SLOVENSKI STANDARD
SIST EN 302 636-5-1 V2.2.1:2019

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Inteligentni transportni sistemi (ITS) - Komunikacije med vozili - Geomreženje - 5. del: Transportni protokoli - 1. poddel: Osnovni transportni protokol

Intelligent Transport Systems (ITS) - Vehicular Communications - GeoNetworking - Part 5: Transport Protocols - Sub-part 1: Basic Transport Protocol

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EUROPEAN STANDARD

Intelligent Transport Systems (ITS);
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GeoNetworking;
Part 5: Transport Protocols;
Sub-part 1: Basic Transport Protocol

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS).

The present document is part 5, sub-part 1 of a multi-part deliverable. Full details of the entire series can be found in part 1 [2].

National transposition dates

Date of adoption of this EN:	16 May 2019
Date of latest announcement of this EN (doa):	31 August 2019
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	29 February 2020
Date of withdrawal of any conflicting National Standard (dow):	29 February 2020

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 Basic Transport Protocol (BTP) provides an end-to-end, connection-less transport service in the ITS ad hoc network. Its main purpose is the multiplexing of messages from different processes at the ITS facilities layer, e.g. CAM and DENM from the cooperative awareness basic service and the distributed environmental notification basic service, for the transmission of packets via the GeoNetworking protocol as well as the de-multiplexing at the destination. BTP enables protocol entities at the ITS facilities layer to access services of the GeoNetworking protocol and to pass protocol control information between the ITS facilities layer and the GeoNetworking protocol.

Message multiplexing/demultiplexing is based on ports, an ITS station-internal 16 bit address. A port represents a communication endpoint that identifies the ITS station protocol entity at the source (source port) or the destination (destination port). The usage of ports is similar to the two-stage packet transport in the IP protocol suite, where the IP provides the routing of packets from source to destination and the transport protocol, such as UDP, multiplexes/demultiplexes messages from/to application processes. In the case of BTP, the GeoNetworking protocol transports the packets among the ITS stations and the BTP protocol delivers the packets to the entities at the ITS facilities layer. BTP also adopts the concept of "well-known ports" from the IP protocol suite that assigns fixed ports to specific ITS facilities layer protocols. The definition of the ports, however, is beyond the scope of the present document.

BTP is a lightweight protocol: it has a 4-byte protocol header and requires minimal processing. It provides an unreliable transport of packets, i.e. packets can arrive out-of-order, appear duplicated or can be lost. The design of BTP assumes that entities using the protocol are either tolerant against the unreliable packet transport or provide appropriate mechanisms for reliable communication in their protocols.

1   Scope

The present document specifies the Basic Transport Protocol (BTP) for the transport of packets among ITS stations. It resides on top of the GeoNetworking protocol specified in ETSI EN 302 636-4-1 [5] and below the ITS-S facilities layer. It provides an end-to-end, connection-less and unreliable transport service.

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 302 665: "Intelligent Transport Systems (ITS); Communications Architecture".

[2]   ETSI EN 302 636-1: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 1: Requirements".

[3]   ETSI EN 302 636-2: "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 2: Scenarios".

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

[5]   ETSI EN 302 636-4-1: "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".

[6]   ETSI TS 103 248: "Intelligent Transport Systems (ITS); GeoNetworking; Port Numbers for the Basic Transport Protocol (BTP)".

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.

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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]   Void.

[i.2]   Void.

[i.3]   ETSI EN 302 637-2: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 2: Specification of Cooperative Awareness Basic Service".

[i.4]   ETSI EN 302 637-3: "Intelligent Transport Systems (ITS); Vehicular Communications; Basic Set of Applications; Part 3: Specifications of Decentralized Environmental Notification Basic Service".

[i.5]   IETF RFC 768: "User Datagram Protocol".

[i.6]   Void.

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 [1], ETSI EN 302 636-3 [4] and the following apply:

BTP-PDU: PDU exchanged between BTP peer entities

destination: receiving BTP entity in the ITS station

destination port: port identifying the destination's protocol entity at the ITS facilities layer

   NOTE: Facilities layer services that do not expect replies either do not include a source port number in the header, or they set it to a default (usually 0) to indicate no reply port available. For session-based services (client-server or peer-to-peer), the source port is often set to a value from an ephemeral (dynamically assigned) subspace of the space of all port numbers.

