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Foreword

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1 Scope

The present document provides the stage 2 description for the 3GPP system provided enablers to support group communication services using EUTRAN access. The corresponding stage 1 requirements are defined in TS 22.468 [2].

The group communication system is represented by an Application Server (GCS AS) using the 3GPP system provided enablers for transferring its application signalling and for delivering application data, e.g. media data, to a group of UEs either (i) over MBMS Bearer Services using the Broadcast Mode of MBMS (TS 23.246 [3]); or (ii) over EPS Bearers; or (iii) over both MBMS and EPS bearer services.

The specification covers both roaming and non-roaming scenarios and also includes support for service continuity, i.e. support for continuous reception of application data when a UE changes between reception of application data via EPS and MBMS Bearer Services.

Application level interactions between the UE and the GCS Application Server are out of scope of this specification.

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.
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- 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 22.468: "Group Communication System Enablers for LTE (GCSE_LTE)".
- [3] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description".
- [4] 3GPP TS 29.214: "Policy and charging control over Rx reference point".
- [5] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".
- [6] 3GPP TS 23.203: "Policy and charging control architecture".
- [7] 3GPP TS 26.346: "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs".
- [8] 3GPP TS 33.246: "3G Security; Security of Multimedia Broadcast/Multicast Service (MBMS)".
- [9] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRAN); Overall description; Stage 2".
- [10] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification".
- [11] 3GPP TS 23.303: "Proximity-based services (ProSe); Stage 2".
- [12] 3GPP TS 23.280: "Common functional architecture to support mission critical services; Stage 2".

3 Definitions 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. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

MBMS Delivery: A mechanism by which application data and signaling are delivered using MBMS bearer service over EUTRAN as defined in TS 23.246 [3].

Unicast Delivery: A mechanism by which application data and signaling are delivered using EPS bearer service over EUTRAN as defined in TS 23.401 [5].

ProSe UE-to-Network Relay: see TS 23.303 [11].

Remote UE: see TS 23.303 [11].

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].

AS	Application Server
ARP	Allocation and Retention Priority
BM-SC	Broadcast Multicast - Service Centre
DL	Down Link
DRX	Discontinuous Reception
FEC	Forward Error Correction
FQDN	Fully Qualified Domain Name
GCS	Group Communication Service
GCS AS	Group Communication Service Application Server
GCSE_LTE	Group Communication System Enabler for LTE
MBMS	Multimedia Broadcast/Multicast Service
MBSFN	Multimedia Broadcast multicast service Single Frequency Network
MCH	Multicast Channel
MCCH	Multicast Control Channel
MTCH	Multicast Traffic Channel
PCC	Policy and Charging Control
PCEF	Policy and Charging Enforcement Function
ProSe	Proximity-based Services
QCI	QoS Class Identifier
RoHC	Robust Header Compression
TMGI	Temporary Mobile Group Identity
UDP	User Datagram Protocol
vPCRF	visited Policy and Charging Rules Function

4 Architecture Model and Concepts

4.1 General Concept

This specification describes how a GCS Application Server (GCS AS) may use the enablers offered by the 3GPP system for providing a Group Communication Service (GCS). These enablers are denoted as Group Communication System Enablers (GCSE).

The GCS AS uses EPS bearer services and may use in addition MBMS bearer services for transferring application signalling and data between the GCS AS and the UEs. In uplink direction, the UE uses an EPS bearer service to

exchange application signalling with the GCS AS or when it wants to send data to the GCS AS. In downlink direction the GCS AS may transfer application signalling and data via the UE individual EPS bearer services and/or via MBMS bearer service. The GCS UEs register with their GCS AS using application signalling for participating in one or multiple GCS groups.

NOTE 1: GCS application signalling (e.g. for group admission and floor control) and GCS group management aspects (such as group creation, deletion, modification, group membership control, etc) are out of scope of this specification.

When an MBMS bearer service is used, its broadcast service area may be pre-configured for use by the GCS AS. Alternatively, the GCS AS may dynamically decide to use an MBMS bearer service when it determines that the number of UE for a GCS group is sufficiently large within an area (e.g. within a cell or a collection of cells).

When MBMS bearer service is used, GCS AS may transfer data from different GCS groups over a single MBMS broadcast bearer. The application signalling and data transferred via MBMS bearer(s) are transparent to BM-SC and the MBMS bearer service. The GCS AS provides the UEs via GCS application signalling with all configuration information that the UE needs to receive application data via MBMS bearer services and to handle that data appropriately.

When a GCS UE moves between areas where its MBMS broadcast bearers are available or not, the UE informs the GCS AS via application signalling that it changes from MBMS broadcast bearer reception to non-reception, or vice versa, the GCS AS activates or deactivates the downlink application signalling and data transfer via the UE individual EPS bearer(s) as appropriate. To accomplish service continuity, a UE may temporarily receive the same GCS application signalling and data in parallel via EPS bearer(s) and MBMS service(s). The GCS UE application discards any received application signalling or data duplicates.

