



SLOVENSKI STANDARD
SIST EN 301 347 V6.8.1:2003
01-december-2003

8 [[]HJb]`WV] b]`hY`ca i b]_UW`g_]`g]ghYa `fZuU&ZL`E`Gd`cybUfUX]`g_Ugkcf]hYj `g
dU_Yh]fUb]a]`dcXUh_]`f] DFGK`E`Dfch_c``ti bY]fUb`Uj `; DFG`f] HDL`dfY_]`j a Ygb]_U
; b`]b`; d`f] GA`\$-`" \$zfUh`]]WU*`", "%z]nXUU`%-`+L

Digital cellular telecommunications system (Phase 2+) (GSM); General Packet Radio Service (GPRS); GPRS Tunnelling Protocol (GTP) across the Gn and Gp Interface (GSM 09.60 version 6.8.1 Release 1997)

iTeh STANDARD PREVIEW
(standards.iteh.ai)

<https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37abf578a7/sist-en-301-347-v6-8-1-2003>

Ta slovenski standard je istoveten z: **EN 301 347 Version 6.8.1**

ICS:

33.070.50	Globalni sistem za mobilno telekomunikacijo (GSM)	Global System for Mobile Communication (GSM)
-----------	---	--

SIST EN 301 347 V6.8.1:2003 en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[SIST EN 301 347 V6.8.1:2003](https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37abf578a7/sist-en-301-347-v6-8-1-2003)

<https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37abf578a7/sist-en-301-347-v6-8-1-2003>

ETSI EN 301 347 V6.8.1 (2000-12)

European Standard (Telecommunications series)

**Digital cellular telecommunications system (Phase 2+);
General Packet Radio Service (GPRS);
GPRS Tunnelling Protocol (GTP)
across the Gn and Gp Interface
(GSM 09.60 version 6.8.1 Release 1997)**

iTeh STANDARD PREVIEW
(standards.iteh.ai)

GSM®

GLOBAL SYSTEM FOR
MOBILE COMMUNICATIONS

[SIST EN 301 347 V6.8.1:2003](https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37abf578a7/sist-en-301-347-v6-8-1-2003)

<https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37abf578a7/sist-en-301-347-v6-8-1-2003>



Reference

REN/TSGN-040960Q6R3

Keywords

Digital cellular telecommunications system,
Global System for Mobile communications (GSM)**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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN 301 347 V6.8.1:2003<https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37abf578a7/sist-en-301-347-v6-8-1-2003>

Important notice

Individual copies of the present document can be downloaded from:

<http://www.etsi.org>

The present document may be made available in more than one electronic version or in print. In any case of existing or perceived difference in contents between such versions, the reference version is the Portable Document Format (PDF). In case of dispute, the reference shall be the printing on ETSI printers of the PDF version kept on a specific network drive within ETSI Secretariat.

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 <http://www.etsi.org/tb/status/>

If you find errors in the present document, send your comment to:
editor@etsi.fr

Copyright Notification

No part may be reproduced except as authorized by written permission.
The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 2000.
All rights reserved.

