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Intelligent Transport Systems (ITS);
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Part 10: Interface between access layer and networking & transport layer

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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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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 10 of a multi-part deliverable. Full details of the entire series can be found in part 1 [i.10].

Introduction

Intelligent Transport Systems (ITS) are systems to support transportation of humans and goods 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 [3] 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.

The present document acts as input to the standards making process for various interfaces between the access layer and networking & transport layer part of ITSC, but also is built from feed-back from this process.

1 Scope

The present document specifies details of the IN interface located between access layer and networking & transport layer.

The present document specifies:

- Details of the "Service Access Point" (SAP) including a selection of applicable set of services and service primitives;
- Amendment of parameter lists of these services and service primitives fitting ITS needs;
- IN interface related 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.

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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/IEC 7498-1: "Information technology - Open Systems Interconnection - Basic Reference Model: The Basic Model".

[3] ETSI EN 302 663: "Intelligent Transport Systems (ITS); Access layer specification for Intelligent Transport Systems operating in the 5 GHz frequency band".

[4] IEEE Std 802: "IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture".

[5] ISO/IEC 8802-2: "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements; Part 2: Logical link control".

[6] ETSI TS 102 724: "Intelligent Transport Systems (ITS); Harmonized Channel Specifications for Intelligent Transport Systems operating in the 5 GHz frequency band".

[7] ETSI TS 102 636-3: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network architecture".

[8] ETSI TS 102 636-4-1: "Intelligent Transport System (ITS); Vehicular communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 1: Media-Independent Functionality".

[9] IETF RFC 2460: "Internet Protocol, Version 6 (Ipv6) Specification".

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 TS 102 723-3: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 3: Interface between management entity and access layer".

[i.2] ETSI TS 102 723-4: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 4: Interface between management entity and networking & transport layer".

[i.3] ETSI TS 102 723-5: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 5: Interface between management entity and facilities layer".

[i.4] ETSI TS 102 723-6: "Intelligent Transport Systems; OSI cross-layer topics; Part 6: Interface between management entity and security entity".

[i.5] ETSI TS 102 723-7: "Intelligent Transport Systems; OSI cross-layer topics; Part 7: Interface between security entity and access layer".

[i.6] 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.7] ETSI TS 102 723-9: "Intelligent Transport Systems; OSI cross-layer topics; Part 9: Interface between security entity and facilities layer".

[i.8] ETSI TS 102 723-11: "Intelligent Transport Systems; OSI cross-layer topics; Part 11: Interface between networking & transport layer and facilities layer".

[i.9] ISO IS 21218: "Intelligent transport systems - Communications access for land mobiles (CALM) - Medium service access points".

[i.10] ETSI TS 102 723-1: "Intelligent Transport Systems (ITS); OSI cross-layer topics; Part 1: Architecture and addressing schemes".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in [1], [6] and [7] apply.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in [1], [6] and [7] apply.

4 Architecture

4.1 General

The global architecture for communications in ITS which specifies the ITS station (ITS-S) reference architecture [1] shall be as presented in Figure 1.

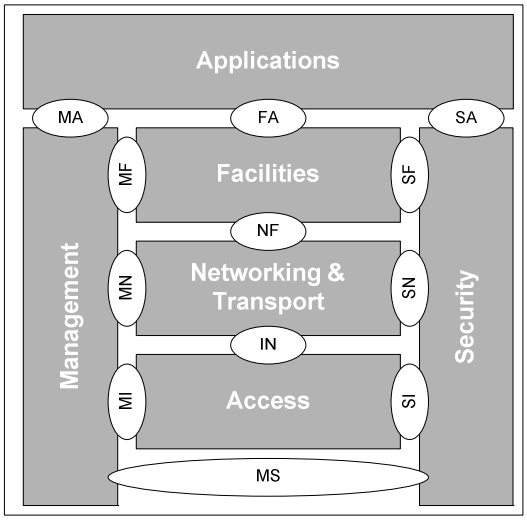

Figure 1: ITS station reference architecture [1]

This architecture view is based on the ISO / OSI layered communication model as detailed in [1] and [2]. It incorporates protocol layers, supporting entities and users (in the form of applications) of the communication protocol stack. The present document specifies the interface between the access layer and the networking and transport layer, the IN interface. Information on the other interfaces (except MA, FA and SA) is in [i.1] through [i.8].

