3GPP TSG CN Plenary Meeting #22 **NP-030512**
10th – 12th December 2003 Maui, USA.

Source: TSG CN WG4

Title: Corrections on Multimedia Broadcast and Multicast Service

Agenda item: 9.8

Document for: APPROVAL

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
29.060	469	2	N4-031313	Rel-6	Introducing MBMS	B	6.2.0

3GPP TSG CN WG4 Meeting #21 **N4-031313**
Bangkok, THAILAND, 27th – 31st October 2003

CR-Form-v7

CHANGE REQUEST

⌘ **29.060** **CR** **469** ⌘ **rev** **2** ⌘ Current version: **6.2.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Introducing MBMS
Source:	⌘	CN4
Work item code:	⌘	MBMS
Date:	⌘	28/10/2003
Category:	⌘	**B**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	MBMS requires new messages and procedures to be added to GTP
Summary of change:	⌘	Introduction of a dedicated section for inclusion of MBMS specific messages, with changes to the reference and overview section to indicate the presence of MBMS. Additionally, the GTP-C header section is updated to describe the use of GTP-C header for MBMS.
Consequences if not approved:	⌘	Delay in MBMS work item.

Clauses affected:	⌘	Sections 2, 3, 4, 7 & 8

	Y	N		
Other specs affected: ⌘		X	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	

Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document.*

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.003: "Numbering, addressing and identification".

[3] 3GPP TS 23.007: "Restoration procedures".

[4] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[5] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".

[6] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[7] 3GPP TS 25.413: "UTRAN Iu interface RANAP signalling".

[8] 3GPP TS 33.102: "3G security; Security architecture".

[9] 3GPP TS 43.020: " Security related network functions".

[10] 3GPP TS 43.064: "Overall description of the GPRS radio interface; Stage 2".

[11] 3GPP TS 44.064: "Mobile Station - Serving GPRS Support Node (MS-SGSN) Logical Link Control (LLC) layer specification".

[12] IETF RFC 791 (STD 0005): "Internet Protocol", J. Postel.

[13] IETF RFC 768 (STD 0006): "User Datagram Protocol", J. Postel.

[14] IETF RFC 1700: "Assigned numbers", J. Reynolds and J. Postel.

[15] IETF RFC 2181: "Clarifications to the DNS specification", R. Elz and R. Bush.

[16] Void.

[17] 3GPP TS 23.121: "Architectural requirements for Release 1999".

[18] 3GPP TS 32.215: "Telecommunication management; Charging management; Charging data description for the Packet Switched (PS) domain".

[19] 3GPP TS 23.236: "Intra domain connection of Radio Access Network (RAN) nodes to multiple Core Network (CN) nodes".

[20] 3GPP TS 48.018: "General Packet Radio Service (GPRS); Base Station System (BSS) - Serving GPRS Support Node (SGSN); BSS GPRS protocol".

[21] 3GPP TR 44.901 (Release 5): "External Network Assisted Cell Change (NACC)".

[22] 3GPP TS 33.210: "3G security; Network Domain Security (NDS); IP network layer security".

[23] 3GPP TS 25.414: "UTRAN Iu interface data transport and transport signalling".

[24] 3GPP TS 23.271: " Technical Specification Group Services and System Aspects; Functional stage 2 description of LCS".

[25] 3GPP TS 23.195: "Provision of User Equipment Specific Behaviour Information (UESBI) to network entities".

[26] 3GPP TS23.246: "Multimedia Broadcast/Multicast Service (MBMS) Architecture and Functional Description"

[27] 3GPP TS29.061: “Interworking beween the Public Land Mobile Network (PLMN) supporting Packet Based Services and Packet Data Networks (PDN)”

3 Definitions and abbreviations

3.1 Definitions

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

G-PDU: is a user data message, It consists of a T-PDU plus a GTP header

GTP Tunnel: in the GTP-U plane is defined for each PDP Context in the GSNs and/or each RAB in the RNC.
A GTP tunnel in the GTP-C plane is defined for all PDP Contexts with the same PDP address and APN (for Tunnel Management messages) or for each MS (for messages not related to Tunnel Management). A GTP tunnel is identified in each node with a TEID, an IP address and a UDP port number. 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)

Network Service Access Point Identifier (NSAPI): 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 is used to multiplex GTP tunnels

Path Protocol: protocol used as a bearer of GTP between GSNs or between a GSN and a RNC

Packet Data Protocol (PDP): 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 (QoS): may be applicable for the GPRS backbone and the Iu interface if the path media supports it Separate paths with different priorities may be defined between a GSN pair or between a GSN and an RNC.

GTP-C Message: GTP-C or control plane messages are exchanged between GSN/RNC pairs in a path
The control plane messages are used to transfer GSN capability information between GSN pairs, to create, update and delete GTP tunnels and for path management.

GTP-U Message: GTP-U or user plane messages are exchanged between GSN pairs or GSN/RNC pairs in a path
The user plane messages are used to carry user data packets, and signalling messages for path management and error indication.

GTP-PDU: GTP Protocol Data Unit is either a GTP-C message or a GTP-U message

Signalling Message: any GTP-PDU except the G-PDU

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-U tunnel.

Traffic Flow Template (TFTs): used by GGSN to distinguish between different user payload packets and transmit packets with different QoS requirements via different PDP context but to the same PDP address

Tunnel Endpoint IDentifier (TEID): unambiguously identifies a tunnel endpoint in the receiving GTP-U or GTP-C protocol entity
The receiving end side of a GTP tunnel locally assigns the TEID value the transmitting side has to use. The TEID values are exchanged between tunnel endpoints using GTP-C (or RANAP, over the Iu) messages.

UDP/IP Path: connection-less unidirectional or bidirectional path defined by two end-points
An IP address and a UDP port number define an end-point. A UDP/IP path carries GTP messages between GSN nodes, and between GSN and RNC nodes related to one or more GTP tunnels.

3.2 Abbreviations

Abbreviations used in the present document are listed in 3GPP TS 21.905 [1]

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

BB	Backbone Bearer
DF	Don't Fragment
FFS	For Further Study
GMLC	Gateway Mobile Location Centre
Gn interface	Interface between GPRS Support Nodes (GSNs) within a PLMN
Gp interface	Interface between GPRS Support Nodes (GSNs) in different PLMNs
GTP	GPRS Tunnelling Protocol
GTP-C	GTP Control
GTP-U	GTP User
IANA	Internet Assigned Number Authority
ICMP	Internet Control Message Protocol
IE	Information Element
IGMP	Internet Group Management Protocol
IP	Internet Protocol
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
MBMS	MultiMedia Broadcast/Multicast Service
MLD	Multicast Listener Discover
MTU	Maximum Transmission Unit
NACC	Network Assisted Cell Change
PUESBINE	Provision of User Equipment Specific Behaviour Information to Network Entities
QoS	Quality of Service
RAN	Radio Access Network
RANAP	Radio Access Network Application Part
RIM	RAN Information Management
RNC	Radio Network Controller
TEID	Tunnel Endpoint IDentifier
TFT	Traffic Flow Template
UDP	User Datagram Protocol
UTRAN	UMTS Terrestrial Radio Access Network

4 General

The present document defines the GPRS Tunnelling Protocol (GTP), i.e. the protocol between GPRS Support Nodes (GSNs) in the UMTS/GPRS backbone network. It includes both the GTP control plane (GTP-C) and data transfer (GTP-U) procedures. GTP also lists the messages and information elements used by the GTP based charging protocol GTP', which is described in 3GPP TS 32.215 [18.