Contents

Intellectual Property Rights	6
Foreword	6
1 Scope	7
2 References	7
3 Definitions and abbreviations	8
3.1 Definitions	8
3.2 Abbreviations	9
4 General	9
5 Transmission order and bit definitions	10
6 GTP header	11
7 Signalling Plane	12
7.1 Signalling protocol	12
7.2 Signalling Message Formats	13
7.3 Usage of the GTP Header	13
7.4 Path Management messages	14
7.4.1 Echo Request	14
7.4.2 Echo Response	14
7.4.3 Version Not Supported	15
7.5 Tunnel Management messages	15
7.5.1 Create PDP Context Request	15
7.5.2 Create PDP Context Response	17
7.5.3 Update PDP Context Request	18
7.5.4 Update PDP Context Response	19
7.5.5 Delete PDP Context Request	20
7.5.6 Delete PDP Context Response	21
7.5.7 Create AA PDP Context Request	21
7.5.8 Create AA PDP Context Response	22
7.5.9 Delete AA PDP Context Request	24
7.5.10 Delete AA PDP Context Response	24
7.5.11 Error Indication	24
7.5.12 PDU Notification Request	25
7.5.13 PDU Notification Response	25
7.5.14 PDU Notification Reject Request	26
7.5.15 PDU Notification Reject Response	27
7.6 Location Management messages	27
7.6.1 Send Routeing Information for GPRS Request	28
7.6.2 Send Routeing Information for GPRS Response	28
7.6.3 Failure Report Request	29
7.6.4 Failure Report Response	29
7.6.5 Note MS GPRS Present Request	30
7.6.6 Note MS GPRS Present Response	30
7.7 Mobility Management messages	30
7.7.1 Identification Request	31
7.7.2 Identification Response	31
7.7.3 SGSN Context Request	32
7.7.4 SGSN Context Response	32
7.7.5 SGSN Context Acknowledge	33
7.8 Reliable delivery of signalling messages	34
7.9 Information elements	34
7.9.1 Cause	35
7.9.2 International Mobile Subscriber Identity (IMSI)	37
7.9.3 Routeing Area Identity (RAI)	37

7.9.4	Temporary Logical Link Identity (TLLI)	38
7.9.5	Packet TMSI (P-TMSI)	38
7.9.6	Quality of Service (QoS) Profile	38
7.9.7	Reordering Required	39
7.9.8	Authentication Triplet	39
7.9.9	MAP Cause	39
7.9.10	P-TMSI Signature	40
7.9.11	MS Validated	40
7.9.12	Recovery	40
7.9.13	Selection mode	41
7.9.14	Flow Label Data I	41
7.9.15	Flow Label Signalling	41
7.9.16	Flow Label Data II	42
7.9.17	Charging ID	42
7.9.18	End User Address	42
7.9.19	MM Context	44
7.9.20	PDP Context	45
7.9.21	Access Point Name	48
7.9.22	Protocol Configuration Options	48
7.9.23	GSN Address	48
7.9.24	MS International PSTN/ISDN Number (MSISDN)	49
7.9.25	Private Extension	49
8	Transmission Plane	49
8.1	Protocol Stack	50
8.1.1	Usage of the GTP Header	50
8.1.1.1	Usage of the Sequence Number	50
8.2	Tunnelling between SGSNs	51
8.3	Tunnelling between GGSNs	51
9	Path Protocols	51
9.1	UDP/IP	51
9.1.1	UDP Header	51
9.1.1.1	Signalling request messages	51
9.1.1.2	Signalling response messages	51
9.1.1.3	Encapsulated T-PDUs	51
9.1.2	IP Header	51
9.1.2.1	Signalling request messages and Encapsulated T-PDUs	51
9.1.2.2	Signalling response messages	52
9.2	TCP/IP	52
9.2.1	TCP Header	52
9.2.2	IP Header	52
10	Error handling	52
10.1	Protocol errors	52
10.1.1	Different GTP versions	53
10.1.2	GTP Message too short	53
10.1.3	Unknown GTP signalling message	53
10.1.4	Unexpected GTP signalling message	53
10.1.5	Missing mandatorily present information element	53
10.1.6	Invalid Length	53
10.1.7	Invalid mandatory information element	53
10.1.8	Invalid optional information element	53
10.1.9	Unknown information element	54
10.1.10	Out of sequence information elements	54
10.1.11	Unexpected information element	54
10.1.12	Repeated information elements	54
10.1.13	Incorrect optional information elements	54
10.2	Path failure	54
10.3	MS detach	54
10.4	Restoration and Recovery	54

11	Inter-PLMN GTP communication over the Gp interface.....	55
12	IP, the networking technology used by GTP.....	55
12.1	IP version.....	55
12.2	IP fragmentation.....	55
12.2.1	MO direction	55
12.2.2	MT direction.....	55
12.2.3	Tunnelling from old to new SGSN	56
13	GTP parameters	56
13.1	Timers.....	56
13.2	Others	56
Annex A (informative): Naming convention		61
A.1	Routing Area Identities	61
A.2	GPRS Support Nodes.....	61
Annex B (informative): A method for sequence number checking		62
Annex C (informative): Document change history		63
History		64

iTeh STANDARD PREVIEW (standards.iteh.ai)

