



**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**

Pre-Standard for Review
<https://standards.etsi.org/standards-search/302-636-4-1-1-20-01>
470-a797-6d271a8c02410e0e712578-661d-

ReferenceREN/ITS-00358

Keywordsautonomic networking, ITS, network, safety

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
Sous-Préfecture de Grasse (06) N° 7803/88

Important notice

The present document can be downloaded from:

<http://www.etsi.org/standards-search>

The present document may be made available in electronic versions and/or in print. The content of any electronic and/or print versions of the present document shall not be modified without the prior written authorization of ETSI. In case of any existing or perceived difference in contents between such versions and/or in print, the prevailing version of an ETSI deliverable is the one made publicly available in PDF format at www.etsi.org/deliver.

Users of the present document should be aware that the document may be subject to revision or change of status.

Information on the current status of this and other ETSI documents is available at

<https://portal.etsi.org/TB/ETSIDeliverableStatus.aspx>

If you find errors in the present document, please send your comment to one of the following services:

<https://portal.etsi.org/People/CommiteeSupportStaff.aspx>

Copyright Notification

No part may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm except as authorized by written permission of ETSI.

The content of the PDF version shall not be modified without the written authorization of ETSI.

The copyright and the foregoing restriction extend to reproduction in all media.

© ETSI 2019.

All rights reserved.

DECT™, **PLUGTESTS™**, **UMTS™** and the ETSI logo are trademarks of ETSI registered for the benefit of its Members.

3GPP™ and **LTE™** are trademarks of ETSI registered for the benefit of its Members and of the 3GPP Organizational Partners.

oneM2M™ logo is a trademark of ETSI registered for the benefit of its Members and of the oneM2M Partners.

GSM® and the GSM logo are trademarks registered and owned by the GSM Association.

Contents

| | |
|--|----|
| Intellectual Property Rights | 7 |
| Foreword..... | 7 |
| Modal verbs terminology..... | 7 |
| Introduction | 8 |
| 1 Scope | 9 |
| 2 References | 9 |
| 2.1 Normative references | 9 |
| 2.2 Informative references..... | 9 |
| 3 Definition of terms, symbols and abbreviations..... | 10 |
| 3.1 Terms..... | 10 |
| 3.2 Symbols..... | 11 |
| 3.3 Abbreviations | 11 |
| 4 Services provided by the GeoNetworking protocol | 12 |
| 5 Format convention..... | 13 |
| 6 GeoNetworking address | 14 |
| 6.1 General | 14 |
| 6.2 GeoNetworking address format..... | 14 |
| 6.3 Fields of the GeoNetworking address | 15 |
| 7 Security and privacy..... | 15 |
| 8 Data structures..... | 16 |
| 8.1 Location table..... | 16 |
| 8.1.1 General..... | 16 |
| 8.1.2 Minimum data elements of a <i>Location Table Entry</i> | 16 |
| 8.1.3 Maintenance of the Location Table | 17 |
| 8.2 Ego Position Vector..... | 17 |
| 8.2.1 General..... | 17 |
| 8.2.2 Minimum data elements..... | 17 |
| 8.2.3 Maintenance..... | 17 |
| 8.3 Sequence number | 17 |
| 8.3.1 General..... | 17 |
| 8.3.2 Maintenance..... | 18 |
| 8.4 Location service packet buffer | 18 |
| 8.4.1 General..... | 18 |
| 8.4.2 Buffer size..... | 18 |
| 8.4.3 Maintenance..... | 18 |
| 8.5 Forwarding packet buffer | 19 |
| 8.5.1 General..... | 19 |
| 8.5.2 Buffer size..... | 19 |
| 8.5.3 Maintenance..... | 19 |
| 9 GeoNetworking packet structure and formats | 20 |
| 9.1 Overview | 20 |
| 9.2 Packet structure | 20 |
| 9.2.1 General..... | 20 |
| 9.2.2 Overall packet structure | 20 |
| 9.2.3 Maximum Transmit Unit | 20 |
| 9.3 GeoNetworking header structure..... | 21 |
| 9.4 GeoNetworking <i>Secured Packet</i> | 21 |
| 9.5 Position vectors | 21 |
| 9.5.1 Overview | 21 |
| 9.5.2 <i>Long Position Vector</i> | 21 |
| 9.5.2.1 Structure..... | 21 |

