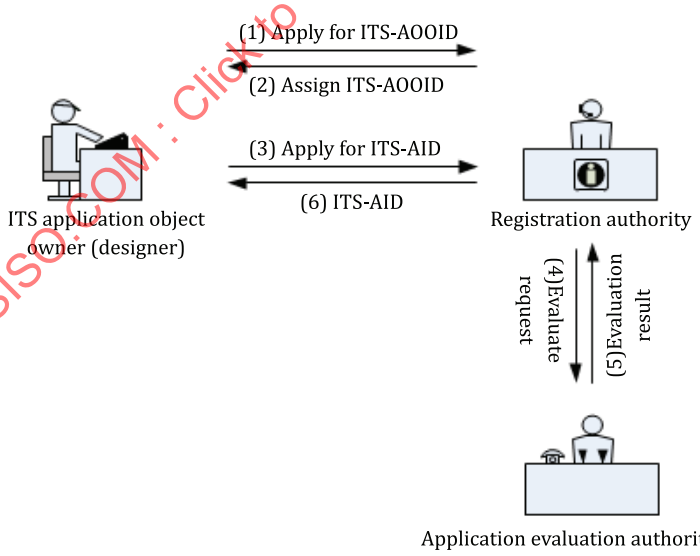

Figure 3 — Registration of ITS-AID — Functional illustration

Owners (designers) of ITS applications (and ITS application classes) are uniquely identified by an ITS-AOOID, and all ITS application objects (ITS applications or ITS application classes) are uniquely identified by an ITS-AID. All requests for assignment of an ITS-AID shall be evaluated by an application evaluation authority prior to the issuance of an ITS-AID. Upon acceptance, the application evaluation authority shall notify the registration authority which shall register an ITS-AID with the ITS application owner as the responsible entity.

2) While necessary to ensure proper ITS-SU operation, certification of ITS communication protocols is outside the scope of this document.

Figure 4 shows entities and functional relationships involved in the registration of ITS message sets and their identifiers (ITS-MsgSetIDs).

NOTE 2 The numbers (x) in Figure 4 indicate the logical sequence of actions.

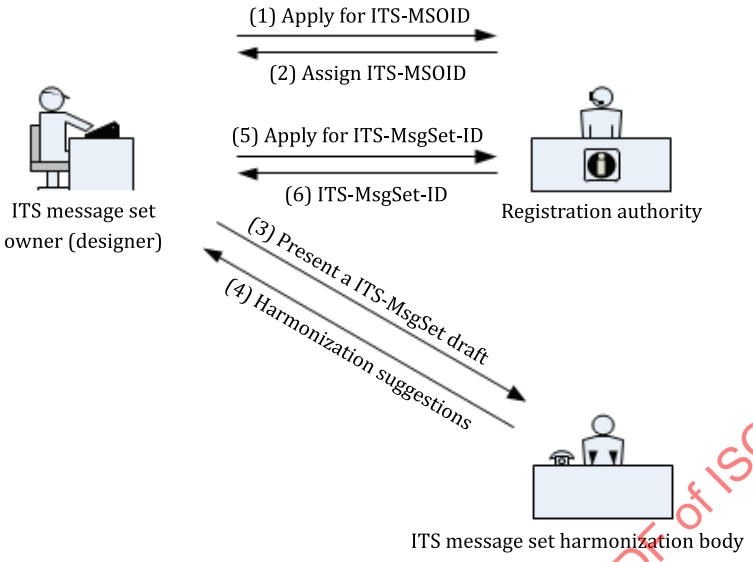

Figure 4 — Registration of ITS-MsgSet-ID — Functional illustration

Owners of ITS message sets are uniquely identified by an ITS-MSOID, and ITS message sets themselves are uniquely identified by an ITS-MsgSetID. Owners of ITS message sets are strongly encouraged to submit their message sets to an appropriate ITS message set harmonization body, e.g. a standards development organization, to prevent unnecessary duplication and possible conflict in the definition of ITS messages and data elements related thereto. While appropriate incorporation of the suggestions returned by the harmonization body is also strongly encouraged, all valid requests for an ITS-MsgSetID made to an appropriate registration authority shall be granted and an ITS-MsgSetID assigned with the ITS message set owner registered initially as the party responsible for maintenance of the message set. The registration authority shall be notified of any changes in the responsible party.

6.3 Certification of ITS-S equipment

Figure 5 shows entities and functional relationships involved in the certification and registration of ITS-SCUs sets and their identifiers (ITS-SCUIDs).

NOTE The numbers (x) in Figure 5 indicate the logical sequence of actions.

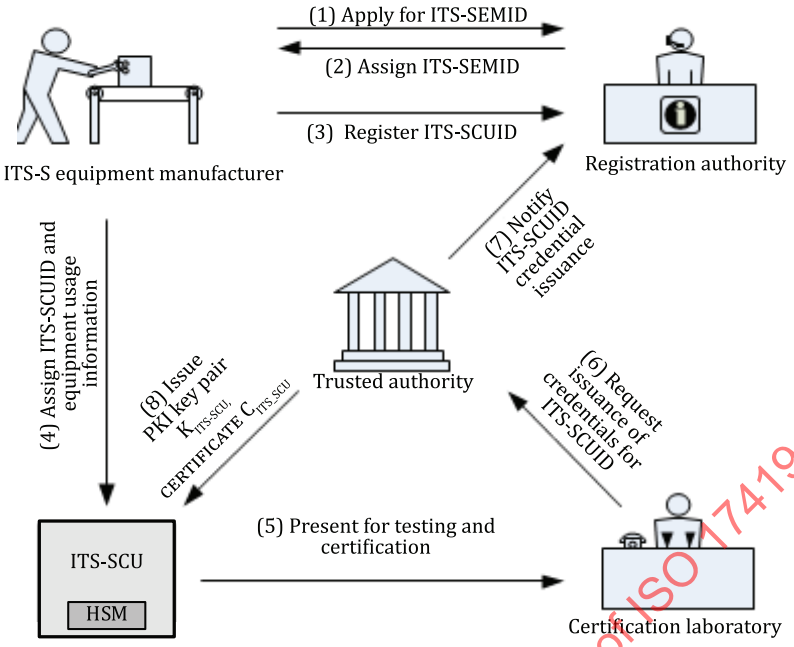

Figure 5 — Certification of ITS-SCUs — Functional illustration

ITS-SCUIDs shall be created by the manufacturer of the device as a concatenation of the globally unique ITS-S equipment manufacturer ID (ITS-SEMID) and a unique serial number assigned by that manufacturer as specified in this document, and are notified to the registration authority. Once the devices pass all conformance tests as prescribed by the certification laboratory, a trusted authority, which may be the certification laboratory itself, issues the requested security credentials (certificates and/or key pairs) and shall notify the appropriate registration authority of the issuance thereof.

An ITS-SU may be composed of one or several ITS-SCUs. ITS-SCUs may become part of an ITS-SU either at time of integration of an ITS-SU, or dynamically as a plug-and-play device. One of the several (or the only one) ITS-SCU of an ITS-SU is referred to as the “Master ITS-SCU”. While ITS-SCUs have a globally unique identifier (ITS-SCUID) assigned under the control of the manufacturer of the ITS-SCU, a globally unique identifier (ITS-SUID) of an ITS-SU needs to be assigned by a registration authority.

6.4 Certification of ITS-S application processes

Figure 6 shows the entities and functional relationships involved in the certification and registration of instantiations of ITS-S application processes (ITS-S-APDIDs, ITS-AIDs, and instantiation related information).

NOTE The numbers (x) in Figure 6 indicate the logical sequence of actions.