[SIST EN 301 347 V6.8.1:2003](https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37ab578a7/sist-en-301-347-v6-8-1-2003)

<https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37ab578a7/sist-en-301-347-v6-8-1-2003>

Intellectual Property Rights

IPRs essential or potentially essential to the present document 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 (<http://www.etsi.org/ipr>).

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.

Foreword

This European Standard (Telecommunications series) has been produced by ETSI Technical Committee Special Mobile Group (SMG).

The present document defines the Gn and Gp interfaces for the General Packet Radio Service (GPRS) within the digital cellular telecommunications system (Phase 2+).

The contents of the present document are subject to continuing work within SMG and may change following formal SMG approval. Should SMG modify the contents of the present document, it will then be re-submitted for OAP by ETSI with an identifying change of release date and an increase in version number as follows:

Version 6.x.y

where:

- 6 indicates Release 1997 of GSM Phase 2+.
- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated in the specification.

National transposition dates

Date of adoption of this EN:	1 December 2000
Date of latest announcement of this EN (doa):	31 March 2001
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	30 September 2001
Date of withdrawal of any conflicting National Standard (dow):	30 September 2001

1 Scope

The present document defines the Gn and Gp interfaces for the General Packet Radio Service (GPRS).

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies.
- A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.
- For this Release 1997 document, references to GSM documents are for Release 1997 versions (version 6.x.y).

- [1] GSM 01.04: "Digital cellular telecommunications system (Phase 2+); Abbreviations and acronyms".
- [2] GSM 03.03: "Digital cellular telecommunications system (Phase 2+); Numbering, addressing and identification".
- [3] GSM 03.07: "Digital cellular telecommunications system (Phase 2+); Restoration Procedures".
- [4] GSM 03.20: "Digital cellular telecommunications system (Phase 2+); Security related network functions".
- [5] GSM 03.60: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Service Description; Stage 2".
- [6] GSM 03.64: "Digital cellular telecommunications system (Phase 2+); General Packet Radio Service (GPRS); Overall description of the GPRS Radio Interface; Stage 2".
- [7] GSM 04.08: "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 - specification".
- [8] GSM 04.64: "Digital cellular telecommunications system (Phase 2+); Mobile Station - Serving GPRS Support Node (MS-SGSN) Logical Link Control (LLC) Layer Specification".
- [9] GSM 09.02: "Digital cellular telecommunications system (Phase 2+); Mobile Application Part (MAP) specification".

- [10] STD 0005: "Internet Protocol", J. Postel.
- [11] STD 0006: "User Datagram Protocol", J. Postel.
- [12] STD 0007: "Transmission Control Protocol", J. Postel.
- [13] RFC 1700: "Assigned Numbers", J. Reynolds and J. Postel.
- [14] RFC 2181: "Clarifications to the DNS Specification", R. Elz and R. Bush.
- [15] ITU-T Recommendation X.25: "Interface between data terminal equipment (DTE) and data circuit-terminating equipment (DCE) for terminals operating in the packet mode and connected to public data networks by dedicated circuit".
- [16] ITU-T Recommendation X.121: "International Numbering Plan for Public Data Networks".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

conditional: when the presence requirement for the information element is conditional, the receiving protocol level can check the presence or absence of an IE based on the received information

G-PDU: T-PDU plus a GTP header. A G-PDU is sent in a path

GTP-Flow: GTP flow is defined by the unidirectional virtual aggregation of G-PDUs and/or signalling messages related to one or more GTP tunnels. A Flow Label included in the GTP header identifies a GTP flow. The meaning of the Flow Label is transparent for the transmitter side, only the receiver may evaluate the Flow Label