GTP (GTP-C and GTP-U) is defined for the Gn interface, i.e. the interface between GSNs within a PLMN, and for the Gp interface between GSNs in different PLMNs. Only GTP-U is defined for the Iu interface between Serving GPRS Support Node (SGSN) and the UMTS Terrestrial Radio Access Network (UTRAN).

On the Iu interface, the Radio Access Network Application Part (RANAP) protocol and signalling part of GTP-U are performing the control function for user plane (GTP-U).

GTP' is defined for the interface between CDR generating functional network elements and Charging Gateway(s) within a PLMN. Charging Gateway(s) and GTP' protocol are optional, as the Charging Gateway Functionality may either be located in separate network elements (Charging Gateways), or alternatively be embedded into the CDR generating network elements (GSNs) when the GSN-CGF interface is not necessarily visible outside the network element. These interfaces relevant to GTP are between the grey boxes shown in figure 1.

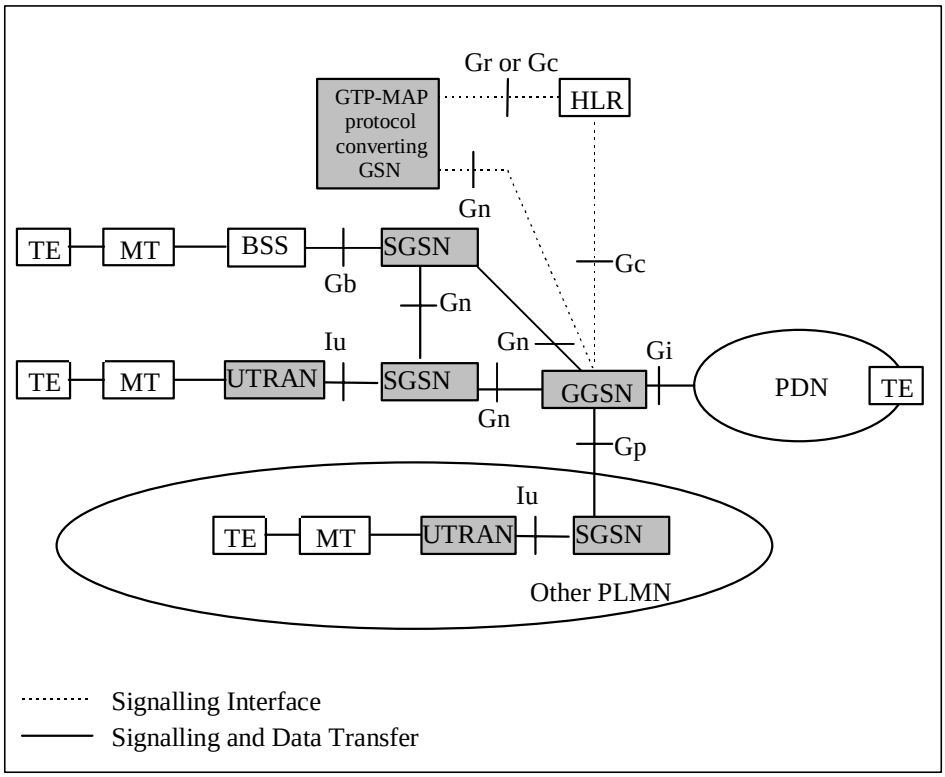

Figure 1: GPRS Logical Architecture with interface name denotations

GTP allows multi-protocol packets to be tunnelled through the UMTS/GPRS Backbone between GSNs and between SGSN and UTRAN.

In the control plane, GTP specifies a tunnel control and management protocol (GTP-C) which allows the SGSN to provide packet data network access for an MS. Control Plane signalling is used to create, modify and delete tunnels. GTP also allows creation, and deletion of a single multicast service tunnel, that can be used for delivering packets to all the users who have joined a particular multicast service.

In the user plane, GTP uses a tunnelling mechanism (GTP-U) to provide a service for carrying user data packets.

The GTP-U protocol is implemented by SGSNs and GGSNs in the UMTS/GPRS Backbone and by Radio Network Controllers (RNCs) in the UTRAN. SGSNs and GGSNs in the UMTS/GPRS Backbone implement the GTP-C protocol. No other systems need to be aware of GTP. UMTS/GPRS MSs are connected to an 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.

SGSN and GGSN implementing GTP protocol version 1 should be able to fallback to GTP protocol version 0. All GSNs should be able to support all earlier GTP versions.

**********NEXT MODIFIED SECTION**********

7 GTP Messages and Message Formats

7.1 Message Formats

GTP defines a set of messages between two associated GSNs or an SGSN and an RNC. The messages to be used are defined in the table below. The three columns to the right define which parts (GTP-C, GTP-U or GTP') that send or receive the specific message type.

Table 1: Messages in GTP

Message Type value (Decimal)	Message	Reference	GTP-C	GTP-U	GTP'
0	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
1	Echo Request	7.2.1	X	X	x
2	Echo Response	7.2.2	X	X	x
3	Version Not Supported	7.2.3	X		x
4	Node Alive Request	3GPP TS 32.215 [18]			X
5	Node Alive Response	3GPP TS 32.215 [18]			X
6	Redirection Request	3GPP TS 32.215 [18]			X
7	Redirection Response	3GPP TS 32.215 [18]			X
8-15	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
16	Create PDP Context Request	7.3.1	X		
17	Create PDP Context Response	7.3.2	X		
18	Update PDP Context Request	7.3.3	X		
19	Update PDP Context Response	7.3.4	X		
20	Delete PDP Context Request	7.3.5	X		
21	Delete PDP Context Response	7.3.6	X		
22-25	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
26	Error Indication	7.3.7		X	
27	PDU Notification Request	7.3.8	X		
28	PDU Notification Response	7.3.9	X		
29	PDU Notification Reject Request	7.3.10	X		
30	PDU Notification Reject Response	7.3.11	X		
31	Supported Extension Headers Notification	7.2.4	X	X	
32	Send Routeing Information for GPRS Request	7.4.1	X		
33	Send Routeing Information for GPRS Response	7.4.2	X		
34	Failure Report Request	7.4.3	X		
35	Failure Report Response	7.4.4	X		
36	Note MS GPRS Present Request	7.4.5	X		
37	Note MS GPRS Present Response	7.4.6	X		
38-47	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
48	Identification Request	7.5.1	X		
49	Identification Response	7.5.2	X		
50	SGSN Context Request	7.5.3	X		
51	SGSN Context Response	7.5.4	X		
52	SGSN Context Acknowledge	7.5.5	X		
53	Forward Relocation Request	7.5.6	X		
54	Forward Relocation Response	7.5.7	X		
55	Forward Relocation Complete	7.5.8	X		
56	Relocation Cancel Request	7.5.9	X		
57	Relocation Cancel Response	7.5.10	X		
58	Forward SRNS Context	7.5.13	X		
59	Forward Relocation Complete Acknowledge	7.5.11	X		
60	Forward SRNS Context Acknowledge	7.5.12	X		

