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1 Scope

This document defines the protocol for the MB2 reference point between the Group Communication Service Application Server (GCS AS) and the Broadcast-Multicast Service Centre (BM-SC).

The MB2 reference point and related stage 2 procedures are defined in TS 23.468 [4] as part of the Group Communication System Enablers for LTE. The stage 1 requirements for Group Communication System Enablers are specified in TS 22.468 [2].

2 References

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

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

[2] 3GPP TS 22.468: "Group Communication System(GCSE)".

[3] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description".

[4] 3GPP TS 23.468: "Group Communication System Enablers for LTE (GCSE_LTE); stage 2".

[5] 3GPP TS 26.346: "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs".

[6] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[7] 3GPP TS 29.212: "Policy and Charging Control (PCC); Reference points".

[8] 3GPP TS 29.274: "3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[9] 3GPP TS 29.281: "General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U)".

[10] 3GPP TS 33.246: "Security of Multimedia Broadcast/Multicast Service (MBMS)".

[11] IETF RFC 791: "Transmission Control Protocol".

[12] IETF RFC 768: "User Datagram Protocol".

[13] IETF RFC 2234: "Augmented BNF for syntax specifications".

[14] Void

[15] IETF RFC 4960: "Stream Control Transmission Protocol".

[16] IETF RFC 5719: "Updated IANA Considerations for Diameter Command Code Allocations".

[17] IETF RFC 5996: "The Internet Key Exchange (IKE)".

[18] IETF RFC 3947: "Negotiation of NAT-Traversal in the IKE".

[19] IETF RFC 3948: "UDP Encapsulation of IPsec ESP Packets".

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[20] IETF RFC 4303: "IP Encapsulating Security Payload (ESP)".

[21] IETF RFC 6347: "Datagram Transport Layer Security Version 1.2".#

[22] 3GPP TS 23.007: "Restoration procedures".

[23] 3GPP TS 29.229: "Cx and Dx interfaces based on the Diameter protocol".

[24] 3GPP TS 36.300: "E-UTRA and E-UTRAN overall description; Stage 2".

[25] IETF RFC 7944: "Diameter Routing Message Priority".

[26] IETF RFC 8583: "Diameter Load Information Conveyance".

[27] IETF RFC 6733: "Diameter Base Protocol".

[28] 3GPP TS 23.285: "Architecture Enhancements for V2X services".

[29] IETF RFC 5795: "The Robust Header Compression (ROHC) Framework".

[30] IETF RFC 3095, "Robust Header Compression (ROHC): Framework and four profiles: RTP, UDP, ESP, and uncompressed"

[31] IETF RFC 6363: "Forward Error Correction (FEC) Framework,".

[32] Void.

[33] 3GPP TS 29.214: " Policy and Charging Control over Rx reference point".

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3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply:

MBMS bearer: The service provided by the EPS to deliver the same IP datagrams to multiple receivers in a designated location.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

ARP	Allocation and Retention Priority
AVP	Attribute-Value Pair
BM-SC	Broadcast-Multicast Service Centre
DRMP	Diameter Routing Message Priority
DSCP	Differentiated Services Code Point
DTLS	Datagram Transport Layer Security
ESP	Encapsulating Security Payload
FEC	Forward Error Correction
GAA	GCS-Action-Answer
GAR	GCS-Action-Request
GCS	Group Communication Service
GCSE	Group Communication System Enablers
GCS AS	Group Communication Service Application Server
GNA	GCS-Notification-Answer
GNR	GCS-Notification-Request
MBMS-GW	MBMS Gateway

PCRF	Policy and Charging Rules Function
P-GW	PDN Gateway
ROHC	Robust Header Compression
TMGI	Temporary Mobile Group Identity
UDP	User Datagram Protocol
V2X	Vehicle-to-Everything

4 Architectural Overview

4.1 Reference Model

Figure 4.1-1 shows a high level reference model of the architectural elements relevant to understand the MB2 reference point. More complete reference models for GCSE are contained in TS 23.468 [4].