GTP tunnel: GTP tunnel is defined by two associated PDP Contexts in different GSN nodes and is identified with a Tunnel ID. A GTP tunnel is necessary to forward packets between an external packet data network and an MS user

MM Context: information sets held in MS and GSNs for a GPRS subscriber related to mobility management (MM) (please refer to the MM Context Information Element)

MM Context ID: IMSI or equivalent for use in conjunction with Anonymous Access (please refer to section GTP Header)

NSAPI: Network Service Access Point Identifier. An integer value in the range [0; 15], identifying a certain PDP Context. It identifies a PDP context belonging to a specific MM Context ID

path: UDP/IP path and TCP/IP path are examples of paths that may be used to multiplex GTP tunnels

path protocol: Path Protocol is the protocol(s) used as a bearer of GTP between GSNs

PDP: Packet Data Protocol (PDP) is a network protocol used by an external packet data network interfacing to GPRS

PDP Context: information sets held in MS and GSNs for a PDP address (please refer to the PDP Context Information Element)

quality of service: Quality of Service may be applicable for the GPRS backbone if the path media supports it. Separate paths with different priorities may be defined between a GSN pair. However, the possible use of QoS in the GGSN is outside the scope of the GTP specification

signalling message: GTP signalling messages are exchanged between GSN pairs in a path. The signalling messages are used to transfer GSN capability information between GSN pairs and to create, update and delete GTP tunnels

TCP/IP path: TCP/IP path is a reliable connection-oriented path defined by two end-points and an end-point is defined by an IP address and a TCP port number. TCP/IP paths should be used when the T-PDUs are based on connection-oriented protocols, such as the X.25 packet layer protocol

T-PDU: original packet, for example an IP datagram, from an MS or a network node in an external packet data network. A T-PDU is the payload that is tunnelled in the GTP tunnel

TID: Tunnel ID (TID) consists of a MM Context ID and a NSAPI

UDP/IP path: UDP/IP path is a connection-less path defined by two end-points and an end-point is defined by an IP address and a UDP port number. A UDP/IP path carries G-PDUs between GSN nodes related to one or more GTP tunnels. A UDP/IP path should be used when the T-PDUs are based on connection-less protocols, such as IP

3.2 Abbreviations

Abbreviations used in the present document are listed in GSM 01.04.

For the purposes of the present document, the following additional abbreviations apply:

BB	Backbone Bearer
DF	Don't Fragment
FFS	For Further Study
Gn interface	Interface between GPRS Support Nodes (GSNs) within a PLMN
Gp interface	Interface between GPRS Support Nodes (GSNs) in different PLMNs
GTP	GPRS Tunneling Protocol
IANA	Internet Assigned Number Authority
ICMP	Internet Control Message Protocol
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
MTU	Maximum Transmission Unit
QoS	Quality of Service
TCP	Transmission Control Protocol
TID	Tunnel Identifier
UDP	User Datagram Protocol

SIST EN 301 347 V6.8.1:2003

[https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-](https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37abf578a7/sist-en-301-347-v6-8-1-2003)

[1e37abf578a7/sist-en-301-347-v6-8-1-2003](https://standards.iteh.ai/catalog/standards/sist/7ad94883-d6c0-4984-a4a0-1e37abf578a7/sist-en-301-347-v6-8-1-2003)

4 General

The present document defines the GPRS Tunnelling Protocol (GTP), i.e. the protocol between GSN nodes in the GPRS backbone network. It includes both the GTP signalling and data transfer procedures.

GTP is defined both for the Gn interface, i.e. the interface between GSNs within a PLMN, and the Gp interface between GSNs in different PLMNs. These interfaces relevant to GTP are between the grey boxes shown in the figure below.