GN-PDU: PDU exchanged between peer entities of the GeoNetworking protocol

ITS-FPCI: control information passed from the ITS Facilities layer to the BTP

port: ITS station-internal address that identifies a protocol entity at the ITS facilities layer and represents an endpoint of a logical connection

source: originating BTP entity in the ITS station

source port: port number to be used by a facilities layer entity as the destination port in a subsequent reply to the originator

   NOTE: Such an entity may be listening for a reply BTP packet.

3.2   Symbols

Void.

3.3   Abbreviations

For the purposes of the present document, the abbreviations given in ETSI EN 302 665 [1], ETSI EN 302 636-3 [4] and the following apply:

BTP	Basic Transport Protocol
BTP-PDU	Basic Transport Protocol Protocol Data Unit
BTP-SAP	Basic Transport Protocol Service Access Point
GN-PDU	GeoNetworking protocol PDU exchanged between peer entities of the GeoNetworking protocol
GN-SAP	GeoNetworking Service Access Point
ITS-FPCI	ITS Facilities layer Protocol Control Information
ITS-FPDU	ITS Facilities layer Protocol Data Unit
ITS-FSDU	ITS Facilities layer Service Data Unit
LL	Link Layer
PCI	Protocol Control Information
PDU	Protocol Data Unit

| SHB | Single Hop Broadcast |
| TSB | Topologically Scoped Broadcast |

4   Services provided by the Basic Transport Protocol

The Basic Transport Protocol (BTP) provides an end-to-end, connection-less transport service in the ITS ad hoc network (ETSI EN 302 636-3 [4]). Similar to UDP (IETF RFC 768 [i.5]), it offers a minimal transport service, i.e. the non-guaranteed delivery of BTP-PDUs among BTP entities. It also allows protocol entities at the ITS facilities layer to directly access the services provided by the GeoNetworking protocol.

The BTP shall meet the requirements specified in ETSI EN 302 665 [1] and ETSI EN 302 636-1 [2] and support the use cases defined in ETSI EN 302 636-2 [3].

The BTP provides services to ITS facilities layer protocol entities (figure 1), such as cooperative awareness basic service (ETSI EN 302 637-2 [i.3]) and DEN basic service (ETSI EN 302 637-3 [i.4]). The services are provided via the BTP-SAP using service primitives of different types that carry parameters, i.e. Protocol Control Information (ITS-FPCI), and the PDU of the upper protocol entity, i.e. ITS-FPDU. In order to provide its packet transport services, BTP uses the services of the GeoNetworking protocol (ETSI EN 302 636-4-1 [5]).
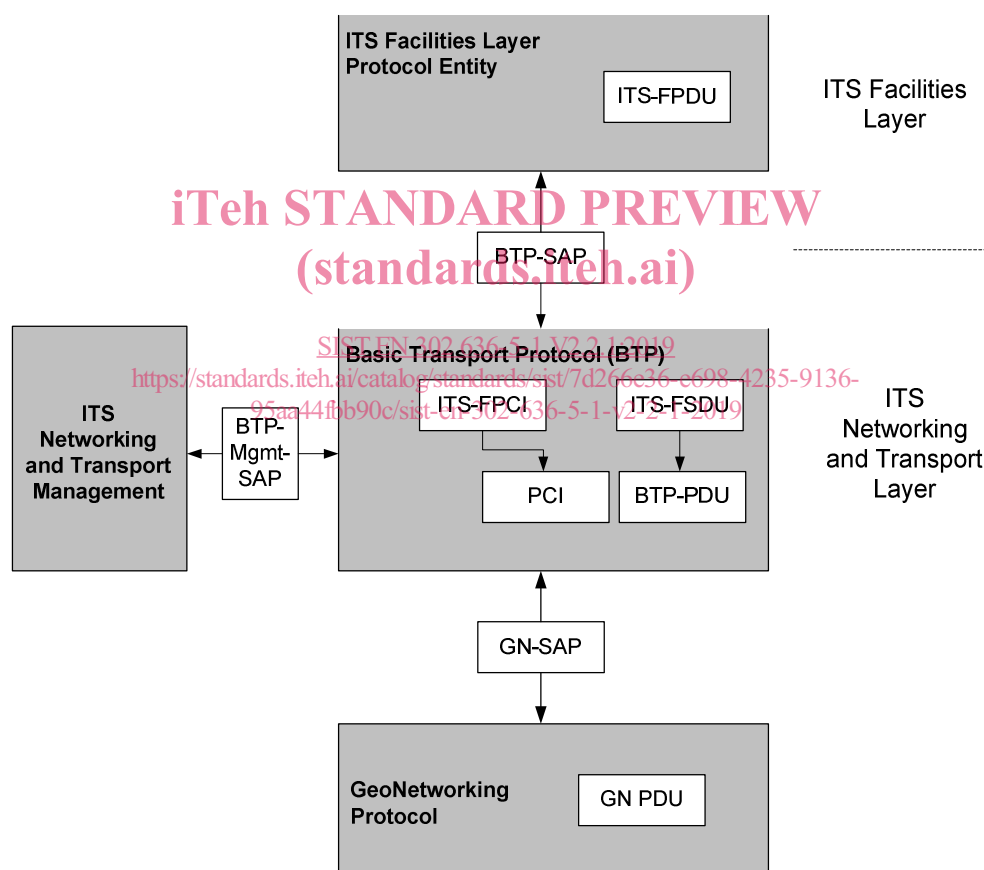