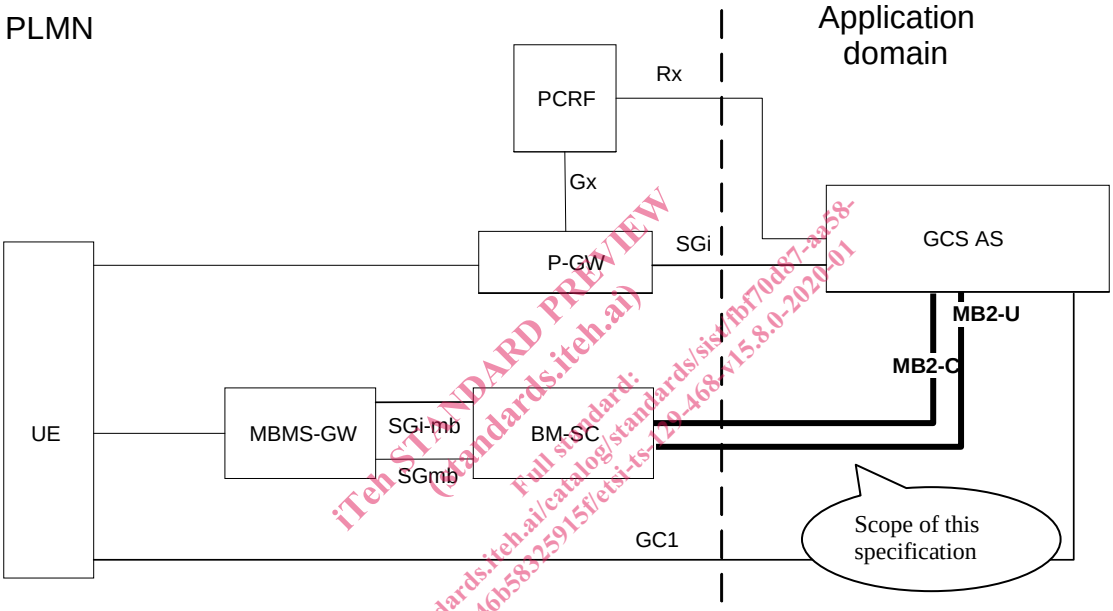

Figure 4.1-1: Reference Model

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NOTE: The GC1 reference point between the UE and the GCS AS is unspecified in the present release. Data related to the GC1 reference point are transported via the Sgi reference point between GCS AS and P-GW.

For the V2X Localized User Plane supported feature, the reference model in Annex B.3 of 3GPP TS 23.285 [28] applies.

4.2 Functional Elements

4.2.1 Group Communication Service Application Server (GCS AS)

The GCS AS is defined in TS 23.468 [4] and supports the following functionality:

- Exchanging GC1 signalling with the UE.
- Receiving unicast uplink data from the UE via the SGi reference point.
- Delivery of data to all the UEs belonging to a group using unicast delivery over the SGi reference point and/or MBMS delivery over the MB2 reference point.
- Support for service continuity procedures for a UE to switch between unicast delivery and MBMS delivery.

- For MBMS delivery:
  - MB2-C procedures defined in TS 23.468 [4], for requesting the BM-SC to activate, deactivate, modify an MBMS bearer, allocate/deallocate TMGI.
  - Forwarding of data to be delivered via an MBMS bearer to the BM-SC via the MB2-U reference point.

In addition to the functions defined in 3GPP TS 23.468 [4], an GCS AS which acts as a V2X Application Server may support the following functions:

- For the V2X Localized User Plane supported feature, MB2-C procedures defined in 3GPP TS 23.285 [28] subclause 5.4.2.2 for requesting the BM-SC to activate an MBMS bearer for local MBMS based MBMS data delivery.

4.2.2 Broadcast-Multicast Service Centre (BM-SC)

The BM-SC is defined in TS 23.246 [3], with additions related to the MB2 reference point in TS 23.468 [4], and supports the following functionality:

- MBMS Broadcast Mode procedures defined in TS 23.246 [3] (stage 2) and in TS 29.061 [6] (stage 3).
- MB2-C procedures defined in TS 23.468 [4], for activating, deactivating, modifying an MBMS bearer, allocating/deallocating TMGI and notifying the TMGI expiry or the MBMS Bearer condition to GCS AS.
- SGmb procedures for controlling MBMS broadcast bearers defined in TS 29.061 [6].
- Reception of user data from the GCS AS via the MB2-U reference point and forwarding those data via the SGi-mb reference point as described in TS 29.061 [6].

In addition to the functions defined in 3GPP TS 23.468 [4], the BM-SC may support the following functions for V2X services:

- For the V2X Localized User Plane supported feature, MB2-C procedures defined in 3GPP TS 23.285 [28] subclause 5.4.2.2 for receiving Local MBMS information defined in 3GPP TS 23.285 [28] from an GCS AS which acts as a V2X Application Server.

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5 Procedures over the MB2 Reference Point

5.1 TMGI and Flow ID handling

The combination of TMGI and Flow Identifier shall uniquely identify an MBMS bearer. TMGI and Flow Identifier are defined in TS 23.246 [3].

A TMGI shall be assigned by the BM-SC upon request of the GCS AS. The BM-SC shall provide an expiration time for each assigned TMGI or group of TMGIs to the GCS AS. The BM-SC shall assign a TMGI, which is different from any other TMGI, which the BM-SC has previously assigned and for which the timer has not yet expired and there is no active MBMS broadcast bearer. The GCS AS may request the BM-SC to refresh the expiration timer for a TMGI. The BM-SC and GSC AS shall store the TMGI until the timer expires.