Message Type value (Decimal)	Message	Reference	GTP-C	GTP-U	GTP'
61-69	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
70	RAN Information Relay	7.5.14.1	X		
71-~~239~~995	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
~~100~~96	MBMS Notification Request		X		
~~101~~97	MBMS Notification Response		X		
~~102~~98	MBMS Notification Reject Request		X		
~~103~~99	MBMS Notification Reject Response		X		
~~104~~100	Create MBMS Context Request		X		
~~105~~101	Create MBMS Context Response		X		
~~106~~102	Update MBMS Context Request		X		
~~107~~103	Update MBMS Context Response		X		
~~108~~104	Delete MBMS Context Request		X		
~~109~~105	Delete MBMS Context Response		X		
~~110-119~~ 106 - 111	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
~~120~~112	MBMS Registration Request		X		
~~121~~113	MBMS Registration Response		X		
~~122~~114	MBMS De-Registration Request		X		
~~123~~115	MBMS De-Registration Response		X		
~~124~~116	MBMS Session Start Request		X		
~~125~~117	MBMS Session Start Response		X		
~~126~~118	MBMS Session Stop Request		X		
~~127~~119	MBMS Session Stop Response		X		
~~128~~120 -239	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
240	Data Record Transfer Request	3GPP TS 32.215 [18]			X
241	Data Record Transfer Response	3GPP TS 32.215 [18]			X
242-254	For future use. Shall not be sent. If received, shall be treated as an Unknown message.				
255	G-PDU	9.3.1		X	

**********NEXT MODIFIED SECTION**********

7.5.14.1 RAN Information Relay

All information elements from the RAN INFORMATION messages, starting from and including the BSSGP 'PDU type', shall be contained within the RAN Transparent Container and forwarded to the destination SGSN in the RAN Information Relay message. For handling of protocol errors the RAN Information Relay message is treated as a Response message.

The optional Private Extension contains vendor or operator specific information.

Table 7.5.14.1: Information Elements in a RAN Information Relay

Information element	Presence requirement	Reference
RAN Transparent Container	Mandatory	7.7.43
Private Extension	Optional	7.7.46

7.x MBMS Messages

The MBMS messages defined here are control plane messages that are used in accordance with 3GPP TS 23.246 [26]. These are further categorised into control plane messages related to UE specific MBMS signalling, and control plane messages related to MBMS service specific signalling.

7.x.1 UE Specific MBMS Messages

7.x.1.1 MBMS Notification Request

When receiving an IGMP/MLD join message within a G-PDU, an MBMS capable GGSN shall initiate the authorisation procedure towards the BM-SC as outlined within TS2~~0~~9.061 [27]. Upon successful authorisation, the GGSN sends an MBMS Notification Request message to the SGSN from where the G-PDU was received. The IP address of the SGSN shall be derived from the address currently stored in the GGSN under the SGSN Address for Control Plane for the UE's active PDP context.

The End User Address information element contains the PDP type and IP Multicast PDP address that the SGSN shall request the MS to activate. The IP multicast address shall be the one requested by the UE in the Join request.

The Access Point Name information element identifies the access point of packet data network that the UE should connect to receive the required MBMS service. It should be noted that the APN may resolve to a GGSN that is different from the GGSN sending the MBMS Notification Request. The configuration of this APN may be based on subscription information in the GGSN and is outside the scope of the standardisation.

The ~~Linked IGMP/MLD~~ NSAPI information element is the NSAPI of the PDP context over which the IGMP/MLD join message was received.

The GGSN shall include a GGSN Address for control plane. The SGSN shall store this GGSN Address and use it when sending control plane messages to the GGSN.

The Tunnel Endpoint Identifier Control Plane information element shall be a tunnel endpoint identifier Control Plane selected by the GGSN and shall be used by the SGSN in the GTP header of the corresponding MBMS Notification Response or MBMS Notification Request Reject message.

Table XX: Information Elements in an MBMS Notification Request

Information element	Presence requirement	Reference
IMSI	Mandatory	7.7.2
Tunnel Endpoint Identifier Control Plane	Mandatory	7.7.14
NSAPI	Mandatory	7.7.17
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
~~Linked IGMP/MLD NSAPI~~	~~Mandatory~~	~~7.7.17~~
GGSN Address for Control Plane	Mandatory	7.7.32
Private Extension	Optional	7.7.46

7.x.1.2 MBMS Notification Response

The message is sent by a SGSN to GGSN as a response of a MBMS Notification Request.

The Cause value 'Request accepted' indicates if the MBMS context activation will proceed. The MBMS context activation procedure will not proceed for all other Cause values.

Possible Cause values are:

- 'Request Accepted'.
- 'No resources available'.
- 'Service not supported'.
- 'System failure'.
- 'GPRS connection suspended'.
- 'Mandatory IE incorrect'.
- 'Mandatory IE missing'.
- 'Optional IE incorrect'.
- 'Invalid message format'.
- 'Roaming restriction'.

After an unsuccessful MBMS activation attempt the GGSN may, dependent the cause value indicated, and based on operator configuration fall back to IP multicast access as defined in 3GPP TS29.061[27].

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in a MBMS Notification Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Private Extension	Optional	7.7.46

7.x.1.3 MBMS Notification Reject Request

If the MBMS context activation proceeds after the MBMS Notification Response, but the MBMS context was not established, due to explicit rejection of the MBMS context Activation Request by the MS, or the MS not responding, the SGSN sends a MBMS Notification Reject Request message. The Cause value indicates the reason why the MBMS Context could not be established:

- 'MS Not GPRS Responding'.
- 'MS Refuses'.

When receiving the MBMS Notification Reject Request message the GGSN may ~~GGSN may~~, dependent the cause value indicated, and based on operator configuration fall back to IP multicast access as defined in 3GPP TS29.061[27]..

The Tunnel Endpoint Identifier in the GTP header of the MBMS Notification Reject Request message shall be the same as the Tunnel Endpoint Identifier Control Plane information element of the MBMS Notification Request that triggered the reject.

The Tunnel Endpoint Identifier Control Plane information element shall be a tunnel endpoint identifier Control Plane selected by the SGSN and shall be used by the GGSN in the GTP header of the corresponding MBMS Notification Reject Response message.

The End User Address information element contains the PDP type and IP Multicast PDP address that could not be activated. The IP multicast address shall be the one requested by the UE in the Join request.

The Access Point Name shall be the same as the Access Point Name of the received MBMS Notification Request message that triggered the reject.

The ~~Linked IGMP/MLD~~ NSAPI information element is the NSAPI of the PDP context over which the IGMP/MLD join message was received that triggered the MBMS Notification Request

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in a MBMS Notification Reject Request

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Tunnel Endpoint Identifier Control Plane	Mandatory	7.7.14
NSAPI	Mandatory	7.7.17
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
~~Linked IGMP/MLD NSAPI~~	~~Mandatory~~	~~7.7.17~~
Private Extension	Optional	7.7.46

7.x.1.4 MBMS Notification Reject Response

The message is sent by a GGSN to SGSN as a response of a MBMS Notification Reject Request.