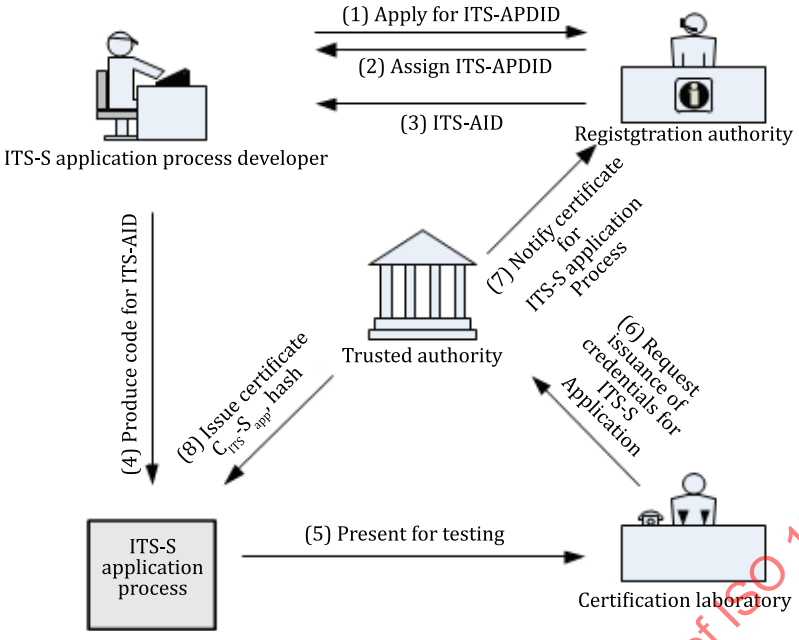

Figure 6 — Certification of ITS-S applications — Functional illustration

All ITS-S application processes shall be tested by an appropriate certification laboratory. Once an ITS-S application process has passed all conformance tests as prescribed by the certification laboratory, a trusted authority, which may be the certification laboratory itself, issues the requested security credentials (certificates and hash) and shall notify the appropriate registration authority of the issuance.

NOTE In an ITS-SU, there can be more than one instance of the same ITS-S application process, where instance means an executable module.

One or several instances of an ITS-S application process installed in an ITS-SU are uniquely distinguished by ITS-SAPIID, see 7.1.17.

6.5 Issuance of ITS-SCU credentials

Figure 7 shows entities and functional relationships involved in the issuance of ITS-SCU credentials.

NOTE The numbers (x) in Figure 7 indicate the logical sequence of actions.

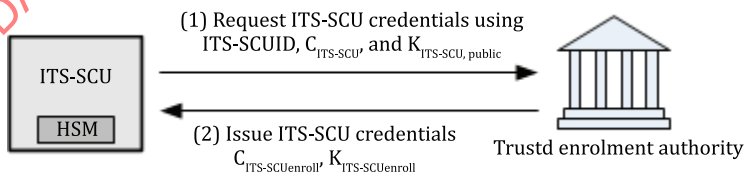

Figure 7 — Issuance of ITS-SCU credentials — Functional illustration

ITS-SCUs shall periodically request ITS-SCU credentials from an appropriate trusted enrolment authority. These security credentials are used for the issuance of certificates for real-time operation. ITS-SCUs shall present their ITS-SCU credentials (ITS-SCUID, $C_{ITS-SCU}$, $K_{ITS-SCU,public}$) and requested permissions to the trusted enrolment authority which, upon successful evaluation thereof, shall issue the appropriate security credentials ($C_{ITS-SCU\ enroll}$, $K_{ITS-SCUenroll}$) to the ITS-SCU. Note that allowing different ITS-SCUs in a single ITS-SU to have different credentials allows these SCUs to have different permissions and restrictions.

6.6 Issuance of certificates for real-time operation

Figure 8 shows entities and functional relationships involved in the issuance of credentials for real-time operations of ITS-S application processes and ITS-S facilities layer protocols.

NOTE The numbers (x) in Figure 8 indicate the logical sequence of actions.

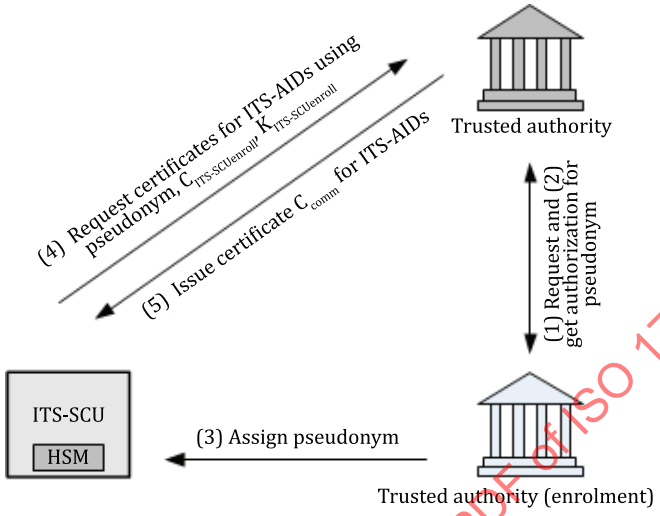

Figure 8 — Certificates for real-time communications — Functional illustration

To obtain security credentials necessary for real-time operation and to ensure a certain level of privacy and anonymity, ITS-SCUs may request a pseudonym from an appropriate trusted enrolment authority. This pseudonym is then used along with the ITS-SCU's enrolment credentials and ITS-AIDs and related information such as security-specific permissions to request from a second trusted authority a set of security credentials for real-time operation. Note that allowing different ITS-SCUs in the same ITS-SU to have different credentials allows these SCUs to obtain credentials with different permissions and restrictions.

6.7 ITS application repository

Figure 9 shows entities and functional relationships involved in the secure online installation of ITS-S applications.

The numbers (x) in Figure 9 indicate the logical sequence of actions.

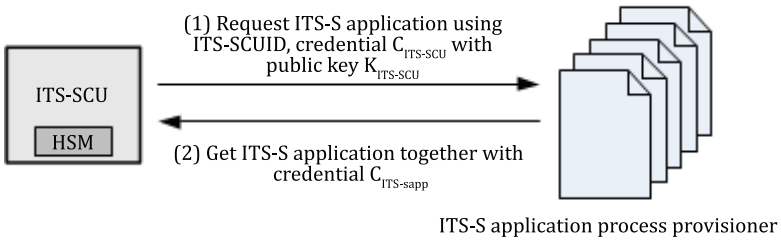

Figure 9 — ITS-S application process provisioning — Functional illustration

NOTE An ITS-SCU connects to an ITS-S application process provisioner via its ITS-SCU-CMC.

Secure download of ITS-S application processes may be performed using the remote ITS station management protocol specified in ISO 24102-2[10].

6.8 Secure installation and maintenance of facilities and communication protocols

Similar to the secure download and installation of ITS-S application processes illustrated in 6.7, protocols and related data elements and registries are needed in support of secure installation of executables of ITS-S facilities and communication protocols, see ISO 24102-2[10].

6.9 Registries

6.9.1 General

Registration of an object is the process of assignment of an unambiguous name (identifier) to an object in a way which makes the assignment available to interested parties. Registrations are performed by registration authorities, which are entities such as an organization, a standard or an automated facility. This document identifies potential registries and minimum information contained in a registry entry.

NOTE 1 Although A.3 specifies ASN.1 types of registry entries, these specifications are not meant to be complete. The specifications given there are understood as the minimum information contained in registries. A complete specification of registry entries is under the responsibility of the respective registration authority and thus out of scope of this document.

NOTE 2 ASN.1 definitions of types related to registry entries can be subject to changes in the process to convert ISO 17419 (this document) into ISO 17419-1 and the simultaneous process to create ISO 17419-2. As appropriate, respective ASN.1 definitions will be allocated in ISO 17419-2 rather than in ISO 17419-1.

6.9.2 ITS application objects

Information contained in a registry for ITS application objects is given by the ASN.1 type `ITSapObRegistry` specified in A.3. This registry shall contain entries for ITS application objects given by the ASN.1 type `ITSapOb` specified in A.3 and listed in Table 4. A registration authority may add further information elements to properly identify and support management of ITS application objects.

NOTE 1 Specific ITS-AIDs can be reserved for ITS application objects of which a specification is not publicly available. Further on a number of ITS-AIDs are registered for test purposes.