| | | |
|------------|---|----|
| 9.5.2.2 | Fields..... | 22 |
| 9.5.3 | <i>Short Position Vector</i> | 22 |
| 9.5.3.1 | Structure..... | 22 |
| 9.5.3.2 | Fields..... | 23 |
| 9.6 | <i>Basic Header</i> | 23 |
| 9.6.1 | Composition of the <i>Basic Header</i> | 23 |
| 9.6.2 | Fields of the <i>Basic Header</i> | 23 |
| 9.6.3 | Encoding of the <i>NH</i> field in the <i>Basic Header</i> | 24 |
| 9.6.4 | Encoding of the <i>LT</i> field..... | 24 |
| 9.7 | <i>Common Header</i> | 25 |
| 9.7.1 | Composition of the <i>Common Header</i> | 25 |
| 9.7.2 | Fields of the <i>Common Header</i> | 25 |
| 9.7.3 | Encoding of the <i>NH</i> field in the <i>Common Header</i> | 25 |
| 9.7.4 | Encoding of the <i>HT</i> and <i>HST</i> fields..... | 26 |
| 9.7.5 | Encoding of the <i>TC</i> field..... | 26 |
| 9.8 | GeoNetworking packet header types..... | 27 |
| 9.8.1 | Overview..... | 27 |
| 9.8.2 | GUC packet header..... | 27 |
| 9.8.2.1 | Composition of the GUC packet header..... | 27 |
| 9.8.2.2 | Fields of the GUC packet header..... | 28 |
| 9.8.3 | TSB packet header..... | 28 |
| 9.8.3.1 | Composition of the TSB packet header..... | 28 |
| 9.8.3.2 | Fields of the TSB packet header..... | 29 |
| 9.8.4 | SHB packet header..... | 29 |
| 9.8.4.1 | Composition of the SHB packet header..... | 29 |
| 9.8.4.2 | Fields of the SHB packet header..... | 30 |
| 9.8.5 | GBC/GAC packet header..... | 30 |
| 9.8.5.1 | Composition of the GBC/GAC packet header..... | 30 |
| 9.8.5.2 | Fields of the GBC/GAC packet header..... | 31 |
| 9.8.6 | BEACON packet header..... | 31 |
| 9.8.6.1 | Composition of the BEACON packet header..... | 31 |
| 9.8.6.2 | Fields of the BEACON packet header..... | 32 |
| 9.8.7 | LS Request packet header..... | 32 |
| 9.8.7.1 | Composition of the LS Request packet header..... | 32 |
| 9.8.7.2 | Fields of the LS Request packet header..... | 33 |
| 9.8.8 | LS Reply packet header..... | 33 |
| 9.8.8.1 | Composition of the LS Reply packet header..... | 33 |
| 9.8.8.2 | Fields of the LS Reply packet header..... | 34 |
| 10 | Protocol operation..... | 34 |
| 10.1 | General..... | 34 |
| 10.2 | Network management..... | 35 |
| 10.2.1 | Address configuration..... | 35 |
| 10.2.1.1 | General..... | 35 |
| 10.2.1.2 | Auto-address configuration..... | 35 |
| 10.2.1.3 | Managed address configuration..... | 35 |
| 10.2.1.3.1 | General Requirements..... | 35 |
| 10.2.1.3.2 | Initial address configuration..... | 35 |
| 10.2.1.3.3 | Address update..... | 35 |
| 10.2.1.4 | Anonymous address configuration..... | 36 |
| 10.2.1.5 | Duplicate address detection..... | 36 |
| 10.2.2 | Ego position vector and time update..... | 37 |
| 10.2.2.1 | Overview..... | 37 |
| 10.2.2.2 | Ego Position Vector update..... | 37 |
| 10.2.2.3 | Time update..... | 37 |
| 10.2.3 | Beaconing..... | 37 |
| 10.2.4 | Location service..... | 37 |
| 10.3 | Packet handling..... | 38 |
| 10.3.1 | Overview..... | 38 |
| 10.3.2 | <i>Basic Header</i> field settings..... | 39 |
| 10.3.3 | <i>Basic Header</i> processing..... | 39 |
| 10.3.4 | <i>Common Header</i> field settings..... | 41 |