Possible Cause values are:

- 'Request Accepted'.
- 'Mandatory IE incorrect'.
- 'Mandatory IE missing'.
- 'Optional IE incorrect'.
- 'Invalid message format'.

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in a MBMS Notification Reject Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Private Extension	Optional	7.7.46

7.x.1.5 Create MBMS Context Request

A Create MBMS Context Request shall be sent from an SGSN node to a GGSN nodes as part of the MBMS Context Activation procedure. After sending the Create MBMS Context Request message, the SGSN marks the MBMS context as 'waiting for response'. A valid request creates a MBMS UE Context within the SGSN and GGSN, (see 3GPP TS 23.246 [26]). Furthermore, a valid request creates a GTP tunnel in the GTP-C plane, however no GTP-U tunnel is created at this step.

The Tunnel Endpoint Identifier Control Plane field specifies a downlink Tunnel Endpoint Identifier for control plane messages which is chosen by the SGSN. The GGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent downlink control plane messages which are related to the requested PDP context.

The MSISDN of the MS is passed to the GGSN inside the Create MBMS Context Request; This additional information can be used when a secure access to a remote application residing on a server is needed. The GGSN would be in fact able to provide the user identity (i.e. the MSISDN) to the remote application server, providing it with the level of trust granted to users through successfully performing the GPRS authentication procedures, without having to re-authenticate the user at the application level.

The IMSI information element together with the NSAPI information element uniquely identifies the PDP context to be created.

The End User Address information element contains the PDP type and IP Multicast PDP address that the UE requires to be activated. The SGSN shall include either the UE provided APN, a subscribed APN or an SGSN selected APN in the message. The Access Point Name information element identifies the access point of packet data network that the UE requires to connect to receive the required MBMS service. The Selection Mode information element shall indicate the origin of the APN in the message. The APN and End User Address information element shall uniquely identify the MBMS service.

The SGSN shall include an SGSN Address for control plane, which may differ from that provided by the underlying network service (e.g. IP). The GGSN shall store the SGSN Address and use them when sending control plane on this GTP tunnel for the UE.

The SGSN shall include a Recovery information element into the Create PDP Context Request if the SGSN is in contact with the GGSN for the very first time or if the SGSN has restarted recently and the new Restart Counter value has not yet been indicated to the GGSN. The GGSN that receives a Recovery information element in the Create MBMS Context Request message element shall handle it in the same way as when receiving an Echo Response message.

The SGSN ~~may~~shall include the Routeing Area Identity (RAI) of the SGSN where the UE is registered. The MCC and MNC components shall be populated with the MCC and MNC, respectively, of the SGSN where the UE is registered. The LAC and RAC components shall be populated by the SGSN with the value of 'FFFE' and 'FF', respectively.

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in a Create MBMS Context Request

Information element	Presence requirement	Reference
IMSI	Conditional	7.7.2
Routeing Area Identity (RAI)	~~Optional~~Mandatory	7.7.3
Recovery	Optional	7.7.11
Selection mode	Conditional	7.7.12
Tunnel Endpoint Identifier Control Plane	Conditional	7.7.14
NSAPI	Mandatory	7.7.17
Trace Reference	Optional	7.7.24
Trace Type	Optional	7.7.25
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
SGSN Address for signalling	Mandatory	GSN Address 7.7.32
MSISDN	Conditional	7.7.33
Trigger Id	Optional	7.7.41
OMC Identity	Optional	7.7.42
Private Extension	Optional	7.7.46

7.x.1.6 Create MBMS Context Response

The message shall be sent from a GGSN node to a SGSN node as a response of a Create MBMS Context Request. When the SGSN receives a Create MBMS Context Response with the Cause value indicating 'Request Accepted', the SGSN may be required to register with the GGSN. For further details see MBMS Registration Request procedure.

The Cause value indicates if a MBMS context has been created in the GGSN or not. An MBMS context has not been created in the GGSN if the Cause differs from 'Request accepted'. Possible Cause values are:

- "Request Accepted".
- "No resources available".
- "No memory is available".
- "Missing or unknown APN".
- "Unknown PDP address or PDP type".
- "User authentication failed".

- "System failure".
- "Mandatory IE incorrect".
- "Mandatory IE missing".
- "Optional IE incorrect".
- "Invalid message format".
- "APN access denied – no subscription".

'No resources available' indicates that not enough resources are available within the network to allow the MBMS Context to be created. 'Missing or unknown APN' indicates e.g. when the GGSN does not support the Access Point Name. 'Unknown PDP address or PDP type' indicates when the GGSN does not support the PDP type or the PDP address. Within the scope of MBMS message, an unknown PDP address is considered to be unknown mulitcast address / service.

'User authentication failed' indicates that the external packet network has rejected the service requested by the user. Only the Cause information element shall be included in the response if the Cause contains another value than 'Request accepted'.

All information elements, except Recovery, Charging Gateway Address, Tunnel Endpoint Identifier Control Plane and Private Extension, are mandatory if the Cause contains the value 'Request accepted'.

The Tunnel Endpoint Identifier Control Plane field specifies an uplink Tunnel Endpoint Identifier for control plane messages, which is chosen by the GGSN. The SGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent uplink-control plane messages, which are related to the requested MBMS context.

The GGSN shall include a GGSN Address for control plane, which may differ from that provided by the underlying network service (e.g. IP).

If the Create MBMS Context Request received from the SGSN included IPv6 SGSN address, an IPv4/IPv6 capable GGSN shall include IPv6 addresses in the fields GGSN Address for Control Plane, and IPv4 addresses in the fields Alternative GGSN Address for Control Plane. If SGSN included only an IPv4 SGSN address in the request, IPv4/IPv6 capable GGSN shall include IPv4 addresses in the fields GGSN Address for Control Plane and IPv6 addresses in the fields Alternative GGSN Address for Control Plane. The SGSN shall store these GGSN Addresses and use one set of them when sending control plane on this GTP tunnel.

The GGSN shall include the Recovery information element into the Create PDP Context Response if the GGSN is in contact with the SGSN for the first time or the GGSN has restarted recently and the new Restart Counter value has not yet been indicated to the SGSN.

The Charging ID is used to identify all charging records produced in SGSN(s) and the GGSN for this MBMS context. The Charging ID is generated by the GGSN and shall be unique within the GGSN.

The Charging Gateway Address is the IP address of the recommended Charging Gateway Functionality to which the SGSN should transfer the Charging Detail Records (CDR) for this MBMS Context.

The Alternative Charging Gateway Address IE has a similar purpose as the Charging Gateway Address but enables co-existence of IPv4 and IPv6 stacks in the Ga charging interfaces, without mandating any node to have a dual stack. The format of the optional Alternative Charging Gateway Address information element is the same as the format of the Charging Gateway Address.

When both these addresses are present, the Charging Gateway address IE shall contain the IPv4 address of the Charging Gateway Function and the Alternative Charging Gateway address IE shall contain the IPv6 address of the Charging Gateway Function.

NOTE: The Charging Gateway Address and Alternative Charging Gateway Address both refer to the same Charging Gateway Function.