The following diagram shows an example of a scenario where a combination of Unicast and MBMS Delivery is used for a particular media, belonging to a single group, by the GCS AS on the DL to different UEs. Here, UE-1 and UE-2 receive DL traffic over unicast whereas UEs 3-6 receive DL traffic over MBMS.

NOTE 2: Even though UE-2, UE-3 and UE-4 are connected to the same eNB (eNB-2), the UEs may be using different delivery modes. For example, UE-2 is using unicast since it may be in an area where the MBMS signal strength is weak.

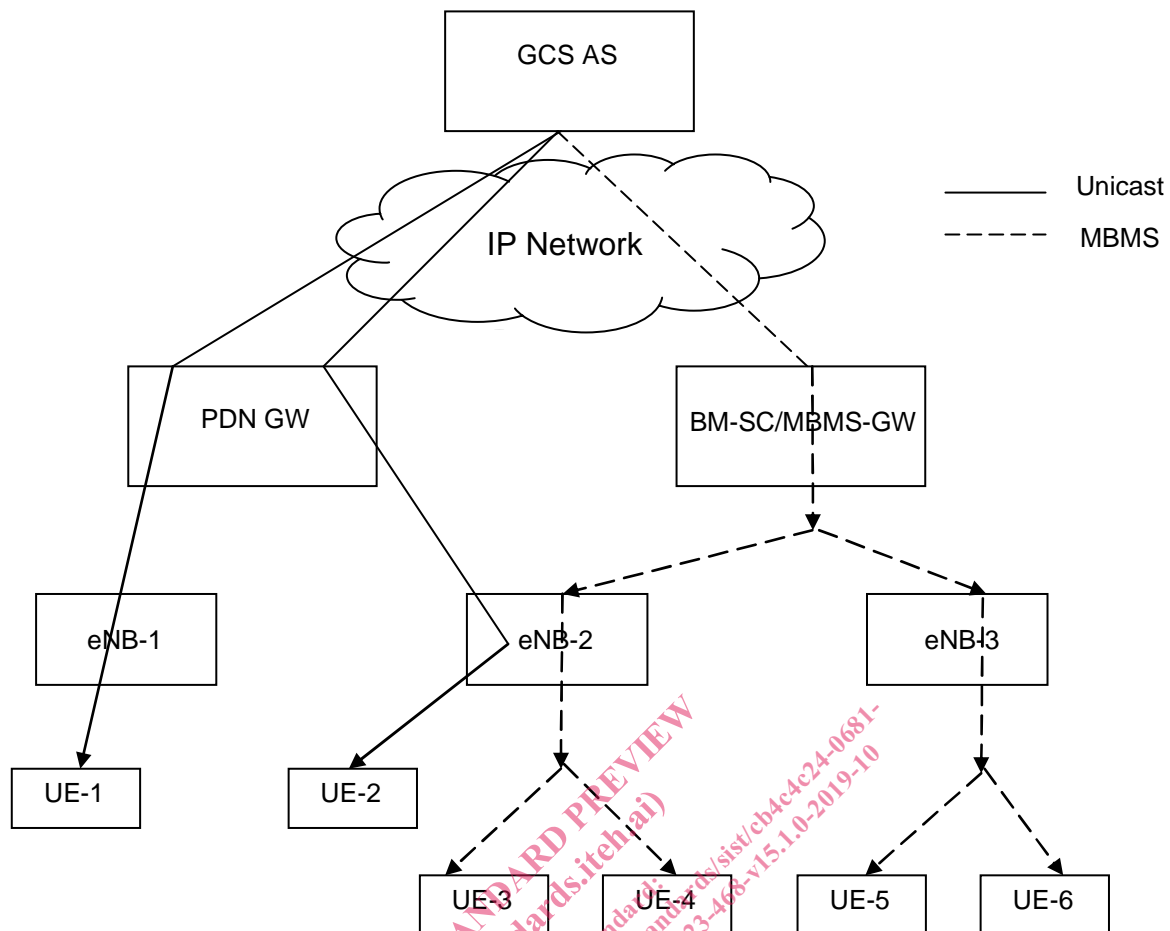


Figure 4.1-1: Media traffic with unicast and MBMS on DL

NOTE 3: During service continuity procedures a UE may simultaneously receive traffic from both unicast and MBMS.

4.2 Architectural Reference Model

4.2.1 General

This model assumes that the GCS AS is not associated with any PLMN (regardless of the subscription of the UEs that use it). The GCS AS is merely perceived as a third party application server by each serving PLMN. In addition:

- When the group communication service is provided using Unicast Delivery, there are no additional requirements in order to provide GCS in roaming other than enabling normal EPS roaming and the ability of the GCS AS to access QoS control capabilities via Rx interface in the HPLMN (for the non-roaming case and the roaming Home routed case). For the Local breakout scenario, QoS control may be established via hPCRF and the S9 interface towards the vPCRF directly to the vPCRF as specified in TS 23.203 [6]. The GCS AS shall provide information to enable session binding as defined in clause 6.1.1.2 of TS 23.203 [6].
- When MBMS Delivery to particular regions of the serving PLMN is required, the GCS AS needs to have access to an MB2 interface offered by the serving PLMN.

