ETSI TS 102 636-7-2 V1.1.1 (2019-01)

TECHNICAL SPECIFICATION

Intelligent Transport Systems (ITS);
Vehicular Communications;
GeoNetworking;
Part 7: Amendments for LTE-V2X;
Sub-part 2: Amendments to ETSI EN 302 636-5-1
(Basic Transport Protocol)

Reference

DTS/ITS-003178

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Foreword

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

The present document is part 7, sub-part 2 of a multi-part deliverable covering Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking, as identified in part 7, sub-part 1 [1].

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

The Intelligent Transport System (ITS) Communication (ITSC) architecture defined in ETSI EN 302 665 [i.11] is intended to support a variety of existing and new access technologies and ITS applications. The ITS station reference architecture also follows the principles of the Open Systems Interconnection (OSI) model [i.12], in which layering provides modularity and the flexibility to support different protocols at various layers. However, several protocols that have been defined in accordance with the ITSC architecture include cross-layer dependencies on other protocols also intended for use within an ITS station. Recently, a new access layer technology for ITS communication, commonly referred to as LTE-V2X, has been specified by the 3rd Generation Partnership Project (3GPP) [i.1] and [i.2]. It has since been determined that the Basic Transport Protocol (BTP) specified in ETSI EN 302 636-5-1 (V2.1.1) [1] includes dependencies on the access layer technology, and thus amendments to BTP are needed to enable operation in an ITS station that utilizes the LTE-V2X access layer technology.

The present document specifies amendments to the BTP specification as needed to support LTE-V2X as an underlying access layer technology of an ITS station. It is possible that a future revision of ETSI EN 302 636-5-1 [1] could incorporate amendments based on the present document. Upon completion of such revisions to ETSI EN 302 636-5-1 [1], consideration might be given as to whether the present document could be subsequently withdrawn.

1 Scope

The present document specifies amendments to ETSI EN 302 636-5-1 (V2.1.1) [1] to extend BTP for the transport of packets among ITS stations that utilize LTE-V2X as the access layer technology.

2 References

2.1 Normative 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 referenced document (including any amendments) applies.

Referenced documents which are not found to be publicly available in the expected location might be found at https://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.

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

[1] ETSI EN 302 636-5-1 (V2.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol".

2.2 Informative 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 referenced document (including any amendments) applies.

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

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 136 300: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (3GPP TS 36.300 Release 14)".

[i.2] ETSI TS 123 285: "Universal Mobile Telecommunications System (UMTS); LTE; Architecture enhancements for V2X services (3GPP TS 23.285 Release 14)".

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

[i.4] ISO/IEC 8802-2: "Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements; Part 2: Logical Link Control".

[i.5] ETSI TS 102 636-4-2: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 4: Geographical addressing and forwarding for point-to-point and point-to-multipoint communications; Sub-part 2: Media-dependent functionalities for ITS-G5".

[i.6] ETSI TS 136 321: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (3GPP TS 36.321 Release 14)".

[i.7] ETSI TS 136 322: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Link Control (RLC) protocol specification (3GPP TS 36.322 Release 14)".

[i.8]   ETSI TS 136 323: "LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data
            Convergence Protocol (PDCP) specification (3GPP TS 36.323 Release 14)".

[i.9]   ETSI TS 124 334: "Universal Mobile Telecommunications System (UMTS); LTE;
            Proximity-services (ProSe) User Equipment (UE) to ProSe function protocol aspects; Stage 3
            (3GPP TS 24.334 Release 14)".

[i.10]   ETSI TS 124 386: "LTE; User Equipment (UE) to V2X control function; protocol aspects; Stage 3
            (3GPP TS 24.386 Release 14)".

[i.11]   ETSI EN 302 665: "Intelligent Transport Systems (ITS); Communications Architecture".

[i.12]   ISO/IEC 7498-1: "Information technology - Open Systems Interconnection - Basic Reference
            Model: The Basic Model".