| | | |
|-----------------------------|---|-----------|
| 10.3.5 | Common Header processing | 42 |
| 10.3.6 | Beacon packet handling | 42 |
| 10.3.6.1 | General | 42 |
| 10.3.6.2 | Source operations | 42 |
| 10.3.6.3 | Receiver operations | 44 |
| 10.3.7 | Location service packet handling | 44 |
| 10.3.7.1 | Source operations | 44 |
| 10.3.7.1.1 | Overview | 44 |
| 10.3.7.1.2 | Operation for initial LS Request | 44 |
| 10.3.7.1.3 | Operation for LS Request re-transmission | 45 |
| 10.3.7.1.4 | Operation for LS Reply | 46 |
| 10.3.7.2 | Forwarder operations | 46 |
| 10.3.7.3 | Destination operations | 46 |
| 10.3.8 | GUC packet handling | 48 |
| 10.3.8.1 | General | 48 |
| 10.3.8.2 | Source operations | 48 |
| 10.3.8.3 | Forwarder operations | 50 |
| 10.3.8.4 | Destination operations | 51 |
| 10.3.9 | TSB packet handling | 52 |
| 10.3.9.1 | General | 52 |
| 10.3.9.2 | Source operations | 53 |
| 10.3.9.3 | Forwarder and receiver operations | 54 |
| 10.3.10 | SHB packet handling | 56 |
| 10.3.10.1 | General | 56 |
| 10.3.10.2 | Source operations | 56 |
| 10.3.10.3 | Receiver operations | 57 |
| 10.3.11 | GBC packet handling | 58 |
| 10.3.11.1 | General | 58 |
| 10.3.11.2 | Source operations | 58 |
| 10.3.11.3 | Forwarder and receiver operations | 60 |
| 10.3.12 | GAC packet handling | 62 |
| 10.3.12.1 | General | 62 |
| 10.3.12.2 | Source operations | 62 |
| 10.3.12.3 | Forwarder and receiver operations | 62 |
| Annex A (normative): | Duplicate packet detection | 64 |
| A.1 | General | 64 |
| A.2 | SN-based duplicate packet detection | 64 |
| Annex B (normative): | Packet data rate and geographical area size control | 65 |
| B.1 | Overview | 65 |
| B.2 | Packet data rate control | 65 |
| B.3 | Geographical area size control | 65 |
| Annex C (normative): | Position vector update | 66 |
| C.1 | Overview | 66 |
| C.2 | Update of LocT position vector | 66 |
| C.3 | Update of GeoNetworking packet position vector | 67 |
| Annex D (normative): | GeoNetworking forwarding algorithm selection procedure | 68 |
| Annex E (normative): | Non-area forwarding algorithms | 70 |
| E.1 | Overview | 70 |
| E.2 | Greedy forwarding algorithm | 70 |
| E.3 | Non-area contention-based forwarding algorithm | 71 |

| | | |
|-------------------------------|---|-----------|
| Annex F (normative): | Area forwarding algorithms | 74 |
| F.1 | Overview | 74 |
| F.2 | Simple GeoBroadcast forwarding algorithm..... | 74 |
| F.3 | Area contention-based forwarding algorithm..... | 74 |
| F.4 | Area advanced forwarding algorithm..... | 77 |
| Annex G (normative): | GeoNetworking traffic classification..... | 82 |
| Annex H (normative): | GeoNetworking protocol constants | 83 |
| Annex I (informative): | ASN.1 encoding of the GeoNetworking MIB | 85 |
| I.1 | Use of modules..... | 85 |
| I.2 | ASN.1 module..... | 85 |
| Annex J (informative): | GeoNetworking data services | 92 |
| J.1 | General | 92 |
| J.2 | <i>GN-DATA.request</i> | 92 |
| J.3 | <i>GN-DATA.confirm</i> | 93 |
| J.4 | <i>GN-DATA.indication</i> | 93 |
| Annex K (informative): | GeoNetworking management services | 95 |
| K.1 | General | 95 |
| K.2 | <i>GN-MGMT.request</i> | 95 |
| K.3 | <i>GN-MGMT.response</i> | 95 |
| Annex L (informative): | Interface to the Security entity | 96 |
| L.1 | Security services used by the GeoNetworking protocol..... | 96 |
| Annex M (informative): | Bibliography..... | 97 |
| History | | 98 |