Since the GCS AS is a third party application server, the GCS AS can access the required network resources to deliver the group communication service, whether the serving PLMN is the Home PLMN or a different VPLMN, based on operator agreement.

The PLMN selection process is according to the existing 3GPP procedures. When a PLMN is selected, the UE should, in order to enable group communication services, register or re-register with the GCS AS and report to it the PLMN ID of the current serving network as well as its HPLMN ID. The GCS AS may then, based on this information, determine

if it has an MB2 connection agreement for the serving PLMN, and if so report to the UE the MBMS related service data required to use the service via MBMS Delivery in that PLMN.

Both the Home and serving PLMN ID(s) are needed to identify the contact point for the Rx interface, in addition to existing parameters as defined in TS 23.203 [6] in order to accurately identify the UE and the session. The GCS AS finds the entry point at the HPLMN using the home PLMN ID, the GCS AS finds the entry point at the VPLMN using the serving PLMN ID. Within the PLMN, the information listed in TS 23.203 [6] is used to find the PCRF.

If no MB2 connection agreement with the GCS AS is available in the serving PLMN, then the GCS AS may deliver the group communication data using Unicast Delivery.

NOTE: In the architecture figures shown in clauses 4.2.2, 4.2.3 and 4.2.4, "GCS AS" is being shown as one entity for simplicity. It may be comprised of different functional entities to handle user and control plane. A BM-SC may be connected to multiple GCS AS, and a UE may be served simultaneously by multiple GCS AS (via separate GC1 connections).

The GCS AS provides the Service Information to the PCRF and the BM-SC. The Service Information is mapped by the PCRF and the BM-SC to the QoS parameters under the consideration of the respective EPS network.

4.2.2 Non-roaming architecture

Figure 4.2.2-1 shows a high level view of the architecture for the non-roaming scenario.

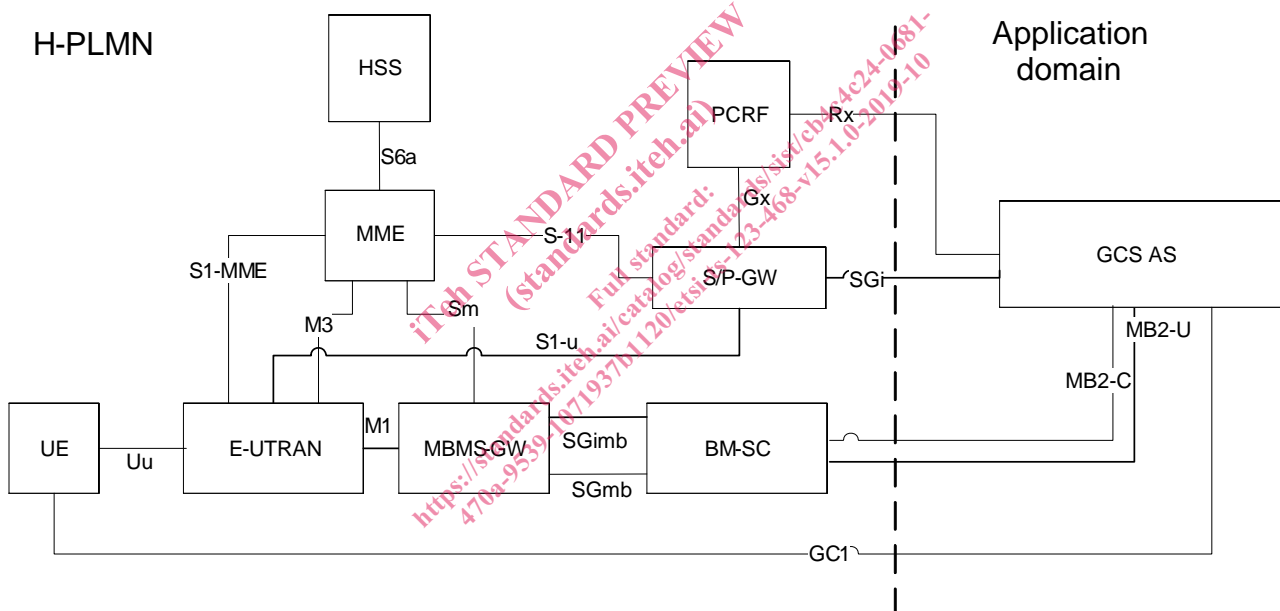


Figure 4.2.2-1: Non-roaming architecture model for GCSE_LTE

4.2.3 Roaming architecture

Figure 4.2.3-1 shows a high level view of the architecture applicable for the Home routed roaming model for Unicast Delivery. For MBMS Delivery, BM-SC in the V-PLMN has a direct MB2 connection with the GCS AS.