[i.13]   ETSI EN 302 636-3: "Intelligent Transport Systems (ITS); Vehicular Communications;
            GeoNetworking; Part 3: Network Architecture".

[i.14]   ETSI EN 302 636-4-1 (V1.3.1): "Intelligent Transport Systems (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".

[i.15]   ETSI TS 102 636-7-1: "Intelligent Transport Systems (ITS); Vehicular Communications;
            GeoNetworking; Part 7: Amendments for LTE-V2X; Sub-part 1: Amendments to ETSI
            EN 302 636-4-1 (Media-Independent Functionality)".

3   Definition of terms, symbols and abbreviations

3.1   Terms

For the purposes of the present document, the terms given in ETSI EN 302 665 [i.11], ETSI EN 302 636-3 [i.13] and
ETSI EN 302 636-5-1 [1] apply.

3.2   Symbols

Void.

3.3   Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 302 665 [i.11], ETSI
EN 302 636-3 [i.13], ETSI EN 302 636-5-1 [1] and the following apply:

BTP	Basic Transport Protocol
FCS	Frame Check Sequence
FSDU	Facilities layer Service Data Unit
ITSC	Intelligent Transport System Communication
LL	Logical Link
LLC	Logical Link Control
LTE	Long Term Evolution
MAC	Medium Access Control
PDCP	Packet Data Convergence Protocol
ProSe	Proximity-Services
RLC	Radio Link Control
SNAP	SubNetwork Access Protocol
UE	User Equipment
V2X	Vehicle-to-Everything

4   Specification compliance

In order to support LTE-V2X as an underlying access layer technology of an ITS station, ETSI
EN 302 636-5-1 (V2.1.1) [1] shall apply with the amendments as specified in the present document.

5   BTP specification amendments

5.1   BTP packet structure

5.1.1   BTP packet structure for ITS-G5 access layer technology

The content of ETSI EN 302 636-5-1 (V2.1.1) [1] clause 6 includes details that are specific to using BTP for transport
of packets among ITS stations that utilize ITS-G5 [i.3] as the access layer technology, but are not clearly identified as
such. For clarity, the content of ETSI EN 302 636-5-1 (V2.1.1) [1] clause 6 is incorporated into this clause
(i.e. clause 5.1.1, the title of which clarifies applicability of the content only to ITS-G5) with amendments as
summarized in table 1.

As specified in ETSI EN 302 636-3 [i.13], the BTP is used in the GeoNetworking protocol stack (ETSI
EN 302 636-3 [i.13], clause 7.3.2).

A BTP packet shall be comprised of the protocol headers and the payload as depicted in figure 1. A BTP packet is
encapsulated in a frame comprising:

- The *MAC header* is the header of the MAC protocol of the ITS-G5 access layer technology. The MAC
  protocol can add additional protocol elements, such as a trailer for the MAC FCS as in ITS-G5 (ETSI
  EN 302 663 [i.3]).

- The *LLC header* is the header of 802.2 LLC/SNAP specified in ISO/IEC 8802-2 [i.4].

- The *GeoNetworking header* is the header of the GeoNetworking packet with an optional security header as
  defined in ETSI EN 302 636-4-1 [i.14] and extended for media-dependent GeoNetworking functionality, such
  as for ITS-G5 as specified in ETSI TS 102 636-4-2 [i.5].

- The *BTP header* is the header of the Basic Transport Protocol as defined in ETSI EN 302 636-5-1 (V2.1.1) [1]
  and the present document.

- The payload represents the user data that is created by upper protocol entities, i.e. the ITS-FSDU, and passed
  to the BTP entity for transmission.

NOTE: The general packet structure is shown as seen by the MAC protocol of the ITS-G5 access layer
          technology.