Table 4 — Registry elements of `ITSapOb`

Element of `ITSapOb`	Semantics
`iTSaid`	Globally unique identifier ITS-AID of ITS application object
`iTSapObName`	Name of ITS application object
`iTSapObType`	Type of ITS application object. Either `class` or `application`
`iTSapObOwner`	Owner (name, type and OID) of the ITS application object.

Annex B provides a template to be used by applicants to request allocation of an ITS-AID.

NOTE 2 The registry for ITS application objects is referred to as “Service Catalogue Manager” in ISO 17427[3].

A registry for ITS application class contexts (mutually exclusive characteristics) is not specified in this document, as such a registry is considered to be part of the specification of the ITS application class. A registry for EFC already exists at CEN TC 278. A general approach for ITS application class contexts, used for service advertisement but generally applicable, is specified in ISO/TS 16460[1].This approach uses the ASN.1 type `SamContext` that uses a two-dimensional address space {ITS-AID, ITS-ACID} to identify globally uniquely a specific context for a specific ITS application class.

6.9.3 ITS message sets

Information contained in a registry for ITS message sets is given by the ASN.1 type `ITSmsgSetRegistry` specified in A.3. This registry shall contain entries for ITS message sets given

by the ASN.1 type `ITSmsgSet` specified in A.3 and listed in Table 5. A registration authority may add further information elements to properly identify and support management of ITS message sets.

Table 5 — Registry elements of `ITSmsgSet`

Element of `ITSmsgSet`	Semantics
`iTSmsID`	Globally unique identifier ITS-MsgSetID of ITS message set
`iTSmsName`	Name of ITS message set
`iTSmsOwner`	Owner (name, type and OID) of the ITS message set.

6.9.4 ITS regulatory regions

Information contained in a registry for ITS regulatory regions is given by the ASN.1 type `ITSregRegionRegistry` specified in A.3. This registry shall contain entries for ITS regulatory regions given by the ASN.1 type `ITSregRegion` specified in A.3 and listed in Table 6. A registration authority may add further information elements to properly identify and support management of ITS regulatory regions.

Table 6 — Registry elements of `ITSregRegion`

Element of `ITSregRegion`	Semantics
`regID`	Globally unique identifier ITS-RRID of ITS regulatory region
`regAuthority`	Regulatory region authority (Name and URL)
`regArea`	Regulatory area definition

This document preliminarily identifies two area definitions. Further area definitions may be added at a later time:

— Areas defined by a country code of ASN.1 type `CountryCode` specified in A.3.

— Areas defined by polygons of ASN.1 type `GeoPolygon` specified in A.3 with a distinction of

  — areas to be included, identified with the ASN.1 type `GeoInclusionAreas` specified in A.3, and

  — areas to be excluded, identifed by the ASN.1 type `GeoExclusionAreas` specified in A.3.

Regulatory content, i.e. rules, is maintained by the authority identified with `regAuthority`. This authority may express a rule by means of a “C-ITS authority data set”.

6.9.5 ITS policy regions

Information contained in a registry for ITS policy region identifiers (ITS-PRID) is given by the ASN.1 type `ITSpolRegionRegistry` specified in A.3. This registry shall contain entries for ITS policy regions given by the ASN.1 type `ITSpolRegion` specified in A.3 and listed in Table 7. A registration authority may add further information elements to properly identify and support management of ITS policy regions.

Table 7 — Registry elements of `ITSpolRegion`

Element of `ITSpolRegion`	Semantics
`polID`	Globally unique identifier ITS-PRID of ITS policy region
`polAuthority`	Policy region authority (Name and URL)
`polArea`	Policy area definition

Area definitions identified in this document are presented in 6.9.4.

Policy contents, i.e. rules, are maintained by the authority identified with polAuthority.

6.9.6 ITS port numbers

Information contained in a registry for ITS ports is given by the ASN.1 type `ITSportNumberRegistry` specified in A.3. This registry shall contain entries for ITS port numbers given by the ASN.1 type `ITSportNumber` specified in A.3 and listed in Table 8. A registration authority may add further information elements to properly identify and support management of ITS port numbers. A registration authority shall clearly distinguish the range of well-known registered ITS port numbers and dynamically assigned ITS port numbers.

Table 8 — Registry elements of `ITSportNumber`

Element of `ITSportNumber`	Semantics
`pn`	Port number (ITS-PN) of ASN.1 type PortNumber
`itssAp`	Information on an interface (communication sink or communication source) of a given ITS application object; ASN.1 type ItsAppInfo

6.9.7 ITS flow types

Information contained in a registry for ITS flow types is specified in ISO 17423[2]. This registry contains entries for ITS flow types identified by ITS-FlowTypeIDs .

6.9.8 ITS logical channels

Information contained in a registry for ITS logical channels is given by the ASN.1 type `ITSlchRegistry` specified in A.3. This registry shall contain entries for ITS logical channels given by the ASN.1 type `ITSlch` specified in A.3 and listed in Table 9. A registration authority may add further information elements to properly identify and support management of ITS logical channels.

Table 9 — Registry elements of `ITSlch`

Element of `ITSlch`	Semantics
`lchID`	Globally unique identifier ITS-LCHID of LCH.
`lchPurpose`	Human readable purpose of LCH

6.9.9 ITS station units

Information contained in a registry for ITS station units is given by the ASN.1 type `ITSsuRegistry` specified in A.3. Such a registry contains entries for ITS station units given by the ASN.1 type `ITSsu` specified in A.3 and presented in Table 10. A registration authority may add further information elements to properly identify and support management of ITS station units.

Table 10 — Registry elements of `ITSsu`

Element of `ITSsu`	Semantics
`itssuID`	Globally unique identifier ITS-SUID of ITS-SU. Such an identifier likely is subject to privacy regulations. Further details are out of scope of this document.

6.9.10 ITS station communication units

Information contained in a registry for ITS station communication units is given by the ASN.1 type `ITSscuRegistry` specified in A.3. This registry shall contain entries for ITS station communication units given by the ASN.1 type `ITSscu` specified in A.3 and listed in Table 11. A registration authority may add further information elements to properly identify and support management of ITS station communication units. The registry preferably is maintained by the respective ITS-SCU Configuration Management Centres, see 5.1 and 5.2.

Table 11 — Registry elements of `ITSscu`

Element of `ITSscu`	Semantics
`itsscuID`	Globally unique identifier ITS-SCUID of ITS-SCU.
`cmc`	ITS-SCU configuration management centre

6.9.11 ITS-S application process provisioner

Information contained in a registry for ITS-S application process provisioner is given by the ASN.1 type `ITSSappRegistry` specified in A.3. This registry shall contain entries for ITS-S application process provisioners given by the ASN.1 type `ITSSapPrPr` specified in A.3 and listed in Table 12. A registration authority may add further information elements to properly identify and support management of ITS-S application process provisioners.

Table 12 — Registry elements of `ITSSapPrPr`

Element of `ITSSapPrPr`	Semantics
`itssappID`	Globally unique identifier ITS-S-APPID
`itssapProv`	Identity of the ITS-S application process provisioner (Name, address, URL)

6.9.12 ITS-S equipment manufacturers

Information contained in a registry for ITS-S equipment manufacturers is given by the ASN.1 type `ITSemRegistry` specified in A.3. This registry shall contain entries for ITS-S equipment manufacturers given by the ASN.1 type `ITSem` specified in A.3 and listed in Table 13. A registration authority may add further information elements to properly identify and support management of equipment manufacturers.

Table 13 — Registry elements of `ITSem`

Element of `ITSem`	Semantics
`itsemID`	Globally unique identifier ITS-SEMID of the ITS-S equipment manufacturer
`equipManu`	Identity of the ITS-S equipment manufacturer (Name, address, URL)

6.9.13 ITS application object owners

Information contained in a registry for ITS application object designers is given by the ASN.1 type `ITSaooRegistry` specified in A.3. This registry shall contain entries for ITS application object owners given by the ASN.1 type `ITSaoo` specified in A.3 and listed in Table 14. A registration authority may add further information elements to properly identify and support management of ITS application object owners.