NOTE: As defined in TS 23.246 [3], TMGIs need to be globally unique. It is assumed that the BM-SC uses a configured range of TMGI values.

The BM-SC shall assign Flow Identifier values, which shall be unique for the corresponding TMGI. For each assigned TMGI, both BM-SC and GCS AS shall store all assigned Flow Identifiers until the expiry of the timer of the TMGI, or until GCS AS requests the deallocation of the TMGI.

5.2 TMGI Management

5.2.1 TMGI Allocation Procedure

The TMGI Allocation procedure may be used by the GCS AS to request a set of TMGIs, or to request the renewal of the expiration time for already allocated TMGIs.

To apply this procedure, the GCS AS shall send a GCS-Action-Request (GAR) command including the TMGI-Allocation-Request AVP. Within the TMGI-Allocation-Request AVP, the GCS AS shall indicate the number of requested new TMGIs, excluding any TMGIs for which only an expiration timer renewal is requested, in the TMGI-Number AVP, and may include within TMGI AVPs TMGIs that are already allocated to the GCS AS, and for which the GCS AS wishes to obtain a later expiration time. The number of TMGIs requested may be zero, if this procedure is used only to renew the expiration time for already allocated TMGIs.

Upon reception of a GCS-Action-Request (GAR) command including the TMGI-Allocation-Request AVP, the BM-SC shall determine whether the GCS AS is authorized to receive the requested TMGIs. If no Route-Record AVP(s) are present, the BM-SC shall derive the identity of the GCS AS from the Origin-Host AVP. If Route-Record AVP(s) are present, the BM-SC shall authorize the request if the identity within the first Route-Record AVP matches the GCS AS authorized to use the TMGIs. If the renewal of TMGIs has been requested, the BM-SC shall also determine whether the TMGIs are allocated to the requesting GCS AS and if yes, whether the renewal of TMGI expiration times is possible. The BM-SC shall also determine an expiration time, which shall be applicable for all new TMGIs and all TMGIs for which the timer was renewed.

NOTE 1: During the TMGI Allocation Procedure, the BM-SC does not activate MBMS. However TMGIs, for which the expiration time is renewed, may already have active MBMS bearers.

The BM-SC shall then send the GCS-Action-Answer (GAA) command including the TMGI-Allocation-Response AVP. For a successful TMGI allocation, the TMGI-Allocation-Response AVP shall include TMGI AVPs and the MBMS-Session-Duration AVP. The TMGI AVPs shall contain all successfully allocated or refreshed TMGIs and the MBMS-Session-Duration AVP shall indicate their common new expiration time. For an unsuccessful TMGI allocation request, the TMGI-Allocation-Response AVP shall include the TMGI-Allocation-Result AVP. For a partial success (i.e. if some, but not all of the requested TMGIs are allocated or timers refreshed), the TMGI-Allocation-Response AVP shall include the TMGI AVPs, the MBMS-Session-Duration AVP and the TMGI-Allocation-Result AVP. The TMGI AVPs shall contain all successfully allocated or refreshed TMGIs and the MBMS-Session-Duration AVP shall indicate their common new expiration time. The TMGI-Allocation-Result AVP shall indicate both success and the reason(s) why the allocation or refresh failed for some TMGIs.

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5.2.2 TMGI Deallocation Procedure

The TMGI Deallocation procedure may be used by the GCS AS to immediately release a set of TMGIs, irrespective of their expiration times.

To apply this procedure, the GCS AS shall send a GCS-Action-Request (GAR) command including the TMGI-Deallocation-Request AVP. If the GCS AS desires to deallocate some, but not all currently allocated TMGIs, it shall include TMGI AVPs for all TMGIs that are to be deallocated within the TMGI-Deallocation-Request AVP. If the GCS AS desires to deallocate all currently allocated TMGIs, it shall not include TMGI AVPs within the TMGI-Deallocation-Request AVP.

Upon reception of a GCS-Action-Request (GAR) command including the TMGI-Deallocation-Request AVP, the BM-SC shall determine whether the GCS AS is authorized to deallocate the TMGIs. If no Route-Record AVP(s) are present, the BM-SC shall derive the identity of the GCS AS from the Origin-Host AVP. If Route-Record AVP(s) are present, the BM-SC shall authorize the request if the identity within the first Route-Record AVP matches the GCS AS authorized to use the TMGIs.

The BM-SC shall then send the GCS-Action-Answer (GAA) command and shall include a TMGI-Deallocation-Response AVP for each TMGI contained in the TMGI-Deallocation-Request AVP. Each TMGI-Deallocation-Response AVP shall include the affected TMGI in the TMGI AVP. For an unsuccessful TMGI deallocation, the TMGI-Deallocation-Response AVP shall also include the TMGI-Deallocation-Result AVP.

When the GCS AS requests the deallocation of a TMGI with some related active MBMS bearers, the BM-SC shall terminate those bearer(s).