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Technical Specification

**Intelligent Transport Systems (ITS);
OSI cross-layer topics;
Part 1: Architecture and addressing schemes**

Reference

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Foreword

This Technical Specification (TS) has been produced by ETSI Technical Committee Intelligent Transport System (ITS).

The present document is part 1 of a multi-part deliverable covering OSI cross-layer topics as identified below:

- Part 1: "Architecture and addressing schemes";**
- Part 2: "Management information base";
- Part 3: "Interface between management entity and access layer";
- Part 4: "Interface between management entity and networking & transport layer";
- Part 5: "Interface between management entity and facilities layer";
- Part 6: "Interface between management entity and security entity";
- Part 7: "Interface between security entity and access layer";
- Part 8: "Interface between security entity and networking & transport layer";
- Part 9: "Interface between security entity and facilities layer";
- Part 10: "Interface between access layer and networking & transport layer";
- Part 11: "Interface between networking & transport layer and facilities layer".

Introduction

Intelligent Transport Systems (ITS) are systems to support transportation of goods and humans with information and communication technologies in order to efficiently and safely use the transport infrastructure and transport means (cars, trains, planes, ships). Complementary elements of ITS are standardized in various standardisation organisations such as ISO TC204/CEN TC278 and ETSI TC ITS.

The architecture of communications in ITS (ITSC) specified in [1] and [2] introduces the ITS station reference architecture with the internal functional blocks:

- access layer,
- networking & transport layer,
- facilities layer,
- ITS applications,
- management entity,

- security entity,

and the interfaces between these blocks.

Various general addressing mechanisms, the ITS station management information base, and the details of these interfaces specified in this multi-part deliverable complement the general architecture of ITSC.

This multi-part deliverable partly acts as input to the standards making process for the various protocols of ITSC, but also is built from feed-back from this process.

1 Scope

The present document specifies:

- the architectural approach to interconnect the various layers and entities of the ITS station reference architecture,
- unique addressing schemes for entities in an ITS station,
- station-local management communications,
- common terms and definitions.

2 References

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the reference document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at <http://docbox.etsi.org/Reference>.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

2.1 Normative references

The following referenced documents are necessary for the application of the present document.

- [1] ETSI EN 302 665: "Intelligent Transport Systems (ITS); Communications Architecture".
- [2] ISO 21217: "Intelligent transport systems - Communications access for land mobiles (CALM) - Architecture".
- [3] ISO/DIS 21218: "Intelligent transport systems - Communications access for land mobiles (CALM) - Access technology support".
- [4] ISO 24102-3: "Intelligent transport systems - Communications access for land mobiles (CALM) - ITS station management Part 3: Service access points".
- [5] ISO 24102-4: "Intelligent transport systems - Communications access for land mobiles (CALM) - ITS station management - Part 4: Station-internal management communications".
- [6] ISO 29281-1: "Intelligent transport systems - Communication access for land mobiles (CALM) - Non-IP networking - Part 1: Fast networking & transport layer protocol (FNTP)".

2.2 Informative references

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] ETSI TR 102 707: "Intelligent Transport Systems (ITS); ETSI object identifier tree; ITS domain".
- [i.2] ETSI TS 102 723-2: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 2: Management information base".
- [i.3] ETSI TS 102 723-3: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 3: Interface between management entity and access layer".

- [i.4] ETSI TS 102 723-4: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 4: Interface between management entity and networking & transport layer".
- [i.5] ETSI TS 102 723-5: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 5: Interface between management entity and facilities layer".
- [i.6] ETSI TS 102 723-6: "Intelligent Transport Systems; OSI cross-layer topics; Part 6: Interface between management entity and security entity".
- [i.7] ETSI TS 102 723-7: "Intelligent Transport Systems; OSI cross-layer topics; Part 7: Interface between security entity and access layer".
- [i.8] ETSI TS 102 723-8: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 8: Interface between security entity and network and transport layer".
- [i.9] ETSI TS 102 723-9: "Intelligent Transport Systems; OSI cross-layer topics; Part 9: Interface between security entity and facilities layer".
- [i.10] ETSI TS 102 723-10: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 10: Interface between access layer and networking & transport layer".
- [i.11] ETSI TS 102 723-11: "Intelligent Transport Systems; OSI cross-layer topics; Part 11: Interface between network and transport layers and facilities layer".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in [2] to [5] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in [2] to [5] apply.

4 Architecture of interfaces

The global architecture for communications in ITS specifies the ITS station reference architecture [1] and [2] presented in figure 1.

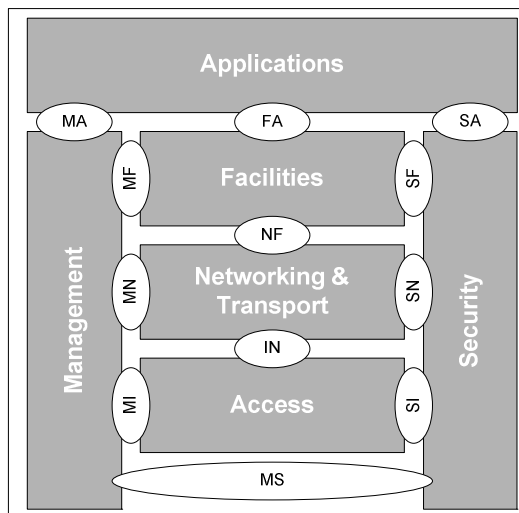


Figure 1: ITS station reference architecture [1] and [2]

This architecture view is based on the ISO / OSI layered communication model as detailed in [1] and [2]. Three protocol layers:

- "Access", "Networking & Transport", "Facilities"

two supporting entities:

- "Management", "Security"

and the user of the communication protocol stack:

- "Applications"

are identified and interconnected via the interfaces IN [3], [i.10], NF [6], [i.11], FA [1], [2], MI [4], [i.3], MN [4], [i.4], MF [4], [i.5], MA [1], [2], MS [4], [i.6], SI [4], [i.7], SN [4], [i.8], SF [4], [i.8] and SA [1], [2].