Table 14 — Registry elements of `ITSaoo`

Element of `ITSaoo`	Semantics
`itsaooID`	Globally unique identifier ITS-AOOID of the ITS-S application object owner
`aoo`	Identity of the ITS-S application object owner (Name, address, URL)

6.9.14 ITS message set owners

Information contained in a registry for ITS application object designers is given by the ASN.1 type `Registry` specified in A.3. This registry shall contain entries for ITS message set owners given by the ASN.1 type `ITSmso` specified in A.3 and listed in Table 15. A registration authority may add further information elements to properly identify and support management of ITS message set owners.

Table 15 — Registry elements of `ITSmso`

Element of `ITSmso`	Semantics
`ITSmso`	Globally unique identifier ITS-MSOID of the ITS message set owner
`mso`	Identity of the ITS message set owner (Name, address, URL)

6.9.15 ITS-S application process developers

Information contained in a registry for ITS-S application process developers is given by the ASN.1 type `ITSSapdRegistry` specified in A.3. This registry shall contain entries for ITS-S application process developers given by the ASN.1 type `ITSSapd` specified in A.3 and listed in Table 16. A registration authority may add further information elements to properly identify and support management of an ITS-S application process developers.

Table 16 — Registry elements of `ITSSapd`

Element of `ITSSapd`	Semantics
`itssapdID`	Globally unique identifier ITS-S-APDID of the ITS-S application process developer
`ad`	Identity of the ITS-S application process developer (Name, address, URL)

6.9.16 ITS-S facility layer services

Information contained in a registry for ITS-S facility layer services is given by the ASN.1 type `ITSSfacilityServiceRegistry` specified in A.3. This registry shall contain entries for ITS-S application process developers given by the ASN.1 type `ITSSfs` specified in A.3 and listed in Table 17. A registration authority may add further information elements to properly identify and support management of an ITS-S application process developers.

Table 17 — Registry elements of `ITSSfs`

Element of `ITSSfs`	Semantics
`itssfsID`	Globally unique identifier ITS-S-FSID of the ITS-S facilities layer service
`fsOwner`	Identity of the owner of an ITS-S facility layer service (Name, address, URL)

NOTE Further details could be added by ISO/TS 17429[4].

6.9.17 ITS-SCU configuration management centres

Information contained in a registry for ITS-SCU configuration management centres (ITS-SCU-CMCs) is given by the ASN.1 type `ITSSCUcmcRegistry` specified in A.3. This registry shall contain entries for ITS-SCU-CMCs given by the ASN.1 type `ITSSCUcmc` specified in A.3 and listed in Table 18. A registration authority may add further information elements to properly identify and support management of an ITS-S application process developers.

Table 18 — Registry elements of `ITSSCUcmc`

Element of `ITSSCUcmc`	Semantics
`itsscucmcID`	Globally unique identifier ITS-SCU-CMCID of the ITS-SCU-CMC
`itsscucmcName`	Name of the ITS-SCU-CMC

6.9.18 ITS communication protocol stacks

Information contained in a registry for ITS communication protocol stack identifiers (ITS-ProtStckIDs) is given by the ASN.1 type `ITSprotStcks` specified in A.3. This registry shall contain entries for

ITS-ProtStckIDs given by the ASN.1 type `ITSprotStckInfo` specified in A.3 and listed in Table 18. A registration authority may add further information elements to properly identify and support management of non-parameterized ITS communications protocol stacks.

Table 19 — Registry elements of `ITSprotStckInfo`

Element of `ITSprotStckInfo`	Semantics
`itsProtStckID`	Globally unique identifier ITS-ProtStckID of a non-parameterized ITS communications protocol stack.
`itsProts`	Sequence of descriptions of ASN.1 type ITSprotocol of required protocols
`ITSprotocol.protID`	Globally unique identifier of a protocol.
`ITSprotocol.protRef`	Reference to specification

6.9.19 ITS protocol identifier

Information contained in a registry for ITS protocol identifiers (ITS-ProtIDs) is given by the ASN.1 type `ITSprots` specified in A.3. This registry shall contain entries for ITS-ProtIDs given by the ASN.1 type `ITSprotocol` specified in A.3 and listed in Table 18. A registration authority may add further information elements to properly identify and support management of non-parameterized ITS communications protocol stacks.

Table 20 — Registry elements of `ITSprotocol`

Element of `ITSprotocol`	Semantics
`protID`	Globally unique identifier of a protocol.
`protRef`	Reference to specification

6.9.20 IANA registries

The “Internet Assigned Numbers Authority” (IANA) is responsible for maintaining many of the codes and numbers contained in a variety of Internet protocols. IANA provides this service in coordination with the “Internet Engineering Task Force” (IETF). The registry of port numbers for the transport protocols UDP and TCP are publicly accessible online at http://www.iana.org/assignments/service-names-port-numbers/service-names-port-numbers.xml

6.9.21 IEEE registries

IEEE offers registration authority programs or registries which maintain lists of unique identifiers under standards and issue unique identifiers to those wishing to register them. The “IEEE Registration Authority” (IEEE-RA) assigns unambiguous names to objects in a way which makes the assignment available to interested parties. Information is publicly accessible online at http://standards.ieee.org/develop/regauth/llc/public.html

Registries for existing globally unique identifiers that may be used in ITS are, e.g.:

— Organizationally unique identifier, also referred to as COMPANY_ID. The registry is publicly accessible online at http://standards.ieee.org/develop/regauth/oui/oui.txt

— 36-bit organizationally unique identifier (OUI-36). The registry is publicly accessible online at http://standards.ieee.org/develop/regauth/oui36/oui36.txt

— Group MAC address

— Ethertype identifiers. The registry is publicly accessible online at http://standards.ieee.org/develop/regauth/ethertype/eth.txt

6.10 Wrong behaviour reporting

As a consequence of the need for wrong behaviour reporting, revocation lists and related registry procedures are needed. Details are outside the scope of this document.

7 GCMA technical framework

7.1 Addresses and identifiers

7.1.1 Overview

A list of addresses and identifiers is presented in Table 3. Details are specified in the following sub-clauses.

7.1.2 ITS-AID

Every ITS application object, i.e. ITS application and ITS application class, operated in a BSMD shall be uniquely identified by a value of the "ITS application identifier" (ITS-AID).

NOTE ITS-AID is not designed to distinguish different versions of the same ITS application object, or to identify messages, message sets, or communications features. ITS-AID is applied e.g. in ISO/TS 16460[1], ISO 24102-5[13], ISO 29281-1[15]. Usage in ISO/TS 16460[1] does not necessarily strictly follow the intended meaning of ITS-AID; however this does not cause conflicts.

ITS-AID is an Integer number with various encodings. Two of the possible encodings are:

a) p-encoding;

b) o-encoding.

For p-encoding, ITS-AID shall be of ASN.1 type `ITSaid` specified in A.3, applying unaligned PER[16]. Figure 10 illustrates the p-encoding format of ITS-AID. The bits "Length Control" are ASN.1 CHOICE tags and EXTENSION bits which define the size of the data type. The element "Length indicator N" identifies the number N of octets following this element and containing the value of ITS-AID.