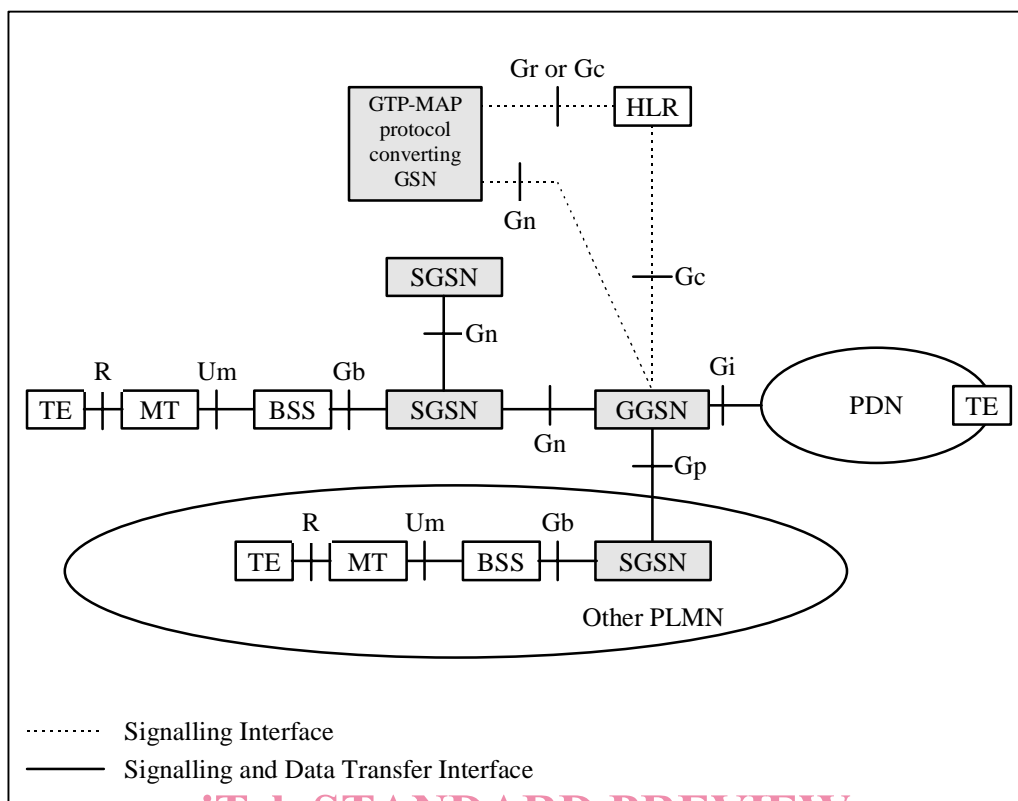


Figure 1: GPRS Logical Architecture with interface name denotations

GTP allows multiprotocol packets to be tunneled through the GPRS Backbone between GPRS Support Nodes (GSNs).

In the signalling plane, GTP specifies a tunnel control and management protocol that allows the SGSN to provide GPRS network access for a MS. Signalling is used to create, modify and delete tunnels.

In the transmission plane, GTP uses a tunnelling mechanism to provide a service for carrying user data packets. The choice of path is dependent on whether the user data to be tunneled requires a reliable link or not.

The GTP protocol is implemented only by SGSNs and GGSNs. No other systems need to be aware of GTP. GPRS MSs are connected to a SGSN without being aware of GTP.

It is assumed that there will be a many-to-many relationship between SGSNs and GGSNs. A SGSN may provide service to many GGSNs. A single GGSN may associate with many SGSNs to deliver traffic to a large number of geographically diverse mobile stations.

5 Transmission order and bit definitions

The messages in the present document shall be transmitted in network octet order starting with octet 1.

The most significant bit of an octet in a GTP message is bit 8. If a value in a GTP message spans several octets and nothing else is stated, the most significant bit is bit 8 of the octet with the lowest number. Where information elements are repeated within a message, the order shall be determined by the order of appearance in the table defining the information elements in the message.

6 GTP header

The GTP header shall be a fixed format 20-octet header used for all GTP messages.