Lower layer headers			*BTP packet*	
MAC Header	LLC Header	GeoNetworking Header with optional Security Header	BTP header	Payload (optional)

Figure 1: BTP packet structure encapsulated in an ITS-G5 lower layer frame

Table 1: Summary of amendments to content from ETSI EN 302 636-5-1 (V2.1.1) [1] clause 6 as incorporated into the present document

Replacement of phrase identifying applicable technology throughout clause	
Original	*"ITS access technology"*
Amended	ITS-G5 access layer technology
Original	*"ITS-G5 access technology layer"*
Amended	ITS-G5 access layer technology
Clarification of figure title	
Original	*"Figure 3: BTP packet structure encapsulated in a lower layer frame"*
Amended	Figure 1: BTP packet structure encapsulated in an ITS-G5 lower layer frame
Clarification of reference for *BTP header*	
Original	*"as defined in the present document"*
Amended	as defined in ETSI EN 302 636-5-1 (V2.1.1) [1] and the present document
Updating of references throughout clause	
Original	*"[4]"*
Amended	ETSI EN 302 636-3 [i.13]
Original	*"figure 3"*
Amended	figure 1
Original	*"[i.1]"*
Amended	ETSI EN 302 663 [i.3]
Original	*"[i.6]"*
Amended	ISO/IEC 8802-2 [i.4]
Original	*"[5]"*
Amended	ETSI EN 302 636-4-1i.14]
Original	*"[i.2]"*
Amended	ETSI TS 102 636-4-2 [i.5]

5.1.2   BTP packet structure for LTE-V2X access layer technology

As specified in ETSI EN 302 636-3 [i.13], the BTP is used in the GeoNetworking protocol stack (ETSI EN 302 636-3 [i.13], clause 7.3.2).

A BTP packet shall be comprised of the protocol headers and the payload as depicted in figure 2. A BTP packet is encapsulated in a frame comprising:

- The *MAC header* is the header of the Medium Access Control (MAC) protocol of the LTE-V2X access layer technology, as specified in the MAC protocol specification, ETSI TS 136 321 [i.6].

- The *RLC header* is specified in the Radio Link Control (RLC) protocol specification, ETSI TS 136 322 [i.7].

- The *PDCP header* is specified in the Packet Data Convergence Protocol (PDCP) specification, ETSI TS 136 323 [i.8].

- The *Non-IP Type header* is specified in the Proximity-services (ProSe) User Equipment (UE) to ProSe function protocol aspects specification ETSI TS 124 334 [i.9], with settings as specified in the User Equipment (UE) to V2X control function; protocol aspects specification, ETSI TS 124 386 [i.10].

- The *GeoNetworking header* is the header of the GeoNetworking packet with an optional security header as defined in ETSI TS 102 636-7-1 [i.15] and extended as needed for media-dependent GeoNetworking functionality.

- The *BTP header* is the header of the Basic Transport Protocol as defined in ETSI EN 302 636-5-1 (V2.1.1) [1] and the present document.

- The payload represents the user data that is created by upper protocol entities, i.e. the ITS-FSDU, and passed to the BTP entity for transmission.

NOTE: The general packet structure is shown as seen by the MAC protocol of the LTE-V2X access layer technology.

Lower layer headers					BTP packet	
MAC Header	RLC Header	PDCP Header	Non-IP Type Header	GeoNetworking Header with optional Security Header	BTP header	Payload (optional)

Figure 2: BTP packet structure encapsulated in an LTE-V2X lower layer frame

5.2 BTP data services

The description of *GN Communication profile* parameter of the *BTP-Data.request* primitive in clause A.2 of ETSI EN 302 636-5-1 (V2.1.1) [1] is clarified to include LTE-V2X as an example.

The *GN Communication profile* parameter determines the LL protocol entity (e.g. unspecified, ITS-G5, or LTE-V2X).

Table 2: Summary of amendments to content from ETSI EN 302 636-5-1 (V2.1.1) [1] clause A.2 as incorporated into the present document

Clarification of *GN communication profile* example	
Original	*"The GN Communication profile parameter determines the LL protocol entity (e.g. unspecified, ITS-G5)."*
Amended	The *GN Communication profile* parameter determines the LL protocol entity (e.g. unspecified, ITS-G5 or LTE-V2X).

History

Document history		
V1.1.1	January 2019	Publication