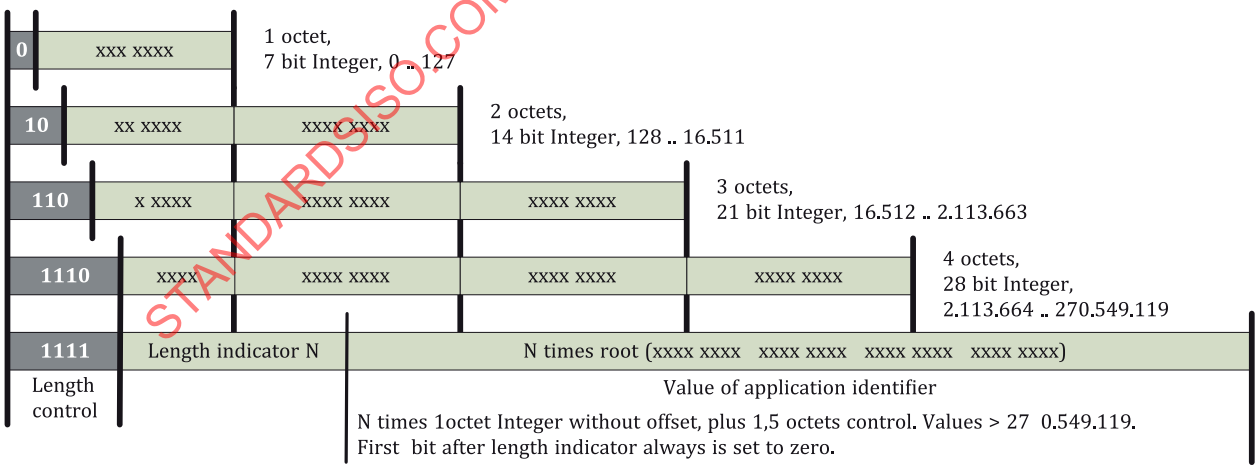

Figure 10 — PER encoded ASN.1 structure of ITS-AID and ITS-MsgSetID

For o-encoding, ITS-AID shall be of ASN.1 type `ITSaidO`, applying OER[17].

P-encoding is used, e.g. in ISO/TS 16460[1], ISO 24102-5[13], ISO 29281-1[15]. O-encoding is used, e.g. in ISO/TS 16460[1].

Table 21 presents the number of octets needed to present an ITS-AID for two different examples of formats and encodings.

Table 21 — Encoded numbers — Required space in octets

ITS-AID (decimal value)	Size in octets	
	p-encoding	o-encoding
0–127	1 octet	2 octets
128–255	2 octets	
256–16.511	2 octets	3 octets
16.512–65.535	3 octets	
65.536–2.113.663	3 octets	4 octets
2.113.664–16.777.215	4 octets	
16.777.216–270.549.119	4 octets	5 octets
270.549.120–4.294.967.295	should not be used, as the required field is not octet-aligned	5 octets
>4.294.967.295		>5 octets

A registration authority for ITS-AID is needed. Requirements related to registration of ITS-AID are specified in 6.2 and 6.9.2.

7.1.3 ITS-SAPID

An ITS application involves at least one ITS-S application process, and may involve several complementary ITS-S application processes. The ITS-S application processes belonging to the same ITS application shall be distinguished by an "ITS-S application process identifier" (ITS-SAPID). ITS-SAPID shall be of ASN.1 type `ITSsapid` specified in A.3. ITS-SAPID is an unsigned Integer number in the range zero through 255. The value zero indicates an unknown ITS-S application process. The ITS-S application processes identified by a specific ITS-AID shall be distinguished by different values of ITS-SAPID in the number range from one through 255.

A registration authority for ITS-SAPID is not needed. Identification of unique values is to be done in the specifications of the respective ITS applications.

7.1.4 ITS-MsgSetID

Every ITS message set designed for usage in a BSMD shall be uniquely identified by a value of the "ITS message set identifier" (ITS-MsgSetID). ITS-MsgSetID shall be of ASN.1 type `ITSmsgSetID` specified in A.3. Figure 10 illustrates the format of ITS-MsgSetID for ASN.1 unaligned PER. The bits "Length Control" are CHOICE and EXTENSION bits which define the size of the data type. The element "Length indicator N" identifies the number N of octets following this element and containing the value of ITS-MsgSetID.

A registration authority for ITS-MsgSetID is needed. Requirements related to registration of ITS-AID are specified in 6.2 and 6.9.2.

7.1.5 ITS-PN

Transport protocols developed for localized communications in ITS with messages standardized in ISO/TS 16460[1], e.g. the ISO "Fast Networking & Transport Protocol" (FNTP) specified in ISO 29281-1[15], may share a common number space for ITS port numbers (ITS-PN). The Integer number space shall be from zero to 65.535. This number space shall be divided into a space for well-known registered port numbers, and a space for dynamic assignments. Acronyms of well-known port numbers together with expected values are presented in Table 22.

Table 22 — ITS port numbers defined for protocols based on the "Localized Message" specified in ISO/TS 16460[1]

ITS-PN	Acronym	Description
0–32767	PORT_REG	Well-known port numbers to be assigned by a registration authority.
0	PORT_UNK	Unknown/don't care.
1	PORT_SAM	FSAP Groupcast manager specified in Reference [13].
2	PORT_FSH	Facilities Service Handler specified in Reference [4].
3–32762		Reserved for future allocation.
32763	PORT_RSMP	Port number of ITS remote station management protocol specified in Reference [10].
32764	PORT_IICP	Port number of ITS station-internal management communication protocol specified in Reference [12].
32765–32767		Reserved for future allocation.
32768–65.535	PORT_DYN	Port numbers dynamically assigned by transport protocols compliant with the localized message specification in ISO/TS 16460[1], e.g. the Fast Network and Transport Protocol (FNTP) specified in ISO 29281-1[15].

ITS-PN shall be of ASN.1 type PortNumber specified in A.3.

A registration authority for ITS-PN is needed. Requirements related to registration of ITS-PN are specified in 6.2 and 6.9.6.

7.1.6 ITS-FlowTypeID

Flow types are part of the requirements for communications to be presented by ITS-S application processes specified in ISO 17423[2]. Management of flows is specified in ISO 24102-6[14]. Identifiers of well-known flow types (ITS-FlowTypeID) need to be globally unique. There shall be a range of dynamically assignable values of ITS-FlowTypeID. Allowed number ranges and initial registered assignments of ITS-FlowTypeID are presented in Table 23.

Table 23 — ITS-FlowTypeIDs

ITS-FlowTypeID	Description
0–61439	Well-known registered values
0	Indicates an unknown flow type
61440–65535	Dynamically assigned values

A registration authority for ITS-FlowTypeID is needed. Requirements related to registration of ITS-FlowTypeID are specified in 6.9.7.

ITS-FlowTypeID shall be of ASN.1 type `FlowTypeID` specified in A.3.

7.1.7 ITS-LCHID

Every "ITS logical channel" (ITS-LCH) shall be uniquely identified by a value of the "ITS logical channel identifier" ITS-LCHID. ITS-LCHID shall be of ASN.1 type `LogicalChannelType` specified in A.3; see Table 24 for initially registered types.

Table 24 — Logical channels

ITS-LCHID	Acronym	Name	Description
0	UNK	Unknown channel type	To be used when no information on a channel type is available or applicable
1	CCH	Control channel	For dissemination and exchange of basic channel control information, communication information, and application management information.
2	SaCH	Service advertisement channel	For advertising of applications and services, e.g. using FSAP specified in ISO/TS 16460[1] and ISO 24102-5[13].
3	SfCH	Safety of life and property channel	For dissemination and exchange of safety of life and property critical information.
4	SCH	Service channel	For exchange of peer to peer ITS-S application process data, and for general message dissemination.

A registration authority for ITS-LCHID is needed. Requirements related to registration of ITS-LCHID are specified in 6.9.8.

7.1.8 ITS-SUID

Every ITS-SU may be uniquely identified by a value of the "ITS-SU identifier" (ITS-SUID). ITS-SUID shall be of ASN.1 type `ITSsuID` specified in A.3.

7.1.9 ITS-SCUID

Every ITS-SCU shall be uniquely identified by a value of the "ITS station communication unit identifier" (ITS-SCUID). ITS-SCUID shall be of ASN.1 type `ITSscuID` specified in A.3.

A registration authority for ITS-SCUID is needed. Requirements related to registration of ITS-SCUID are specified in 6.2 and 6.9.10.

NOTE There is a further unique identifier for ITS-SCUs (ITS-SCU-ID) used in, e.g. the ITS station-internal management communications protocol (IICP) specified in ISO 24102-4[12], the FNTP specified in ISO 29281-1[15], and for ITS station management specified in ISO 24102-1[9]. ITS-SCU-ID is of ASN.1 type `ITS-scuId` specified in A.3.

7.1.10 ITS-S-APPID

Every ITS-S application process provisioner shall be uniquely identified by a value of the "ITS-S application process provisioner identifier" (ITS-S-APPID). ITS-S-APPID shall be of ASN.1 type `ITSSappid` specified in A.3.