An interfaces could be:

- A "Service Access Point" (SAP), which does not need to be observable and testable, and which describes the functional behaviour of the interface by means of service primitives.
- An "Application Programming Interface" (API), i.e. a well-defined software interface, which is observable and testable, e.g. an object oriented or function oriented interface from the facilities layer to ITS-S applications.
- An observable and testable interface for the exchange of protocol data units (PDUs).
- A plug-and-play interface, i.e. an observable and testable interface with precise physical, electrical and logical behaviour.

NOTE: Technical details of API, observable interfaces with PDUs and plug-and-play interfaces are not covered in the present document.

5 Interface specifications

The general structure of the following service access points is specified in [4]:

- MI, MN, MF
- MS
- SI, SN, SF

The general structure of the following service access point is specified in [3]:

- IN

There is so far no general structure of the following service access point specified:

- NF

There is so far no general structure of the following interface specified, which is assumed to be an Application Programming Interface (API):

- FA

Details of the functional behaviour of the IN-SAP are specified in [3]. Additional functionality may be specified in [i.10], if applicable.

Details of the functional behaviour of the NF-SAP for the ISO "Fast Networking & Transport Layer Protocol" (FNTP) are specified in [6]. Additional functionality related to other protocols in the ITS-S networking & transport layer may be specified in [i.11], if applicable.

Details of the functional behaviour of the MI-SAP are specified in [4]. Additional functionality may be specified in [i.3], if applicable.

Details of the functional behaviour of the MN-SAP are specified in [4]. Additional functionality may be specified in [i.4], if applicable.

Details of the functional behaviour of the MF-SAP are specified in [4]. Additional functionality may be specified in [i.5], if applicable.

Details of the functional behaviour of the MS-SAP are specified in [4]. Additional functionality may be specified in [i.6], if applicable.

Details of the functional behaviour of the SI-SAP are specified in [4]. Additional functionality may be specified in [i.7], if applicable.

Details of the functional behaviour of the SN-SAP are specified in [4]. Additional functionality may be specified in [i.8], if applicable.

Details of the functional behaviour of the SF-SAP are specified in [4]. Additional functionality may be specified in [i.9], if applicable.

6 Common addressing scheme

6.1 ITS station communication units

The ITS architecture specified in [1] and [2] supports a variety of different implementations of an ITS station, i.e. ranging from a simple single box solution up to complex set-ups with several units. Every unit contains an instance of the management entity presented in figure 1. Such a unit is referred to as "ITS Station Communication Unit" (ITS-SCU) [5].

ITS-SCUs within an ITS sub-system are addressable by means of a unit identifier "ITS-SCU-ID" as specified in [5], if applicable.

6.2 Communication interfaces

An ITS-SCU contains one or more "Communication Interfaces" (CIs), i.e.:

- for station-internal communication via the ITS station-internal network [1], [2] and [5];
- for communications between different instances of an ITS station [1] and [2].

Each CI may maintain relations:

- in MAC broadcast mode with any other CI, identified by a "Broadcast Virtual CI" (BC-VCI);
- in MAC multicast mode with a group of other CIs, identified by a "Multicast Virtual CI" (MC-VCI);
- in MAC unicast mode with other CIs, each of which being identified by a "Unicast Virtual CI" (UC-VCI);

as specified in [3].

CIs and VCIs are identified by a "Link-ID" specified in [3], if applicable.

7 Station-internal management communication

Station-internal management communication, also referred to as "Inter ITS-SCU Communications" (IIC) or Inter-unit management communications (IUMC), may be applicable in case the functionality of an ITS station is implemented in several physical units. IIC may be implemented as specified in [5].

8 Object identifiers

For the set of ITS standards from ETSI, [i.1] specifies the "Object Identifier" (OID) tree to the ETSI ITS domain.

General objects shall use the root given by the ASN.1 OBJECT IDENTIFIER `oidITS` specified in the ASN.1 module `ITSreg { itu-t(0) identified-organization(4) etsi(0) itsDomain(5) wg2(2) version1 (1) }`. Additional branches are under control of ETSI TC ITS.

NOTE: In the first version of [i.1], OIDs to the five working groups of TC ITS were defined with the purpose to have these OIDs representing the mandatory root to standards from these working groups. This approach is being deprecated now, but will still continue to be valid for already published standards.

The OID of ordinary ASN.1 modules, not containing MIBs as specified in [i.2], shall be constructed with the root as specified above, extended with the following branches:

- basic number of the standard, e.g. `<short_name_of_standard> (2723)` for the present document;
- part number, e.g. `part (1)` for the present document, if applicable.

Version information shall be presented either by a further branch, e.g. `version (0)`, or contained in an ASN.1 value parameter, e.g. `iTScITSversion` for the present document.

OIDs of MIBs shall use the tree as presented above with the extension following the branch "part number":

- `<mib_name> (<sequential_number_of_mib>)`.

History

Document history		
V1.1.1	November 2012	Publication