**3GPP TSG-SA4 Telco on FS\_5GMS\_MulticastS4aI201081**

**29th October, 2020**

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| *CR-Form-v12.0* |
| **PSEUDO CHANGE REQUEST** |
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|  | **TR 26.802** | **CR** | **–** | **rev** | **–** | **Current version:** | **0.0.2** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:***  | pCR to TR26.802 on related multicast and broadcast work in 3GPP |
|  |  |
| ***Source to WG:*** | TELUS, Huawei |
| ***Source to TSG:*** | S4 |
|  |  |
| ***Work item code:*** | FS\_5GMS\_Multicast |  | ***Date:*** | 2020-10-29 |
|  |  |  |  |  |
| ***Category:*** | **D** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),****C*** *(functional modification of feature)****D*** *(editorial modification)*. |  |
|  |  |
| ***Reason for change:*** | Add related multicast and broadcast work in 3GPP |
|  |  |
| ***Summary of change:*** | Related work TR23.757, MB2, xMB, etc. |
|  |  |
| ***Consequences if not approved:*** | The Study Item will be lack of context from other related work in 3GPP |
|  |  |
| ***Clauses affected:*** | 5.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |  |
|  |  |
| ***Other comments:*** | Changes against baseline document TR 26.802 v0.0.2 |
|  |  |
| ***This CR's revision history:*** |  |

FIRST CHANGE

## 3.1 Terms

For the purposes of the present document, the terms given in 3GPP TR 21.905 [5], TS 26.501 [1], TR 23.757 [y] 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 or TS 26.501.

**Multimedia Broadcast/Multicast Service (MBMS):** See 3GPP TS 22.146 [x].

**Broadcast session:** See 3GPP TR 23.757.

**Multicast session:** See 3GPP TR 23.757.

**MBS session:** See 3GPP TR 23.757.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [5] 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.

5GMS 5G Media Streaming

ABR Adaptive Bit Rate

AL‑FEC Application-Level Forward Erasure Correction

IPTV Internet Protocol Television

MBS Multicast/Broadcast Service

TMGI Temporary Mobile Group Identity

NEXT CHANGE

# 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 TS 26.501: "5G Media Streaming (5GMS); General description and architecture”".

[2] IETF RFC 2236: "Internet Group Management Protocol, Version 2".

[3] IETF RFC 4604: "Using Internet Group Management Protocol Version 3 (IGMPv3) and Multicast Listener Discovery Protocol Version 2 (MLDv2) for Source-Specific Multicast".

[4] IETF RFC 3376: "Internet Group Management Protocol, Version 3".

[5] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[6] 3GPP TS 23.246: "MBMS Architecture and functional description".

[7] 3GPP TR 23.757: “Study on architecture enhancements for 5G multicast-broadcast services".

[8] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G system".

[9] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

[10] 3GPP TS 23.502: "System architecture for the 5G System (5GS)".

[11] 3GPP TS 23.503: "System architecture for the 5G System (5GS)".

[12] DVB BlueBook A176 (Second edition): "Adaptive media streaming over IP multicast", Internet Available <https://dvb.org/wp-content/uploads/2020/03/A176_Adaptive-Media-Streaming-over-IP-Multicast_Mar-2020.pdf>

[13] CableLabs: "IP Multicast Adaptive Bit Rate Architecture Technical Report", Internet Available <https://specification-search.cablelabs.com/ip-multicast-adaptive-bit-rate-architecture-technical-report>

[14] ETSI TS 103 285: "Digital Video Broadcasting (DVB); MPEG-DASH Profile for Transport of ISO BMFF Based DVB Services over IP Based Networks".

[15] 3GPP TS 26.348: "Northbound Application Programming Interface (API) for Multimedia Broadcast/Multicast Service (MBMS) at the xMB reference point", Release 16.

[16] 3GPP TS 26.346: " Multimedia Broadcast/Multicast Service (MBMS); Protocols and Codecs", Release 16.

[17] ATSC A/331: "ATSC Standard: Signaling, Delivery, Synchronization, and Error Protection".

[18] 3GPP TS 29.468: "Group Communication System Enablers for LTE (GCSE\_LTE); MB2 Reference Point; Stage 3".

[19] 3GPP TS 23.468: "Group Communication System Enablers for LTE (GCSE\_LTE); Stage 2".

[20] RFC 6733: "Diameter Base Protocol".

[21] 3GPP TS 26.347 "Multimedia Broadcast/Multicast Service (MBMS); Application Programming Interface and URL", Release 16.

NEXT CHANGE

## 4.2 Related 5G multicast and broadcast work in 3GPP

This section provides a brief summary of ongoing and existing multicast and broadcast standardization work in 3GPP.