A registration authority for ITS-S-APPID is needed. Requirements related to registration of ITS-S-APPID are specified in 6.7 and 6.9.11.

7.1.11 ITS-RRID

Every ITS regulatory region shall be uniquely identified by a value of the "ITS regulatory region identifier" (ITS-RRID). ITS-RRID shall be of ASN.1 type `ITSrrID` specified in A.3.

A registration authority for ITS-RRID is needed. Requirements related to registration of ITS-S-APPID are specified in 6.9.4.

7.1.12 ITS-PRID

Every ITS policy region shall be uniquely identified by a value of the "ITS policy region identifier" (ITS-PRID). ITS-PRID shall be of ASN.1 type `ITSprID` specified in A.3.

A registration authority for ITS-PRID is needed. Requirements related to registration of ITS-PRID are specified in 6.9.5.

7.1.13 ITS-SEMID

Every ITS-S equipment manufacturer shall be uniquely identified by a value of the "ITS-S equipment manufacturer identifier" (ITS-SEMID). ITS-SEMID shall be of ASN.1 type `ITSSemID` specified in A.3.

A registration authority for ITS-SEMID is needed. Requirements related to registration of ITS-SEMID are specified in 6.3 and 6.9.12.

7.1.14 ITS-AOOID

Every ITS application object owner shall be uniquely identified by a value of the "ITS application object owner identifier" (ITS-AOOID). ITS-AOOID shall be of ASN.1 type `ITSaooID` specified in A.3.

A registration authority for ITS-AOOID is needed. Requirements related to registration of ITS-AOOID are specified in 6.2 and 6.9.13.

7.1.15 ITS-ATT

Every ITS access technology type shall be uniquely identified by a value of "ITS Access Technology Type" (ITS-ATT). ITS-ATT shall be of ASN.1 type `ITSatt` specified in A.3. Assigned values are presented in Table 25.

NOTE ITS-ATT originally was specified in ISO 21218[8] with name MedType.

Table 25 — ITS access technology types

ITS-ATT	Access technology standard	Access technology
0	n.a.	Indicates unknown access technology
1	n.a.	Indicates any access technology
2	ISO 21212	2G cellular network technology
3	ISO 21213	3G cellular network technology
4	ISO 21214	Infrared light
5	ISO 21215	802.11 @ 5 GHz
6	ISO 21216	Millimetre waves at 60 GHz
7	ISO 25112	IEEE 802.16e
8	ISO 25113	HC-SDMA
9	ISO 29283	IEEE 802.20
10	ISO 17515-1	LTE cellular network technology
11	ISO 19079	6LowPAN
128	CEN EN 12253	CEN DSRC at 5,8 GHz
254	ISO 11898	CAN wired communications
255	IEEE 802.3	Ethernet wired communications

Registration is done by means of ISO 21218[8] updates, prepared by new access technology standards.

7.1.16 ITS-MSOID

Every ITS message set owner shall be uniquely identified by a value of the "ITS message set owner identifier" (ITS-MSOID). ITS-MSOID shall be of ASN.1 type `ITSmsoID` specified in A.3.

A registration authority for ITS-MSOID is needed. Requirements related to registration of ITS-MSOID are specified in 6.2 and 6.9.14.

7.1.17 ITS-SAPIID

Every instance of an ITS-S application process installed in an ITS-SU shall be uniquely identified by a value of the "ITS-S application process instance identifier". ITS-SAPIID shall be of ASN.1 type `ITSsapiid` specified in A.3 and presented in Table 26.

Table 26 — ITS-S-APDID

`ITSsapiid`	ASN.1 type	Description
`.itsaid`	`ITSaid`	ITS-AID of ITS application object that corresponds with the given ITS-S application process.
`.itssapid`	`ITSsapid`	ITS-S application process identifier of the given ITS application
`.itsscu`	`ITS-scuId`	Unique identifier of an ITS-SCU in an ITS-SU in which the ITS-S application process resides. It is also used as address in the ITS station-internal management communications protocol (IICP) standardized in ISO 24102-4[12]. Values of ITS-scuId are: 0: reserved 1: an ITS-SCU with host role (multicast address) 2: an ITS-SCI with router role (multicast address) 3: an ITS test system specified in ISO/TS 20026[6] 4: a test CI unit specified in ISO/TS 20026[6] 5–65534: unicast addresses of a specific ITS-SCU, to be assigned manually or automatically as specified in ISO 24102-4[12] 65535: any ITS-SCU (broadcast address)
`.instance`	`AppInstance`	Integer identifier unique in an ITS-SCU indicating the instance of an ITS-S application process. Values are: 0: default value, if there is only a single instance of the ITS-S application process in the given ITS-SCU 1–255 Further instances

A registration authority for ITS-SAPIID is not needed.

NOTE The ITS-S application process instance identifier originally was referred to as ApplicationID specified in ISO 24102-1[9]) that consists of only three identifiers, i.e. a globally unique ITS-AID, a globally unique ITS-SCUID, and an instance identifier being unique in a specific ITS-SCU.

7.1.18 ITS-S-APDID

Every ITS-S application process developer shall be uniquely identified by a value of the "ITS-S application process developer identifier" (ITS-S-APDID). ITS-S-APDID shall be of ASN.1 type `ITSSapdID` specified in A.3.

A registration authority for ITS-S-APDID is needed. Requirements related to registration of ITS-S-APDID are specified in 6.4 and 6.9.15.

7.1.19 ITS-SAPSSID

Every sink and source of an instance of an ITS-S application process installed in an ITS-SU shall be uniquely identified by a value of the "ITS-S application process sink source identifier" (ITS-SAPSSID). ITS-SAPSSID shall be of ASN.1 type `ITS-SapSsId` specified in A.3.

A registration authority for ITS-SAPSSID is not needed.

7.1.20 ITS-SecAlgID

Details on an ITS security algorithm identifier, if applicable at all, will be provided in a future version of this document.

7.1.21 ITS-S-FSID

Every ITS-S facilities layer service shall be uniquely identified by a value of the "ITS-S facilities layer identifier" (ITS-S-FSID). ITS-S-FSID shall be of ASN.1 type `ITSSfsID` specified in A.3.

A registration authority for ITS-S-FSID is needed. Requirements related to registration of ITS-S-APDID are specified in 6.9.16.

7.1.22 ITS-SCU-CMCID

Every ITS-SCU Configuration Management Centre (ITS-SCU-CMC) shall be uniquely identified by a value of the "ITS-SCU Configuration Management Centre Identifier" (ITS-SCU-CMCID). ITS-SCU-CMCID shall be of ASN.1 type `ItsScuCmcID` specified in A.3.

A registration authority for ITS-SCU-CMCID is needed. Requirements related to registration of ITS-SCU-CMCID are specified in 6.9.17.

7.1.23 ITS-ProtStckID

Non-parameterized ITS communication protocol stacks (ITS-SCU-CMC) shall be uniquely identified by a value of the "ITS Protocol Stack Identifier" (ITS-ProtStckID). ITS-ProtStckID shall be of ASN.1 `type ITSprotocolStackID` specified in A.3.

A registration authority for ITS-ProtStckID is needed. Requirements related to registration of `ITS-ProtStckID` are specified in 6.9.18.

7.1.24 ITS-ProtID

ITS protocols shall be uniquely identified by a value of the "ITS Protocol Identifier" (ITS-ProtID). ITS-ProtID shall be of ASN.1 type `ITSprotID` specified in A.3.

A registration authority for ITS-ProtID is needed. Requirements related to registration of ITS-ProtID are specified in 6.9.19.

7.2 Online management

7.2.1 Secure installation and maintenance of ITS-S application processes

ITS-S application processes may be installed in an ITS-SCU of an ITS-SU either at time of manufacturing, or in a secured laboratory environment, or with an automated process from an ITS application repository as described in 6.7.

The secure online installation of ITS-S application processes is performed with remote management procedures specified in ISO 24102-2[10].

Details are outside the scope of this document.