Intellectual Property Rights

Essential patents

IPRs essential or potentially essential to normative deliverables may have been declared to ETSI. The information pertaining to these essential IPRs, if any, is publicly available for **ETSI members and non-members**, and can be found in ETSI SR 000 314: "*Intellectual Property Rights (IPRs); Essential, or potentially Essential, IPRs notified to ETSI in respect of ETSI standards*", which is available from the ETSI Secretariat. Latest updates are available on the ETSI Web server (<https://ipr.etsi.org/>).

Pursuant to the ETSI IPR Policy, no investigation, including IPR searches, has been carried out by ETSI. No guarantee can be given as to the existence of other IPRs not referenced in ETSI SR 000 314 (or the updates on the ETSI Web server) which are, or may be, or may become, essential to the present document.

Trademarks

The present document may include trademarks and/or tradenames which are asserted and/or registered by their owners. ETSI claims no ownership of these except for any which are indicated as being the property of ETSI, and conveys no right to use or reproduce any trademark and/or tradename. Mention of those trademarks in the present document does not constitute an endorsement by ETSI of products, services or organizations associated with those trademarks.

Foreword

This draft European Standard (EN) has been produced by ETSI Technical Committee Intelligent Transport Systems (ITS), and is now submitted for the combined Public Enquiry and Vote phase of the ETSI standards EN Approval Procedure.

The present document is part 4, sub-part 1 of a multi-part deliverable. Full details of the entire series can be found in part 1 [2].

| Proposed national transposition dates | |
|--|---------------------------------|
| Date of latest announcement of this EN (doa): | 3 months after ETSI publication |
| Date of latest publication of new National Standard or endorsement of this EN (dop/e): | 6 months after doa |
| Date of withdrawal of any conflicting National Standard (dow): | 6 months after doa |

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).

"**must**" and "**must not**" are **NOT** allowed in ETSI deliverables except when used in direct citation.

Introduction

The GeoNetworking protocol is a network layer protocol that provides packet routing in an ad hoc network. It makes use of geographical positions for packet transport. GeoNetworking supports the communication among individual ITS stations as well as the distribution of packets in geographical areas.

GeoNetworking can be executed over different ITS access technologies for short-range wireless technologies, such as ITS-G5 and infrared. The ITS access technologies for short-range wireless technologies have many technical commonalities, but also differences. In order to reuse the GeoNetworking protocol specification for multiple ITS access technologies, the specification is separated into media-independent and media-dependent functionalities.

Media-independent functionalities are those which are common to all ITS access technologies for short-range wireless communication to be used for GeoNetworking. The media-dependent functionalities extend the media-independent functionality for a specific ITS access technology. Therefore, the GeoNetworking protocol specification consists of the standard for media-independent functionality and at least one standard for media-dependent functionality. However, it should be noted that the media-dependent extensions do not represent distinct protocol entities.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
Full standard:
<https://standards.iteh.ai/catalog/standards/sist/e712c678-661d-4f70-a797-6d271a8ea584/etsi-en-302-636-4-1-v1.4.1-2020-01>

1 Scope

The present document specifies the media-independent functionality of the GeoNetworking protocol.