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in a Create MBMS Context Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Recovery	Optional	7.7.11
Tunnel Endpoint Identifier Control Plane	Conditional	7.7.14
Charging ID	Conditional	7.7.26
GGSN Address for Control Plane	Conditional	GSN Address 7.7.32
Alternative GGSN Address for Control Plane	Conditional	GSN Address 7.7.32
Charging Gateway Address	Optional	7.7.44
Alternative Charging Gateway Address	Optional	7.7.44
Private Extension	Optional	7.7.46

7.x.1.7 Update MBMS Context Request

An Update MBMS Context Request message shall be sent from a SGSN to a GGSN as part of the GPRS Inter SGSN Routeing Update procedure or to redistribute contexts due to load sharing. The message shall be sent by the new SGSN at the Inter SGSN Routeing Update procedure. The GGSN shall update the MBMS UE context fields accordingly.

The NSAPI information element together with the Tunnel Endpoint Identifier in the GTP header unambiguously identifies a MBMS Context in the GGSN.

The IMSI shall be included if the message is sent during an Inter SGSN change when changing the GTP version from GTP v0 to GTP v1; this is required, as the TEID in the header of the message is set to all zeros in this case.

The Tunnel Endpoint Identifier Control Plane field specifies a downlink Tunnel Endpoint Identifier Control Plane messages which is chosen by the SGSN. The GGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent downlink control plane messages that are related to the requested PDP context.

The SGSN shall include an SGSN Address for control plane, which may differ from that provided by the underlying network service (e.g. IP).

If an IPv4/IPv6 capable SGSN received IPv4 GGSN addresses from the old SGSN, it shall include IPv4 addresses in the fields SGSN Address for Control Plane and IPv6 addresses in the fields Alternative SGSN Address for Control Plane. Otherwise, an IPv4/IPv6 capable SGSN shall use only SGSN IPv6 addresses if it has GGSN IPv6 addresses available. If the GGSN supports IPv6 below GTP, it shall store and use the IPv6 SGSN addresses for communication with the SGSN and ignore the IPv4 SGSN addresses. If the GGSN supports only IPv4 below GTP, it shall store and use the IPv4 SGSN addresses for communication with the SGSN and ignore the IPv6 SGSN addresses. When active contexts are being redistributed due to load sharing, G-PDUs that are in transit across the Gn-interface are in an undetermined state and may be lost.

The SGSN shall include a Recovery information element into the Update MBMS Context Request if the SGSN is in contact with the GGSN for the very first time or if the SGSN has restarted recently and the new Restart Counter value has not yet been indicated to the GGSN.

The SGSN shall include Trace Reference, Trace Type, Trigger Id, and OMC Identity in the message if GGSN trace is activated while the MBMS context is active. The SGSN shall copy Trace Reference, Trace Type, and OMC Identity from the trace request received from the HLR or OMC.

The SGSN ~~may~~shall include the Routeing Area Identity (RAI) of the SGSN where the UE is registered. The MCC and MNC components shall be populated with the MCC and MNC, respectively, of the SGSN where the UE is registered. The LAC and RAC components shall be populated by the SGSN with the value of 'FFFE' and 'FF', respectively.

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in an Update MBMS Context Request

Information element	Presence requirement	Reference
IMSI	Conditional	7.7.2
Routeing Area Identity (RAI)	~~Optional~~Mandatory	7.7.3
Recovery	Optional	7.7.11
Tunnel Endpoint Identifier Control Plane	Conditional	7.7.14
NSAPI	Mandatory	7.7.17
Trace Reference	Optional	7.7.24
Trace Type	Optional	7.7.25
SGSN Address for Control Plane	Mandatory	GSN Address 7.7.32
Alternative SGSN Address for Control Plane	Conditional	GSN Address 7.7.32
Trigger Id	Optional	7.7.41
OMC Identity	Optional	7.7.42
Private Extension	Optional	7.7.46

7.x.1.8 Update MBMS Context Response

The message shall be sent from a GGSN node to a SGSN node as a response of an Update MBMS Context Request.

If the SGSN receives an Update MBMS Context Response with a Cause value other than 'Request accepted', it shall abort the update of the MBMS context.

If the SGSN receives an Update MBMS Context Response with a Cause value ‘Non-existent', it shall delete the UE MBMS Context.

Only the Cause information element and optionally the Recovery information element shall be included in the response if the Cause contains another value than 'Request accepted'.

Possible Cause values are:

- 'Request Accepted'.
- 'Non-existent'.
- 'Service not supported'.
- 'System failure'.
- 'Mandatory IE incorrect'.
- 'Mandatory IE missing'.
- 'Optional IE incorrect'.
- 'Invalid message format'.

The Tunnel Endpoint Identifier Control Plane field specifies an uplink Tunnel Endpoint Identifier Control Plane messages which is chosen by the GGSN. The SGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent uplink control plane messages which are related to the requested MBMS context.

The GGSN shall also include a GGSN address for control plane, which shall not differ from that provided at MBMS context setup time and shall remain unchanged for the lifetime of the MBMS context. If the Update MBMS Context Request received from the SGSN included IPv6 SGSN addresses, an IPv4/IPv6 capable GGSN shall include an IPv6 address in the field GGSN Address for Control Plane and a corresponding IPv4 address in the field Alternative GGSN Address for Control Plane. If SGSN included only an IPv4 SGSN address in the request, IPv4/IPv6 capable GGSN shall include IPv4 address for Control plane in the field GGSN Address for Control Plane and IPv6 address for Control plane in the field Alternative GGSN Address for Control Plane.

The GGSN Address for control plane shall be included if the Cause contains the value 'Request accepted'. The Alternative GGSN Address shall be included if the GGSN supports IPv6 below GTP and the Cause contains the value 'Request accepted'.

The GGSN shall include the Recovery information element into the Update MBMS Context Response if the GGSN is in contact with the SGSN for the first time or if the GGSN has restarted recently and the new Restart Counter value has not yet been indicated to the SGSN. The SGSN receiving the Recovery information element shall handle it as when an Echo Response message is received but shall consider the MBMS context as updated and active if the response cause indicates a successful operation at the GGSN.

The Charging ID is used to identify all charging records produced in SGSN(s) and the GGSN for this MBMS context. The Charging ID has been previously generated by the GGSN and is unique for this MBMS context. If an inter-SGSN routing area update occurs, it is transferred to the new SGSN as part of each active MBMS context. This information element shall be included if the Cause contains the value 'Request accepted'.

The Charging Gateway Address is the IP address of the recommended Charging Gateway Functionality to which the SGSN should transfer the Charging Detail Records (CDR) for this MBMS Context.

The Alternative Charging Gateway Address IE has a similar purpose as the Charging Gateway Address but enables co-existence of IPv4 and IPv6 stacks in the Ga charging interfaces, without mandating any node to have a dual stack. The format of the optional Alternative Charging Gateway Address information element is the same as the format of the Charging Gateway Address.

When both these addresses are present, the Charging Gateway address IE shall contain the IPv4 address of the Charging Gateway Function and the Alternative Charging Gateway address IE shall contain the IPv6 address of the Charging Gateway Function.

NOTE: The Charging Gateway Address and Alternative Charging Gateway Address both refer to the same Charging Gateway Function.

The optional Private Extension contains vendor or operator specific information.