7.2.2 Secure installation of ITS-S protocols and control functions

ITS-S protocols can be in the ITS-S access layer, the ITS-S networking and transport layer, the ITS-S facilities layer, the ITS-S management entity and the ITS-S security entity. Installation, update and management of such protocols in an ITS-SU require similar procedures as the installation, update and management of ITS-S application processes.

Details are outside the scope of this document.

7.2.3 Registration of ITS-S application processes with the ITS-S management entity

Registration of ITS-S application processes with the ITS-S management prior to data flow management and communications is necessary.

Details are specified in various standards, e.g. ISO 17423[2], ISO 18750[5], ISO/TS 17429[4], and ISO 22418[13].

7.2.4 Data flow management

Data flow management includes:

— ITS-S communication protocol stack setup for a source of an ITS-S application process and return of FlowID to the ITS-S application process as specified in ISO 17423[2]. This includes consideration of policies and regulation, see ISO 21218[8], ISO 24102-1[9].

— Request by ITS-S applications for registration with the service advertisement manager in the ITS-S management as specified in ISO 24102-5[13].

— Subscription by ITS-S applications to a message/data distribution handler (e.g. LDM) for data elements, messages from ITS message sets, PDUs from an ITS-AID, ..., as specified in ISO/TS 17429[4].

— Registration by ITS-S application to a message/data distribution handler for provisioning of data elements, messages from ITS message sets, own PDUs, ..., as specified in ISO/TS 17429[4].

7.2.5 Management of certificates for real-time communications

Management of certificates for real-time communications is necessary. Details are outside the scope of this document.

7.2.6 Exception reporting

Exception reporting is a necessary system feature. Details are outside the scope of this document.

Annex A
(normative)

ASN.1 modules

A.1 Overview

The ASN.1 basic notation is specified in ISO/IEC 8824-1:2015. The following ASN.1 modules are specified in this normative annex:

— CITSdataDictionary1 {iso(1) standard(0) cits-applMgmt (17419) dataDictionary (1) version1 (1)}

Contains ASN.1 types of general interest for C-ITS.

NOTE It is intended to move the ASN.1 module CITSdataDictionary1 to the ISO online registry CICDR. Once this move is performed, this module will be deprecated in this document. This module gathers ASN.1 definitions that are originally specified in other modules. This approach is to simplify management of ASN.1 modules.

— CITSapplMgmtApplReg2 {iso(1) standard(0) cits-applReg (17419) applRegistry (2) version2 (2)}

Contains definitions related to globally unique identification.

In case the ASN.1 specifications given in this Annex are not compliant with illustrations or specifications provided elsewhere in this document, the specifications given in this Annex shall prevail.

Updates of these ASN.1 modules will be published on http://standards.iso.org/iso/17419/ed-1/en.

Applicable encodings of the types and values defined in the ASN.1 module specified in A.2 and A.3 depend on the usage. ASN.1 BASIC-PER, UNALIGNED, as specified in ISO/IEC 8825-2:2015[16], shall apply if no other explicit requirement on encoding is given.

A.2 Module CITSdataDictionary1

```
CITSdataDictionary1 {iso(1) standard(0) cits-applMgmt (17419) dataDictionary (1) version1
(1)}
DEFINITIONS AUTOMATIC TAGS::=BEGIN

--IMPORTS nothing
-- ;
-- End of IMPORTS

-- Types

-- General data types
-- VarLengthNumber
VarLengthNumber::=CHOICE{
   content   [0]   INTEGER(0..127), -- one octet length
   extension[1]   Ext1
   }
Ext1::=CHOICE{
   content   [0]   INTEGER(128..16511), -- two octets length
   extension [1]   Ext2
}
Ext2::=CHOICE{
   content   [0]   INTEGER(16512..2113663), -- three octets length
   extension [1]   Ext3
   }
Ext3::=INTEGER(2113664..270549119,...) -- four and more octets length

-- VarLengthNumber
```

```
VarLengthNumber2::=CHOICE{
   shortNo    [0] INTEGER(0..127),
   longNo     [1] INTEGER(0..32767)
   }

-- Non-negative Integer
IntZeroMax::=INTEGER (0..MAX)

-- 1, 2, 3, and 4 octet non-negative Integer in UPER
Int1::=INTEGER(0..255)
Int2::=INTEGER(0..65535)
Int3::=INTEGER(0..16777215)
Int4::=INTEGER(0..4294967295)
Int5::=INTEGER(0..1099511627775)
Int6::=INTEGER(0..281474976710655)

-- Priority applicable for several purposes
-- Originally defined in ISO 21218
-- 0: lowest priority
-- 255: highest priority
UserPriority::=Int1

-- Latitude (replaces Lat specified in ISO 21218)
-- Compliant with ISO 16460 and IEEE 1609.3
Latitude::= SEQUENCE{
   fillBit   BIT STRING (SIZE(1)), -- set to '0' (MSB of Latitude)
   lat    INTEGER (-900000000..900000001) -- in degree
   }

-- Longitude (replaces Lon specified in ISO 21218)
-- Compliant with ISO 16460 and IEEE 1609.3
Longitude::= INTEGER (-1800000000..1800000001) -- in degree

-- Altitude (-4000m up to 12777,214 m)
-- See also Elevation in ISO 16460 and IEEE 1609.3 / SAE
-- See also AltitudeValue in ETSI ITS common data dictionary
Altitude::= INTEGER{
   referenceEllipsoidSurface   (0),
   oneMillimeter    (1),
   unknown    (12777215)
   } (-4000000..12777215) -- in millimeter

-- Universal Atomic Time format
-- Originally defined in ISO 21218
Time48IAT::= Int6 -- International Atomic Time with one millisecond steps
c-Time48IAT-utcStartOf2004   Time48IAT::=0
c-Time48IAT-oneMilliSecAfterUTCStartOf2004   Time48IAT::=1

-- Time unit format
-- Originally defined in ISO 21218
TimeUnit::=INTEGER{
   microseconds    (0),
   milliseconds    (1),
   seconds         (2),
   minutes         (3),
   hours           (4),
   days            (5),
   weeks           (6),
   months          (7),
   years           (8)
   }(0..63) -- 6 bits in PER

-- Positive time value
TimeDurationValue::=SEQUENCE {
   value    INTEGER(0..1023), -- (10 bits in PER)
   unit    TimeUnit
   } -- 16 bits in PER

-- Logic value (can be extended with other values)
Logic::=INTEGER{
   false    (0),
```

```
   true    (255)
   } (0..255)

-- Medium cost was originally defined in ISO 17423
MediumCost::=SEQUENCE{
   fill   BIT STRING (SIZE(2)), -- bits set to zero
   costClass   CostClass, -- uses 3 bits
   costAmount  CostAmount OPTIONAL,
   timeUnit    CostTimeUnit OPTIONAL,
   amountUnit  CostAmountUnit OPTIONAL
   }

CostClass::=INTEGER{
   tempUnavailable   (0),
   noCharge          (1),
   flatRate          (2),
   perTime           (3),
   perAmount         (4),
   perConnection     (5)
   } (0..7)

CostAmount::=SEQUENCE{
   currency   INTEGER(0..1023), -- ISO 4217 three digit numeric code
   value   CostValue
   } -- presented in 4 octets

CostValue::=SEQUENCE{
   main       INTEGER(0..4095), -- in currency unit
   fraction   INTEGER(0..1023) -- in 1/1000 of currency unit
   }

CostTimeUnit::=TimeDurationValue


CostAmountUnit::=INTEGER{
   tempUnavailable   (0),
   kbyte             (1),  -- units of kilobytes
   tkbyte            (2),  -- units of tens of kilobytes
   hkbyte            (4),  -- units of hundreds of kilobytes
   mbyte             (8),  -- units in megabytes
   tmbyte            (16), -- units in tens of megabytes
   hmbyte            (32), -- units of hundreds of megabytes
   gbyte             (64), -- units of gigabytes
   tgbyte            (128) -- units of tens of gigabytes
   } (0..255)

-- General port number format
-- As used e.g. for TCP, UDP, FNTP
PortNumber::=Int2

-- This type is needed to fix a bug with TTCN-3 tools (conformance testing)
NullType::=NULL

-- Ethertype format
Ethertype::= Int2

-- The following 48 bit MAC and 64 bit EUI formats originally were specified in ISO 21218
-- EUI64 format
EUI64::=OCTET STRING (SIZE(8))

-- EUI64 encapsulation of MAC48 format
EUI64MAC48::=SEQUENCE{
   oui         MACoui,
   selector2   TwoOCTETones,
   ext         MACext
   }

MACoui::=SEQUENCE{
   uoi1   INTEGER(0..63),
   ulBit  BOOLEAN,
   igBIT  BOOLEAN,
```

```
   uoi2   OCTET STRING (SIZE(2))
   }

TwoOCTETones::=INTEGER{
   all    (65535)
   } (0..65535)

MACext::=OCTET STRING (SIZE(3))

OneOCTETones::=INTEGER{
   all    (255)
   } (0..255)

-- General MAC address format
MACaddress::=OCTET STRING (SIZE(6))

-- IPv6 address format
IPv6Address::=EUI64

-- Values


/*
   The ASN.1 specification has been checked for conformance to the ASN.1
   standards by OSS ASN.1 Syntax Checker, and by OSS ASN-1STEP
*/

END
```