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 (V1.1.1): "Intelligent Transport Systems (ITS); Communications Architecture".
- [2] ETSI EN 302 636-1 (V1.2.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 1: Requirements".
- [3] ETSI EN 302 636-2 (V1.2.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 2: Scenarios".
- [4] ETSI EN 302 636-3 (V1.2.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 3: Network architecture".
- [5] Void.
- [6] ETSI EN 302 636-5-1 (V1.2.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 5: Transport Protocols; Sub-part 1: Basic Transport Protocol".
- [7] ETSI EN 302 636-6-1 (V1.2.1): "Intelligent Transport Systems (ITS); Vehicular Communications; GeoNetworking; Part 6: Internet Integration; Sub-part 1: Transmission of IPv6 Packets over GeoNetworking Protocols".
- [8] ETSI EN 302 931 (V1.1.1): "Intelligent Transport Systems (ITS); Vehicular Communications; Geographical Area Definition".
- [9] ETSI TS 102 731: "Intelligent Transport Systems (ITS); Security; Security Services and Architecture".
- [10] ETSI TS 103 097: "Intelligent Transport Systems (ITS); Security; Security header and certificate formats".
- [11] ETSI TS 102 894-2: "Intelligent Transport Systems (ITS); Users and applications requirements; Part 2: Applications and facilities layer common data dictionary".

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] Void.
- [i.2] 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.3] ETSI TS 102 940: "Intelligent Transport Systems (ITS); Security; ITS communications security architecture and security management".
- [i.4] Void.
- [i.5] IETF RFC 2578: "Structure of Management Information Version 2 (SMIPv2)".
- [i.6] National Imagery and Mapping Agency (NIMA), US Department of Defense: "World Geodetic System 1984 - Its Definition and Relation with Local Geodetic Systems", Third Edition - Amendment 1, NIMA TR 8350.2.
- [i.7] IETF RFC 2579: "Textual Conventions for SMIPv2".
- [i.8] IEEE 802.3:2008™: "IEEE Standard for Information Technology - Telecommunications and information exchange between systems-Local and metropolitan area networks - Specific requirements - Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications".
- [i.9] ETSI TS 102 965: "Intelligent Transport Systems (ITS); Application Object Identifier (ITS-AID); Registration".
- [i.10] ETSI TS 103 613: "Intelligent Transport Systems (ITS); Access layer specification for Intelligent Transport Systems using LTE Vehicle to everything communication in the 5,9 GHz frequency band".
- [i.11] 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".

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], ETSI EN 302 636-6-1 [7] and the following apply:

destination: receiver that processes a packet and delivers it to upper protocol entities, but does not relay the packet to other GeoAdhoc routers

forwarder: GeoAdhoc router that processes a packet and relays it to other GeoAdhoc routers

GeoAdhoc router: ad hoc router that implements the GeoNetworking protocol

local position vector: position vector for the local GeoAdhoc router

media dependent procedures: packet handling steps that are specific to the access layer technology over which the GeoNetworking packet will be transmitted

neighbour: GeoAdhoc router in direct (single-hop) communication range

packet: GeoNetworking PDU

packet transport type: method of handling GeoNetworking packets

position accuracy indicator: binary that indicates whether a position is within a specific confidence interval

position vector: position information of a GeoAdhoc router represented by a tuple of address, timestamp, geographical position, speed, heading and corresponding accuracy information

receiver: GeoAdhoc router that processes a packet, delivers its data to upper protocol entities

sender: GeoAdhoc router that has sent the GeoNetworking packet

source: GeoAdhoc router that originates a GeoNetworking packet

traffic class: identifier assigned to a GeoNetworking packet that expresses its requirements on data transport

3.2 Symbols

For the purposes of the present document, the following symbols apply:

| | |
|-------------------|---|
| GEO_MAX | Maximum size of the GeoNetworking packet header |
| H(GN_ADDR) | Heading of the ITS-S GN_ADDR |
| LAT | Latitude |
| LL_ADDR | Link layer address that identifies the ITS-S at the link layer protocol entity in the ITS Access Layer |
| LL_ADDR_NH | Link layer address of the next hop |
| LONG | Longitude |
| LS_PENDING | Location Service pending flag |
| MTU_AL | MTU of the ITS Access Layer |
| PAI(POS, GN_ADDR) | Position accuracy indicator for geographical position POS of the ITS-S GN_ADDR |
| PDR(GN_ADDR) | Packet data rate (exponential moving average) |
| POS(GN_ADDR) | Geographical position of the ITS-S GN_ADDR |
| PV(GN_ADDR) | Position vector of the ITS-S GN_ADDR |
| RAND[x,y] | Function that returns a random (integer) number from a uniform distribution in the given interval [x,y] |
| S(GN_ADDR) | Speed of the ITS-S GN_ADDR |
| SN_MAX | Largest possible value of the sequence number |
| SN(P) | Value of the sequence number field carried in a GeoNetworking packet |
| T(LocTE) | Lifetime of an entry in the location table |
| TO_CBF_MIN | Timeout; minimum duration a packet is buffered in the CBF cache |
| TO_CBF_MAX | Timeout; maximum duration a packet is buffered in the CBF cache |
| TST(GN_ADDR) | Last timestamp received from a GeoAdhoc router |
| TST(P) | Value of the timestamp field carried in a GeoNetworking packet |
| TST(TAI) | Number of elapsed TAI milliseconds since 2004-01-01 00:00:00.000 UTC |

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], ETSI EN 302 636-6-1 [7] and the following apply:

| | |
|------|---------------------------------|
| ASN | Abstract Syntax Notation |
| BC | BroadCast |
| BTP | Basic Transport Protocol |
| CBF | Contention-Based Forwarding |
| DAD | Duplicate Address Detection |
| DE | Destination |
| DPC | Duplicate Packet Counter |
| DPL | Duplicate Packet List |
| DPD | Duplicate Packet Detection |
| EMA | Exponential Moving Average |
| EPV | Ego Position Vector |
| FIFO | First In First Out |
| GAC | Geographically-Scoped Anycast |
| GBC | Geographically-Scoped Broadcast |
| GF | Greedy Forwarding |
| GN | GeoNetworking |

| | |
|---------|--|
| GN_ADDR | GeoNetworking ADDRESS |
| GN6ASL | GeoNetworking to IPv6 Adaptation Sub-Layer |
| GN6-SDU | GN6 Service Data Unit |
| GN-PDU | GeoNetworking Protocol Data Unit |
| GN-SDU | GeoNetworking Service Data Unit |
| GUC | Geographically-Scoped Unicast |
| HST | Header Sub-Type |
| HT | Header Type |
| LL | Link Layer |
| LocT | Location Table |
| LocTE | Location Table Entry |
| LPV | Local Position Vector |
| LS | Location Service |
| LT | LifeTime |
| LTE | Long Term Evolution |
| MAC | Medium Access Control |
| MFR | Most Forward within Radius |
| MHL | Maximum Hop Limit |
| MHVB | Multi-Hop Vehicular Broadcast |
| MIB | Management Information Base |
| MID | MAC ID |
| MTU | Maximum Transmit Unit |
| NH | Next Header |
| PAI | Position Accuracy Indicator |
| PCI | Protocol Control Information |
| PDR | Packet Data Rate |
| PDU | Protocol Data Unit |
| PL | Payload Length |
| POS | POSition |
| PV | Position Vector |
| RHL | Remaining Hop Limit |
| RTC | Retransmit Counter |
| SCF | Store Carry & Forward |
| SDU | Service Data Unit |
| SE | SEnder |
| SHB | Single Hop Broadcast |
| SN | Sequence Number |
| SO | SOUrce |
| SPV | Short Position Vector |
| SSP | Service Specific Permissions |
| ST | Station Type |
| TAI | Temps Atomique International (International Atomic Time) |
| TC | Traffic Class |
| TC ID | Traffic Class Identifier |
| TSB | Topologically Scoped Broadcast |
| T-SDU | Transport Service Data Unit |
| TST | TimeSTamp |
| UC | UniCast |
| V2X | Vehicle-to-Everything |
| UTC | Universal Time Coordinated |
| WGS | World Geodetic System |

4 Services provided by the GeoNetworking protocol

The GeoNetworking protocol is a network protocol that resides in the ITS networking & transport layer. It shall meet the requirements as specified in ETSI EN 302 665 [1]. It is executed in the ad hoc router (ETSI EN 302 636-3 [4]), specifically in the GeoAdhoc router. It provides the transport of packets in the ITS ad hoc network (ETSI EN 302 636-3 [4]). It shall support the requirements specified in ETSI EN 302 636-1 [2] and the scenarios specified in ETSI EN 302 636-2 [3].