Table XXX: Information Elements in an Update MBMS Context Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Recovery	Optional	7.7.11
Tunnel Endpoint Identifier Control Plane	Conditional	7.7.14
Charging ID	Conditional	7.7.26
GGSN Address for Control Plane	Conditional	GSN Address 7.7.32
Alternative GGSN Address for Control Plane	Conditional	GSN Address 7.7.32
Charging Gateway Address	Optional	7.7.44
Alternative Charging Gateway Address	Optional	7.7.44
Private Extension	Optional	7.7.46

7.x.1.9 Delete MBMS Context Request

A Delete MBMS Context Request can be sent either from a SGSN node to a GGSN node as part of the GPRS Detach procedure or from the ~~the~~ GGSN node to the SGSN node as part of the MBMS Context Deactivation procedure initiated by the UE by the sending of an IGMP/MLD leave message. If the deactivation of the MBMS context results in no more users being registered within the GSN for the Multicast Service, the SGSN may initiate the MBMS deregistration procedure. (For further information see 3GPP TS 23.246 [26]).

A GSN shall be prepared to receive a Delete MBMS Context Request at any time and shall always reply regardless if the MBMS context exists or not. If any collision occurs, the Delete MBMS Context Request takes precedence over any other Tunnel Management message.

An SGSN initiated Delete MBMS Context Request shall only include the NSAPI which shall uniquely identify the MBMS context to be deactivated and the optional Private Extension contains vendor or operator specific information.

If the MBMS context to be deactivated (indicated by the multicast address within the IGMP/MLD leave message) resides on the same GGSN as which the IGMP/MLD leave message is received, a GGSN initiated Delete MBMS Context Request shall only include the NSAPI which shall uniquely identify the MBMS context to be deactivated and the optional Private Extension contains vendor or operator specific information.

If the MBMS context to be deactivated (~~indiated~~indicated by the multicast address within the IGMP/MLD leave message) resides on a different GGSN from that which the IGMP/MLD leave message is received, a GGSN initiated

Delete MBMS Context Request shall contain the IMSI, TEID Control Plane, End User Address, APN, GGSN Address for Control Plane the optional Private Extension contains vendor or operator specific information. This message will then trigger the SGSN to send a SGSN initiated Delete MBMS Context Request for the identified MBMS context toward the GGSN hosting the MBMS context.

The IMSI shall unambiguously identify the user. The End User Address information element contains the PDP type and IP Multicast PDP address that the GGSN shall request the SGSN to de-activate. The IP multicast address shall be the one included by the UE in the Leave request.

The Access Point Name information element further identifies the access point of packet data network that the SGSN will use to identify which MBMS context to deactivate. The APN and End User Address information element shall uniquely identify the MBMS service.

The GGSN shall include a GGSN Address for control plane. The SGSN shall store this GGSN Address and use it when sending Delete MBMS Context Response messages to the GGSN.

The Tunnel Endpoint Identifier Control Plane information element shall be a tunnel endpoint identifier Control Plane selected by the GGSN and shall be used by the SGSN in the GTP header of the corresponding Delete MBMS Context Response message.

Table XX: Information Elements in a Delete MBMS Context Request

Information element	Presence requirement	Reference
~~NSAPI~~	~~Conditional~~	~~7.7.17~~
IMSI	Conditional	7.7.2
Tunnel Endpoint Identifier Control Plane	Conditional	7.7.14
NSAPI	Conditional	7.7.17
End User Address	Conditional	7.7.27
Access Point Name	Conditional	7.7.30
GGSN Address for Control Plane	Conditional	7.7.32
Private Extension	Optional	7.7.46

7.x.1.10 Delete MBMS Context Response

The message shall be sent as a response to a Delete MBMS Context Request.

A GSN shall ignore a Delete MBMS Context Response for a non-existing MBMS context.

If a GSN receives a Delete MBMS Context Request message for a non existing MBMS context, it shall send back to the source of the message a Delete MBMS Context Response message with cause value "Non existent". The TEID value used in the response message shall be zero.

Possible Cause values are:

- 'Request Accepted'.
- 'Mandatory IE incorrect'.
- 'Mandatory IE missing'.
- 'Optional IE Incorrect'.
- 'Invalid message format'.
- 'Non existent'.

If the received Delete MBMS Context Response contains a cause value other than 'Request accepted' and 'Non Existent', the PDP context shall be kept active.

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in a Delete MBMS Context Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Private Extension	Optional	7.7.46

7.x.2 Service Specific MBMS Messages

7.x.2.1 MBMS Registration Request

An MBMS Registration Request shall be sent by ~~by~~ an SGSN in order to request registration with a GGSN and receive future session attributes and data for a particular MBMS service from the GGSN. This message shall be sent when the first MBMS UE context for a particular MBMS service is created in the SGSN, or when an MBMS registration Request is received from an RNC that is registering for a particular MBMS service that is not present in the SGSN. A successful registration causes the creation of an MBMS Bearer Context in the SGSN, and GGSN. (see 3GPP TS 23.246 [26])

The End User Address information element contains the PDP type and IP Multicast PDP address of the MBMS service for which the SGSN is registering. The Access Point Name information element identifies the access point of packet data network that the GGSN requires to connect to receive the required MBMS service. The APN and End User Address information element shall uniquely identify the MBMS service.

If the MBMS Registration Request is being sent as a result of the first MBMS UE context being created on the SGSN, the SGSN shall copy the End User Address and APN information from the MBMS UE Context. If the MBMS Registration Request is received from an RNC that is registering for a particular MBMS service that is not established in SGSN, the SGSN shall copy the End User Address and APN information from the corresponding message sent by the RNC.

The selection of the GGSN will be dependent on the reason for the registration request. If the MBMS Registration Request is being sent due to the first MBMS UE context for a particular service, the SGSN shall send the MBMS registration Request to the GGSN address identified in the MBMS UE context. Alternatively, if the MBMS Registration Request is being sent due to an MBMS registration Request that received from an RNC which is registering for a particular MBMS service that is not established in the SGSN, the GGSN shall be selected via APN resolution. If the registration process is successful, the SGSN shall keep this address for de-registration procedures.

Table XX: Information Elements in a MBMS Registration Request

Information element	Presence requirement	Reference
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
Private Extension	Optional	7.7.46

7.x.2.2 MBMS Registration Response

An MBMS Registration Response is sent by an GGSN in response to a received MBMS Registration Request. If the GGSN is already registered for the indicated MBMS service, the GGSN can immediately send back this response, adding the SGSN to it's list of registered nodes for that MBMS service. If the GGSN is ~~not~~ not registered for the indicated MBMS service it shall register with the BM-SC as defined in 3GPP TS29.061[27].

The Cause value indicates if a registration has been successful in the GGSN. An MBMS Bearer Context has not been created in the GGSN if the Cause differs from 'Request accepted'. Possible Cause values are:

- "Request Accepted".
- "No resources available".

- "No memory is available".
- "Missing or unknown APN".
- "Unknown PDP address or PDP type".
- "System failure".
- "Mandatory IE incorrect".
- "Mandatory IE missing".
- "Optional IE incorrect".
- "Invalid message format".