4.2 Access Layer

Figure 2 illustrates the access layer in more detail (the internal structure if for illustration purposes only).

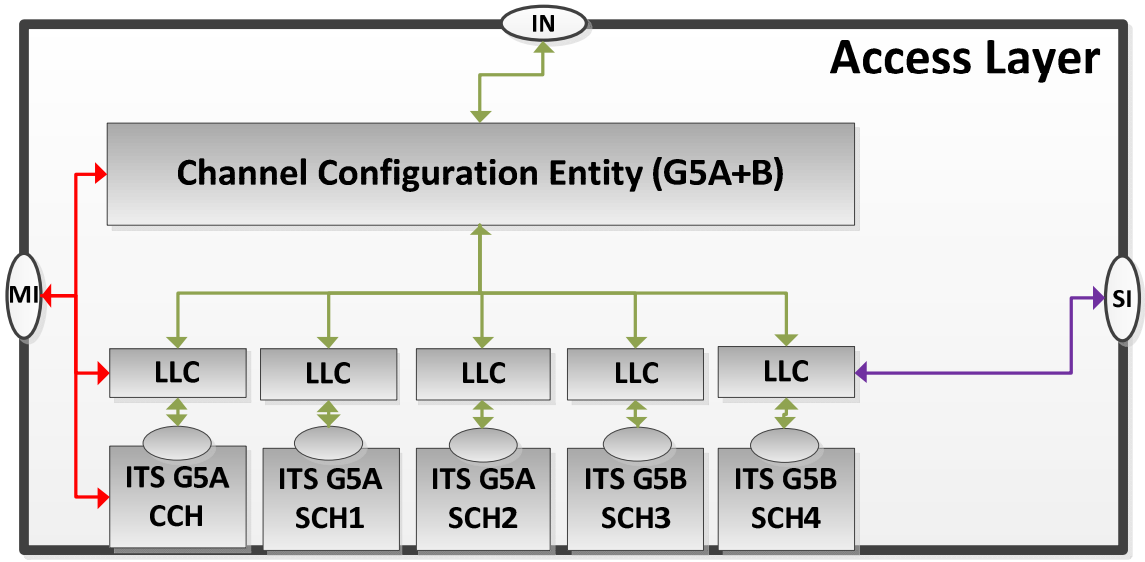

Figure 2: ACCESS Layer

The IN interface presented in Figure 2 is subject of the present document. The MI and SI interfaces are specified in [i.1] and [i.5], respectively. The present document restricts itself to ITS G5A and ITS G5B. It does not consider ITS G5C because it is not fully under DCC control.

The Access Layer consists of the following functional entities:

- The Channel Configuration Entity: The Channel Configuration Entity accepts transmission requests at its IN-SAP, selects a channel to use for this request, processes the request's parameters and forwards the request to the LLC interface of the selected channel. Additional functions like rate control and prioritization may be performed if suitable for the technology. This is specified for G5A and G5B in [6].

- Logical Link Control: Logical Link Control performs protocol multiplexing and layer-2 error and flow control as specified for ITS G5A and G5B in [3], [4] and [5].
- Channels: G5 supports the notion of multiple channels. Each channel is accessed through its Channel SAP. This SAP, however, is introduced here for illustration purposes only; the internal SAPs are not normative.

4.3 Service Access Points

The Access Layer shall support the following Service Access Points:

- The IN-SAP: The IN-SAP of the Access Layer accepts transmission requests from higher layers and delivers received frames on any of its supported technologies. It provides access to the IN Service; the main subject of the present document. The present document is an extension to [i.9]. The IN-SAP is specified in Clause 5.
- The MI SAP: The MI-SAP of the Access Layer provides access to its management functions, i.e. the MI Service.
- The SI SAP: The SI SAP of the Access Layer provides access to its security functions, i.e. the SI Service.

The Channel SAP introduced in the previous clause is for illustration purposes only.

5 IN-SAP

5.1 Basics

The IN-SAP shall provide means for transmission and reception of frames.