- Version shall be set to 0 to indicate this, the first version of GTP. For the treatment of other versions, see section 10.1.1, "Different GTP versions".
- Spare '1': These unused bits shall be set to '1' by the sending side and shall not be evaluated by the receiving side.
- SNN is a flag indicating if SNDCP N-PDU Number is included or not.
- Message Type indicates the type of GTP message.
- Length indicates the length in octets of the GTP message (G-PDU), excluding the GTP header. Bit 8 of octet 3 is the most significant bit and bit 1 of octet 4 is the least significant bit of the length field.
- Sequence Number is a transaction identity for signalling messages and an increasing sequence number for tunnelled T-PDUs.
- SNDCP N-PDU Number is used at the Inter SGSN Routeing Area Update procedure to co-ordinate the data transmission between the MS and SGSN.
- TID is the tunnel identifier that points out MM and PDP contexts (see Figure 3: Tunnel ID (TID) format).
- The flow label identifies unambiguously a GTP flow.

All fields in the GTP header shall always be present but the content of the fields differs depending on if the header is used for signalling messages (see the sub-section Usage of the GTP Header in the section Signalling Plane) or T-PDUs (see the sub-section Usage of the GTP Header in the section Transmission Plane).

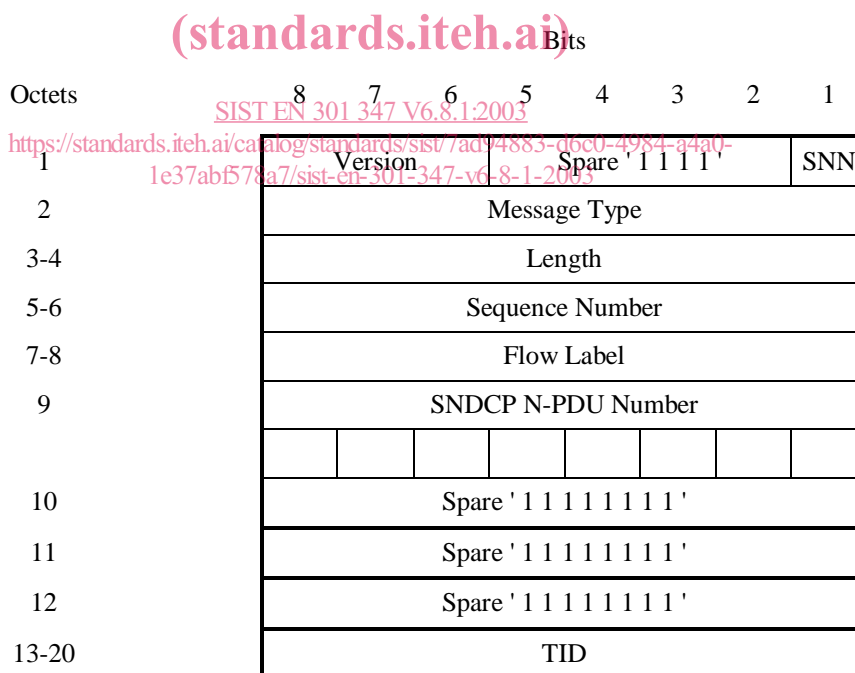


Figure 2: Outline of GTP header

Octets	Bits							
	8	7	6	5	4	3	2	1
	IMSI digit 2				IMSI digit 1			
	IMSI digit 4				IMSI digit 3			
	IMSI digit 6				IMSI digit 5			
	IMSI digit 8				IMSI digit 7			
	IMSI digit 10				IMSI digit 9			
	IMSI digit 12				IMSI digit 11			
	IMSI digit 14				IMSI digit 13			
	NSAPI				IMSI digit 15			

The IMSI is defined in GSM 03.03 (and includes MCC, MNC and MSIN). IMSI digits that are not used shall be coded as '1111' or F(HEX).

NOTE: For Anonymous Access, the MSIN part of the IMSI shall be replaced by a number assigned by the particular PLMN. The assigned number shall not collide with any MSIN used in the PLMN and shall be unique within the PLMN.