Figure 1: SAPs, SDUs and PDUs relevant for the BTP

The present document specifies the following SAPs:

- BTP-SAP between BTP and the ITS facilities layer; and

- BTP-Mgmt-SAP between the BTP and the ITS Network and Transport Management.

5 Format convention

The basic convention for the specification of packet formats is illustrated in figure 2. The bits are grouped into octets. The bits of an octet are always shown horizontally and are numbered from 0 to 7. Up to 4 octets are shown horizontally; multiple sets of 4 octets are grouped vertically. Octets are numbered from 0 to N-1.
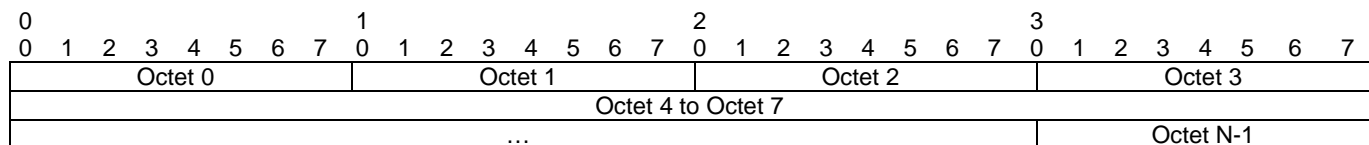
0								1								2								3							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
Octet 0								Octet 1								Octet 2								Octet 3							
Octet 4 to Octet 7																															
…																								Octet N-1							

Figure 2: Format convention

When (a part of) an octet represents a numeric quantity, the leftmost bit in the diagram is the most significant bit. Similarly when a numeric value spans multiple octet fields the leftmost field is the most significant (i.e. Big Endian or Network Byte Order).

EXAMPLE: The decimal value 199 is represented as shown below:

0	1	2	3	4	5	6	7
1	1	0	0	0	1	1	1

6 BTP packet structure

As specified in ETSI EN 302 636-3 [4], the BTP is used in the GeoNetworking protocol stack (ETSI EN 302 636-3 [4], clause 7.3.2).

A BTP packet shall be comprised of the protocol headers and the payload as depicted in figure 3. A BTP packet is encapsulated in a frame comprising:

- The access layer header is the header of the specific ITS access layer technology with which the packet is transmitted.

- The GeoNetworking header is the header of the GeoNetworking packet with an optional security header as defined in ETSI EN 302 636-4-1 [5].

- The BTP header is the header of the Basic Transport Protocol as defined in 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 access technology layer.
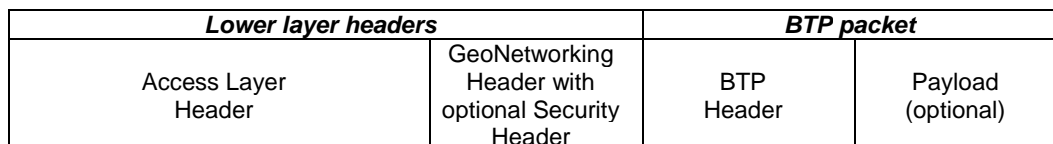
Lower layer headers		BTP packet	
Access Layer Header	GeoNetworking Header with optional Security Header	BTP Header	Payload (optional)

Figure 3: BTP packet structure encapsulated in a lower layer frame

7 BTP header

7.1 Overview

BTP defines two protocol headers:

- BTP-A for interactive packet transport; and