'No resources available' indicates that not enough resources are available within the network to allow the MBMS Context to be created. 'Missing or unknown APN' indicates e.g. when the GGSN does not support the Access Point Name. 'Unknown PDP address or PDP type' indicates when the GGSN does not support the PDP type or the PDP address. Within the scope of MBMS message, an unknown PDP address is considered to be unknown mulitcast address / service.

Table XX: Information Elements in an MBMS Registration Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Private Extension	Optional	7.7.46

7.x.2.3 MBMS De-registration Request

An MBMS De-registration Request shall be sent by ~~by~~ an SGSN in order to inform an GGSN that it no longer requires to receive session attributes and data for a particular MBMS service. This message shall be sent when the last MBMS UE context for a particular MBMS service is deleted in the SGSN, or when an MBMS De-registration Request is received from an RNC that is de-registering for a particular MBMS service that is currently established in the SGSN that has no MBMS UE context associated.

The End User Address information element contains the PDP type and IP Multicast PDP address of the MBMS service for which the SGSN is de-registering. The Access Point Name information element identifies the access point of packet data network that the GGSN requires to connect to de-register the MBMS service, it this is the last SGSN that was registered for the MBMS service.

If the MBMS De-registration Request is being sent as a result of the last MBMS UE context being deleted on the SGSN, the SGSN shall copy the End User Address and APN information from the MBMS UE Context. If the MBMS De-registration Request is received from an RNC that is de-registering for a particular MBMS service for which the SGSN has no MBMS UE Contexts, the SGSN shall copy the End User Address and APN information from the corresponding message sent by the RNC.

The selection of the GGSN will be dependent on the reason for the de-registration request. If the MBMS De-registration Request is being sent due to the leaving of the last MBMS UE context for a particular service, the SGSN shall send the MBMS De-registration Request to the GGSN address identified in the MBMS UE context. Alternatively, if the MBMS De-registration Request is being sent due to an MBMS De-registration Request that received from an RNC for which the SGSN has no MBMS UE contexts established, the GGSN shall be selected via the address stored during registration.

Table XX: Information Elements in a MBMS De-registration Request

Information element	Presence requirement	Reference
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
Private Extension	Optional	7.7.46

7.x.2.4 MBMS De-Registration Response

An MBMS De-registration Response is sent by an GGSN in response to a received MBMS De-registration Request. If the SGSN is the last registered downstream node within the MBMS bearer context of the GGSN, the GGSN shall de-register itself with the BM-SC as defined in 3GPP TS29.061[27].

The Cause value indicates if the de-registration has been successful in the GGSN. An MBMS Bearer Context has not been created in the GGSN if the Cause differs from 'Request accepted'. Possible Cause values are:

- "Request Accepted".
- "Missing or unknown APN".
- "Unknown PDP address or PDP type".
- "System failure".
- "Mandatory IE incorrect".
- "Mandatory IE missing".
- "Optional IE incorrect".
- "Invalid message format".

'Missing or unknown APN' indicates e.g. when the GGSN does not support the Access Point Name. 'Unknown PDP address or PDP type' indicates when the GGSN does not support the PDP type or the PDP address. Within the scope of MBMS message, an unknown PDP address is considered to be unknown mulitcast address / service.

Table XX: Information Elements in an MBMS De-registration Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Private Extension	Optional	7.7.46

7.x.2.5 MBMS Session Start Request

An MBMS Session Start Request message shall only ever be sent by the GGSN, and will be triggered by the BM-SC when it is ready to send data for the indicated MBMS service. An MBMS Session Start Request shall trigger the SGSN to setup the necessary MBMS user plane resources and indicate to the RAN to setup the appropriate radio bearers.

The End User Address information element contains the PDP type and IP Multicast PDP address of the MBMS service. The Access Point Name information element identifies the access point of packet data network that the GGSN requires to connect to receive the required MBMS service. The APN and End User Address information element shall uniquely identify the MBMS service.

The Quality of Service Profile information element shall be the QoS required from the MBMS bearer.

It should be noted that due to the asymmetrical nature of MBMS service, the TEID or GGSN address need not to be included in this message.

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in an MBMS Session Start Request

Information element	Presence requirement	Reference
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
Quality of Service Profile	Mandatory	7.7.34
Private Extension	Optional	7.7.46

7.x.2.6 MBMS Session Start Response

An MBMS Session Start Response is sent by an SGSN in response to a received MBMS Session Start Request. When the GGSN receives a MBMS Session Start Response with the Cause value indicating 'Request Accepted', the GGSN shall mark the MBMS Bearer Context as Active, and may start to forward T-PDUs to the SGSN using the indicated TEID and SGSN Address.

The procedure has not been successful if the Cause differs from 'Request accepted'. Possible Cause values are:

- "Request Accepted".
- "Context not found"
- "No resources available".
- "No memory is available".
- "System failure".
- "Mandatory IE incorrect".
- "Mandatory IE missing".
- "Optional IE incorrect".
- "Invalid message format".

'No resources available' indicates that not enough resources are available within the network to allow the MBMS Bearer to be created.

Only the Cause information element shall be included in the response if the Cause contains another value than 'Request accepted'.

The Tunnel Endpoint Identifier for Data (I) field specifies an downlink Tunnel Endpoint Identifier for G-PDUs that is chosen by the SGSN. The GGSN shall include this Tunnel Endpoint Identifier in the GTP header of all subsequent uplink G-PDUs which are related to the MBMS context.

The SGSN shall include an SGSN address for user traffic, which may differ from that provided by the underlying network service (e.g. IP). The GGSN shall store these SGSN Addresses and use them when G-PDUs to the SGSN for the MBMS Context.

The optional Private Extension contains vendor or operator specific information.

Table 6XX: Information Elements in MBMS Session Start Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Tunnel Endpoint Identifier Data I	Conditional	7.7.13
SGSN Address for user traffic	Conditional	GSN Address 7.7.32
Private Extension	Optional	7.7.46

7.x.2.7 MBMS Session Stop Request

An MBMS Session Stop Request message shall only ever be sent by the GGSN, and will be triggered by the BM-SC when it no longer has any data to be sent for the indicated MBMS service. An MBMS Session Stop Request shall trigger the SGSN to teardown the MBMS user plane resources and indicate to the RAN to teardown the Radio bearers associated with the MBMS Service.

The End User Address information element contains the PDP type and IP Multicast PDP address of the MBMS service. The Access Point Name information element identifies the access point of packet data network that the GGSN requires to connect to receive the required MBMS service. The APN and End User Address information element shall uniquely identify the MBMS service.

The optional Private Extension contains vendor or operator specific information.

Table XX: Information Elements in an MBMS Session Start Request

Information element	Presence requirement	Reference
End User Address	Mandatory	7.7.27
Access Point Name	Mandatory	7.7.30
Private Extension	Optional	7.7.46

7.x.2.8 MBMS Session Stop Response

An MBMS Session Stop Response is sent by an SGSN in response to a received MBMS Session Stop Request. When the GGSN receives an MBMS Session Stop Response with the Cause value indicating 'Request Accepted', the GGSN shall mark the MBMS Bearer Context as Standby, indicating no user plane resource are setup, and will no longer forward T-PDU for this MBMS context.

The procedure has not been successful if the Cause differs from 'Request accepted'. Possible Cause values are:

- "Request Accepted".
- "Context not found"
- "System failure".
- "Mandatory IE incorrect".
- "Mandatory IE missing".
- "Optional IE incorrect".
- "Invalid message format".