Figure 3: Tunnel ID (TID) format

iTeh STANDARD PREVIEW
(standards.iteh.ai)

7 Signalling Plane

The signalling plane in this case relates to GPRS Mobility Management functions like for example GPRS Attach, GPRS Routing Area Update and Activation of PDP Contexts. The signalling between GSN nodes shall be performed by the GPRS Tunnelling Protocol (GTP).

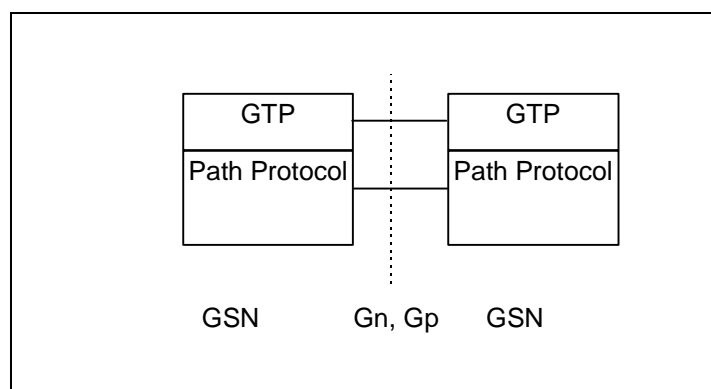


Figure 4: Signalling Plane - Protocol stack

7.1 Signalling protocol

The GTP signalling flow shall be logically associated with, but separate from, the GTP tunnels. For each GSN-GSN pair one or more paths exist. One or more tunnels may use each path. GTP shall be the means by which tunnels are established, used, managed and released. A path may be maintained by keep-alive echo messages. This ensures that a connectivity failure between GSNs can be detected in a timely manner.

7.2 Signalling Message Formats

GTP defines a set of signalling messages between two associated GSNs. The signalling messages to be used are defined in the table below.

Table 1: Signalling messages

Message Type value (Decimal)	Signalling message	Reference
0	For future use. Shall not be sent. If received, shall be treated as an Unknown message.	
1	Echo Request	7.4.1
2	Echo Response	7.4.2
3	Version Not Supported	7.4.3
4-15	For future use. Shall not be sent. If received, shall be treated as an Unknown message.	
16	Create PDP Context Request	7.5.1
17	Create PDP Context Response	7.5.2
18	Update PDP Context Request	7.5.3
19	Update PDP Context Response	7.5.4
20	Delete PDP Context Request	7.5.5
21	Delete PDP Context Response	7.5.6
22	Create AA PDP Context Request	7.5.7
23	Create AA PDP Context Response	7.5.8
24	Delete AA PDP Context Request	7.5.9
25	Delete AA PDP Context Response	7.5.10
26	Error Indication	7.5.11
27	PDU Notification Request	7.5.12
28	PDU Notification Response	7.5.13
29	PDU Notification Reject Request	7.5.14
30	PDU Notification Reject Response	7.5.15
31	For future use. Shall not be sent. If received, shall be treated as an Unknown message.	
32	Send Routing Information for GPRS Request	7.6.1
33	Send Routing Information for GPRS Response	7.6.2
34	Failure Report Request	7.6.3
35	Failure Report Response	7.6.4
36	Note MS GPRS Present Request	7.6.5
37	Note MS GPRS Present Response	7.6.6
38-47	For future use. Shall not be sent. If received, shall be treated as an Unknown message.	
48	Identification Request	7.7.1
49	Identification Response	7.7.2
50	SGSN Context Request	7.7.3
51	SGSN Context Response	7.7.4
52	SGSN Context Acknowledge	7.7.5
53-254	For future use. Shall not be sent. If received, shall be treated as an Unknown message.	
255	T-PDU	8.1.1

7.3 Usage of the GTP Header

For signalling messages the GTP header shall be used as follows:

- SNN shall be set to 0.
- Message Type shall be set to the unique value that is used for each type of signalling message.
- Length shall be the length, in octets, of the signalling message excluding the GTP header.
- SDCP N-PDU Number: this field is not yet used in signalling messages. It shall be set to 255 by the sender and shall be ignored by the receiver.