The GeoNetworking protocol provides services to upper protocol entities, i.e. the ITS Transport Protocol, such as the Basic Transport Protocol (BTP) as specified in ETSI EN 302 636-5-1 [6], and the GeoNetworking to IPv6 Adaptation Sub-Layer (GN6ASL) as specified in ETSI EN 302 636-6-1 [7]. The services are provided via the GN_SAP using service primitives of different types that carry parameters and the PDU of the upper protocol entity, i.e. T/GN6 PDU (see figure 1). A PDU of the transport protocols is considered as SDU in the GeoNetworking protocol. The SDU is complemented with Protocol Control Information (PCI) and transmitted as GN PDU to the peer entity.

In order to provide its packet transport services, the GeoNetworking protocol uses the services of the ITS Access Layer.

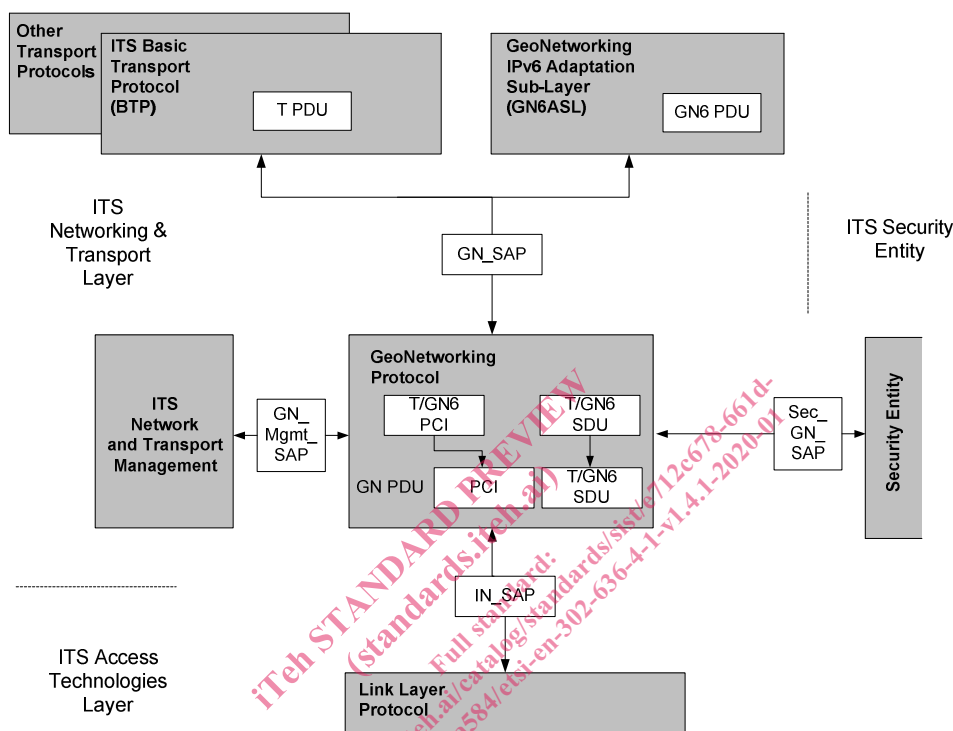


Figure 1: Service primitives, SDUs and PDUs relevant for the GeoNetworking protocol

Figure 1 illustrates the interfaces and SAPs of the ITS networking & transport layer as specified in ETSI EN 302 636-3 [4]. The present document specifies the internal GN_SAP between the GeoNetworking protocol and the ITS transport protocol, such as the Basic Transport Protocol (BTP) as specified in ETSI EN 302 636-5-1 [6], the GeoNetworking IPv6 Adaptation Sub-Layer (GN6ASL) as defined in ETSI EN 302 636-6-1 [7] and other transport protocols, the GN_Mgmt_SAP between the GeoNetworking protocol and the *ITS Networking & Transport Layer Management*, as well as the Sec_GN_SAP between the GeoNetworking protocol and the ITS Security.

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 | 0 | 1 | 2 | 3 | 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