A.3 Module CITSapplMgmtApplReg

```
CITSapplMgmtApplReg2 {iso(1) standard(0) cits-applMgmt (17419) applRegistry (2) version2
(2)}
DEFINITIONS AUTOMATIC TAGS::=BEGIN

IMPORTS
-- C-ITS Data Dictionary (still in ISO 17419)
VarLengthNumber, IntZeroMax, Int1, Int2, Int6, Longitude, Latitude, PortNumber FROM
CITSdataDictionary1 {iso(1) standard(0) cits-applMgmt (17419) dataDictionary (1) version1
(1)}


;

-- End of IMPORTS

-- Types
-- General types
-- ITS Object Name
ITSObName::=UTF8String

-- ITS Object / Entity Owner information
ITSOwnerInfo::=SEQUENCE{
   ownerName      ITSObOwnerName,
   ownerType      ITSObOwnerType,
   ownerAddress   ITSObOwnerAddress,
   ownerOID       ITSObOwnerOID, -- if applicable
   ownerURL       URLreg -- if applicable
   }

-- ITS Object Owner Name
ITSObOwnerName::=UTF8String

ITSObOwnerAddress::=UTF8String

ITSObOwnerOID::=OBJECT IDENTIFIER

-- ITS Object Owner Type
ITSObOwnerType::=INTEGER{
   unknown    (0),
   sdo        (1), -- standard developing organization
```

```
   enterprise (2), -- a registered enterprise
   private    (3) -- a private person
   } (0..255)

-- URL
URLreg::=UTF8String

CountryCode::=UTF8String (SIZE(3)) -- ISO 3166 Alpha-3 code

-- Area definitions
ITSRPAREA::=CLASS{
   &areaRef Int1,
   &Area
   }

ITS-RParea::=SEQUENCE{
   areaTypeNo   ITSRPAREA.&areaRef({ITS-RPareaTypes}),
   areaType     ITSRPAREA.&Area({ITS-RPareaTypes})
   }

ITS-RPareaTypes ITSRPAREA::={rpAreaCountryCode | rpAreaGeoPolygon,...}

rpAreaCountryCode  ITSRPAREA::={&areaRef 0, &Area CountryCode}
rpAreaGeoPolygon   ITSRPAREA::={&areaRef 1, &Area GeoPolygonArea}

GeoPolygonArea::=SEQUENCE{
   inclusions   GeoInclusionAreas,
   exclusions   GeoExclusionAreas
   }

GeoInclusionAreas::=SEQUENCE (SIZE(0..255)) OF GeoPolygon

GeoExclusionAreas::=SEQUENCE (SIZE(0..255)) OF GeoPolygon

GeoPolygon::=SEQUENCE (SIZE(0..65535)) OF GeoCoordinates

GeoCoordinates::=SEQUENCE{
   lat    Latitude,
   long   Longitude
   }

-- Authority identifier
ITS-RegPolicyAuthority::=SEQUENCE{
   name   ITSObOwnerName,
   url    URLreg
   }

PortRxTx::=INTEGER{
   rxPort   (1), -- port number used in receive mode only
   txPort   (2), -- port number used in transmit mode only
   rxtxPort (4) -- port number used in receive and transmit mode
   } (0..255)

ITSprotocol::=SEQUENCE{
   protID    ITSprotID,
   protRef   ITSprotocolReference
   }

ITSprotocolReference::=UTF8String -- Standard reference number

-- End of general types

-- Addresses and identifiers, see 7.1
-- ITS-AID, 7.1.2
-- ITS-AID p-encoding
ITSaid::=VarLengthNumber
-- one value of ITSaid identifies the group of unregistered applications
-- ITS-AID o-encoding
ITSaidO::=INTEGER (0..MAX)

-- ITS-MsgSetID, 7.1.4
```

```
ITSmsgSetID::=IntZeroMax

-- ITS-SAPID, 7.1.3
ITSsapid::=INTEGER{
   apid-unknown    (0),
   apid-default-one    (1)
   }

-- ITS-PN, 7.1.5
-- PortNumber is imported

-- ITS-FlowTypeID, 7.1.6
FlowTypeID::=Int2
c-FlowTypeID-unknown     FlowTypeID::=0
-- well-known registered FlowTypeIDs   1 - 61.439
-- dynamically assigned  FlowTypeIDs   61440 - 65535


-- ITS-LCHID, 7.1.7
LogicalChannelType::=Int2 -- used in 17423, 21218, 24102-1
c-LogicalChannelType-unknown   LogicalChannelType::=0
c-LogicalChannelType-CCH       LogicalChannelType::=1
c-LogicalChannelType-SaCH      LogicalChannelType::=2
c-LogicalChannelType-SfCH      LogicalChannelType::=3
c-LogicalChannelType-SCH       LogicalChannelType::=4

-- ITS-SUID, 7.1.8
ITSsuID::=IntZeroMax

-- ITS-SCUID, 7.1.9
ITSscuID::=SEQUENCE{
   emID   ITSSemID, -- ITS-SU manufacturer ID
   serialNo   ItsScuSerialNumber -- serial number
   }
ItsScuSerialNumber::=IntZeroMax

-- ITS-S-APPID, 7.1.10
ITSSappid::=IntZeroMax

-- ITS-RRID, 7.1.11
ITSrrID::=IntZeroMax

-- ITS-PRID, 7.1.12
ITSprID::=IntZeroMax

-- ITS-SEMID, 7.1.13
ITSSemID::=IntZeroMax

-- IITS-AOOID, 7.1.14
ITSaooID::=IntZeroMax

-- ITS-ATT, 7.1.15 (originally defined in ISO 21218 with name MedType)
ITSatt::=Int1
-- Named values of ITSatt
c-ITSatt-unknown    ITSatt::=0
c-ITSatt-any        ITSatt::=1
c-ITSatt-iso21212   ITSatt::=2 -- 2G
c-ITSatt-iso21213   ITSatt::=3 -- 3G
c-ITSatt-iso21214   ITSatt::=4 -- ITS-IR
c-ITSatt-iso21215   ITSatt::=5 -- ITS-M5
c-ITSatt-iso21216   ITSatt::=6 -- ITS-MM
c-ITSatt-iso25112   ITSatt::=7 -- 802.16e
c-ITSatt-iso25113   ITSatt::=8 -- HC-SDMA
c-ITSatt-iso29283   ITSatt::=9 -- 802.20
c-ITSatt-iso17515   ITSatt::=10 -- LTE
c-ITSatt-iso19079   ITSatt::=11 -- 6LowPAN ISO 19079
c-ITSatt-iso15628   ITSatt::=128 -- DSRC
c-ITSatt-can        ITSatt::=254
c-ITSatt-ethernet   ITSatt::=255

MedType::=ITSatt -- for backward compatibility
```