Only the Cause information element shall be included in the response if the Cause contains another value than 'Request accepted'.

The optional Private Extension contains vendor or operator specific information.

Table XX6: Information Elements in MBMS Session Stop Response

Information element	Presence requirement	Reference
Cause	Mandatory	7.7.1
Private Extension	Optional	7.7.46

7.6 Reliable Delivery of Signalling Messages

Each path maintains a queue with signalling messages to be sent to the peer. The message at the front of the queue, if it is a request for which a response has been defined, shall be sent with a Sequence Number, and shall be held in a path list until a response is received. Each path has its own list. The Sequence Number shall be unique for each outstanding request message sourced from the same IP/UDP endpoint. A GSN or RNC may have several outstanding requests while waiting for responses.

The T3-RESPONSE timer shall be started when a signalling request message (for which a response has been defined) is sent. A signalling message request or response has probably been lost if a response has not been received before the T3-RESPONSE timer expires. The request is then retransmitted if the total number of request attempts is less than N3-REQUESTS times. The timer shall be implemented in the control plane application as well as user plane application for Echo Request / Echo Response. The wait time for a response (T3-RESPONSE timer value) and the number of retries (N3-REQUESTS) shall be configurable per procedure. The total wait time shall be shorter than the MS wait time between retries of Attach and RA Update messages.

**********NEXT MODIFIED SECTION**********

8 Control Plane (GTP-C)

The control plane in this case relates to GPRS Mobility Management functions like for example GPRS Attach, GPRS Routeing Area Update and Activation of PDP Contexts. The GPRS Tunnelling Protocol-Control plane (GTP-C) shall perform the control plane signalling between GSN nodes.

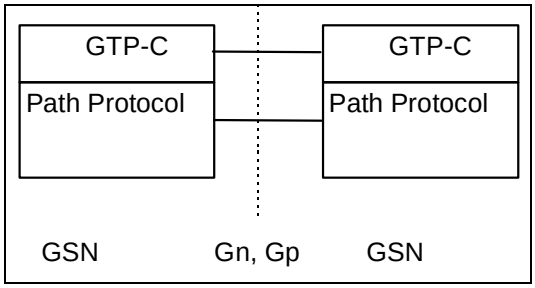

Figure 63: Signalling Plane - Protocol Stack

8.1 Control Plane Protocol

The GTP-C control plane flow shall be logically associated with, but separate from, the GTP-U tunnels. For each GSN-GSN pair one or more paths exist. One or more tunnels may use each path. GTP-C 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.

8.2 Usage of the GTP-C Header

For control plane messages the GTP header shall be used as specified in clause 6 with the following clarifications and additions:

- Version shall be set to decimal 1 ('001').
- Protocol Type flag (PT) shall be set to '1'.
- Sequence number flag (S) shall be set to '1'.
- N-PDU Number flag (PN) shall be set to '0'. A GTP-C receiver shall not return an error if this flag is set to '1'.
- Message Type shall be set to the unique value that is used for each type of control plane message. Valid message types are marked with an x in the GTP-C column in table 1.
- Length shall be the length in octets of the payload, i.e. the rest of the packet following the mandatory part of the GTP header (that is the first 8 octets). The Sequence Number, the N-PDU Number or any Extension headers shall be considered to be part of the payload, i.e. included in the length count.
- The Tunnel Endpoint Identifier is set by the sending entity to the value requested by the corresponding entity (SGSN or GGSN); it identifies all the PDP Contexts with the same PDP address and APN (for Tunnel Management messages) or it identifies each MS and its associated context data (for messages not related to Tunnel Management), except for the following cases:

  - The Create PDP Context Request message and the Create MBMS Context Request message for a given MS sent to a specific GGSN shall have the Tunnel Endpoint Identifier set to all zeroes, if the SGSN has not been assigned a Tunnel Endpoint Identifier Control Plane by the GGSN.
  - The Update PDP Context Request message for a given MS sent to a specific GGSN shall have the Tunnel Endpoint Identifier set to all zeros, if it is used to switch the GTP version of the tunnel to the GGSN from GTP v0 to GTP v1.
  - The Identification Request/Response messages, where the Tunnel Endpoint Identifier shall be set to all zeroes.
  - The SGSN Context Request message, where the Tunnel Endpoint Identifier shall be set to all zeroes.
  - The Echo Request/Response, Supported Extension Headers notification and the Version Not Supported messages, where the Tunnel Endpoint Identifier shall be set to all zeroes.
  - The Forward Relocation Request message, where the Tunnel Endpoint Identifier shall be set to all zeroes.
  - The PDU Notification Request message, where the Tunnel Endpoint Identifier shall be set to all zeroes.
  - The MBMS Notification Request message, where the Tunnel Endpoint Identifier shall be set to all zeroes.
  - The RAN Information Relay message, where the Tunnel Endpoint Identifier shall be set to all zeroes.
  - The Relocation Cancel Request message where the Tunnel Endpoint Identifier shall be set to all zeroes, except for the case where the old SGSN has already been assigned the Tunnel Endpoint Identifier Control Plane of the new SGSN.
  - All Location Management messages, where the Tunnel Endpoint Identifier shall be set to all zeroes.
  - If a GSN receives a GTP-C message requesting action related to a PDP context that the sending node believes is in existence, but that is not recognised by the receiving node, the receiving node shall send back to the source of the message, a response with the appropriate cause value (either 'Non-existent' or 'Context not found'). The Tunnel Endpoint Identifier used in the response message shall be set to all zeroes.
  - All Service Specific MBMS messages, where the Tunnel Endpoint Identifier shall be set to all zeroes.

  The GSN Address for Control Plane set in the request message could be different from the IP Source address of the message. The Tunnel Endpoint Identifier notified in the request message is also used in this case for sending the corresponding response message.

- Sequence Number shall be a message number valid for a path. Within a given set of contiguous Sequence Numbers from 0 to 65535, a given Sequence Number shall, if used, unambiguously define a GTP control plane request message sent on the path (see section Reliable delivery of signalling messages). The Sequence Number in a control plane response message shall be copied from the control plane request message that the GSN is

replying to. For GTP-C messages not having a defined response message for a request message, i.e. for messages Version Not Supported, RAN Information Relay and Supported Extension Headers Notification, the Sequence Number shall be ignored by the receiver.

- N-PDU Number shall not be interpreted.

The GTP-C header may be followed by subsequent information elements dependent on the type of control plane message. Only one information element of each type is allowed in a single control plane message, except for the Authentication Triplet, the PDP Context and the Tunnel Endpoint Identifier Data II information element where several occurrences of each type are allowed.

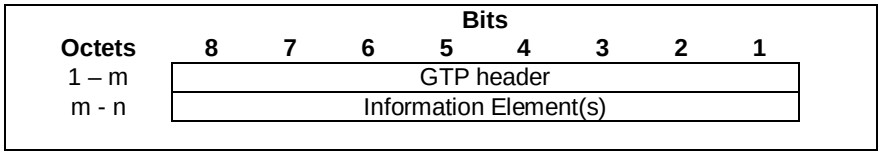

Figure 64: GTP Header followed by subsequent Information Elements