5.2 IN-UNITDATA.request

This service primitive requests transmission of a frame. The parameters of the service primitive shall be as follows (optional parameters are marked with '[O]'):

Table 1: IN-UNITDATA.request parameter list

Parameter	Meaning	Default	Notes
CommandRef	Cyclic reference number, incremented after each request. INTEGER (0 to 255)	Start value = 0.	For future reference in a IN-UNITDATA.status.
Protocol [O]	Layer-3 protocol identification.	G5A+B: ETSI GeoNetworking.	LLC / Ethertype / SNAP, see [3] and Clause 5.2.1.
SourceAddress	Source address for the frame.	N.A.	ITS G5 IN-SAP [3].
DestinationAddress	Destination address for the frame.	N.A.	ITS G5 IN-SAP [3].
Data	Payload.	N.A.	MTU restrictions may apply, see [3].
DP-ID	Identification of DP-ID [6]. INTEGER (0 to 255)		The DP-ID ('DCC Profile ID') is explained in [6]. See Clause 5.2.2.
TxParameters [O]	Additional transmit parameters.	None.	See Clause 5.2.3 and Table 2.

5.2.1 Protocol parameter

The 'Protocol' parameter shall identify the layer-3 protocol requesting the transmission of a frame. It defaults to ETSI GeoNetworking [8]. An alternative protocol is IPv6 [9].

5.2.2 DP-ID parameter

DP-IDs are specified in [6]. The service primitive IN-UNITDATA.request shall be passed the DP-ID associated with the payload offered. The DP-ID shall be used to select the channel onto which the transmission of a frame will take place, as well as its Access Category [3]. This information is retrieved from the Management Layer [6] and [i.1].

The DP-ID parameter is only applicable to DCC.

5.2.3 Transmit parameters

For ITS G5A+B, the following transmit parameters (as introduced in Table 1) shall be allowed:

Table 2: Transmit parameter for the IN-UNITDATA.request service primitive

Parameter	Meaning	Default
ServiceClass [O]	QoSAck or QoSNoAck.	Unspecified = use L2 default, see [3].
UseRTS [O]	Use RTS/CTS combo (only allowed for unicast destinations).	Unspecified = use L2 default, see [3].
TxPower [O]	Transmit power, units of 0,5 dBm.	Unspecified = use L2 default, see [3].
MCS [O]	Modulation and coding scheme.	Unspecified = use L2 default, see [3].

5.3 IN-UNITDATA.indication

This service primitive indicates the reception of a frame. The parameters of the service primitive shall be as follows:

Table 3: IN-UNITDATA.indication parameter list

Parameter	Meaning	Notes
Protocol	Layer-3 protocol identification	LLC / Ethertype / SNAP, see [3]
SourceAddress	Source address for the frame	See [3] for format
DestinationAddress	Destination address for the frame	See [3] for format
Data	Payload	
RxParameters	Additional receive parameters	See Table 4

For ITS G5A+B, the allowed receive parameters (as specified in Table 3) shall be as follows:

Table 4: Receive Parameters for the IN-UNITDATA.indication service primitive

Parameter	Meaning
Channel	Channel on which the data was received, see Table 1.
RSSI	Received signal strength indication.
MCS	Modulation and coding scheme used [3].
NOTE: The MCS defines (among others) the net data rate.	

5.4 IN-UNITDATA.status

This service primitive of local significance supplies status information for a corresponding preceding IN-UNITDATA.request service primitive. The parameters of the IN-UNITDATA.status service primitive shall be as follows:

Table 5: IN-UNITDATA.status parameter list

Parameter	Meaning
CommandRef	CommandRef of the IN-UNITDATA.request to which this IN-UNITDATA.status is the response. INTEGER (0 to 255).
SourceAddress	Source address used for the frame [3].
DestinationAddress	Destination address used for the frame [3].
Channel	Channel onto which the frame has been sent, see Table 1.
TxStatus	Transmission status, see [3].
TxParameters	Transmit parameters used see Table 2 and [3].

Annex A (informative): Bibliography

IEEE Std 802.11-2012: "IEEE Standard for Information technology - Telecommunications and information exchange between systems; Local and metropolitan area networks - Specific requirements; Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications", IEEE, 2012.

History

Document history		
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