### 4.2.1 SA2 5MBS Study item on architectural enhancements for 5G multicast-broadcast

3GPP SA2 workgroup has been exploring potential solutions to enhance 5G multicast-broadcast functionalities in TS 23.757 [7]. This 5MBS study item is expected to be completed in Dec, 2020 except those with RAN2 decisions needed. Most of the key issues are under the final evaluation and conclusion phase. This section reviews the ongoing SA2 workgroup’s activities on enhanced 5G multicast-broadcast architecture.

The goal of this Study Item is to identify and evaluate potential enhancements to the 5G system architecture to provide multicast-broadcast services which might be used for different vertical businesses. How to use the provisioned capabilities in a specific service type is out scope of this SID. The objectives are:

* Define the framework, including the functional split between (R)AN and CN, to support multicast/broadcast services, e.g., ad-hoc multicast/broadcast streams, transparent IPv4/IPv6 multicast delivery, IPTV, software delivery over wireless, group communications and broadcast/multicast IoT applications, V2X applications, public safety.
* Support for different levels of services (e.g., transport only mode vs. full service mode).
* Enable flexible (i.e., distributed vs. centralized) network deployment and operation (e.g., CP-UP separation).
* Address whether and how relevant QoS and PCC rules are applicable to multicast/broadcast services.
* Support use cases and requirements (e.g. service continuity) for public safety, identified in SA1 and SA6 specifications (e.g., TS 22.179 and TS 22.280).

In this study only NR of NG-RAN is considered as wireless access technology. Support for UEs using or moving to an access not supporting multicast/broadcast shall be considered. The impact on RAN is to be analysed by and coordinated with the relevant RAN WGs.

Currently there are about 46 solutions focusing on the following key issues:

1. MBS Session Management.

2. Definition of Service Levels.

3. Levels of authorization for Multicast communication services.

4. QoS level support for Multicast and Broadcast communication services.

5. Support of Broadcast TV Video and Radio communication services. *(Not within Rel-17.)*

6. Local MBS service.

7. Reliable delivery method switching between unicast and multicast.

8. Reliable switching between unicast and broadcast delivery methods. *(Not within Rel-17.)*

9. Minimizing the interruption of public safety services upon transition between NR/5GC and E-UTRAN/EPC.

The study assumes the sequence to eatablish and deliver a Multicast Broadcast (MBS) session is as follows:

1. Optional delivery of 5G MBS service information from application/service layer to 5GC.

2. UEs participate in receiving MBS flow, i.e. UE requests to join an MBS session (for Multicast session).

3. Establishment of MBS flow transport. This step may happen before step 2 for individual UEs joining an MBS session which is already started.

4. MBS data delivery to UEs.

5. UEs stop receiving MBS flow (for Multicast session).

6. Release of MBS flow transport (what used to be session stop).

Multiple **delivery methods** may be used to deliver MBS traffic in the 5GS from a single data source to multiple UEs. TR 23.757 [7] further described delivery methods in 5G CN and RAN.

Two delivery methods are possible from the 5G Core Network’s point of view:

- **5GC Individual MBS traffic delivery method**: 5G CN receives a single copy of MBS data packets and delivers separate copies of those MBS data packets to individual UEs via per-UE PDU sessions.

- **5GC Shared MBS traffic delivery method**: 5G CN receives a single copy of MBS data packets and delivers a single copy of those MBS packets packet to a RAN node, which then delivers them to one or multiple UEs.

NOTE 1: The Shared MBS traffic delivery method and Individual MBS traffic delivery method are defined in SA2 WG and are listed here for reference only.

From the RAN’s point of view, in the case of the shared delivery, two delivery methods are available for the transmission of MBS packet flows over the radio interface:

- **Point-to-Point (PTP) delivery method**: a RAN node delivers separate copies of MBS data packet over radio to individual UE.

- **Point-to-Multipoint (PTM) delivery method**: a RAN node delivers a single copy of MBS data packets over radio to a set of UEs.

A RAN node may use any combination of the PTP/PTM delivery methods to deliver an MBS packet to a population of UEs.

NOTE 2: The PTP and PTM delivery methods are defined in RAN WG and are listed here for reference only.

As shown in Figure 4.2.1-1, the Shared PTP or PTM delivery method and Individual delivery method may be used at the same time for a 5G MBS session depending on selected solution.



Figure 4.2.1-1: Overview of User Plane for a multicast session

A set of interim requiremetns are agreed in the conclusion section of TR 23.757 [7]:

- For multicast solutions, signalling from the UE to the network to join a multicast session shall be supported by UE and network. Join/leave operation via Control Plane (NAS) signalling shall be supported.

- For N3 transport of the shared delivery method, GTP-U tunnelling using a transport layer IP multicast method and shared N3 (GTP-U) Point-to-Point tunnel shall be supported with support for QoS.

- Both 5GC Shared MBS traffic delivery method and 5GC Individual MBS traffic delivery method shall be standardized for multicast data delivery.

- The network shall be able to prepare and start the multicast traffic transmission for a MBS session after MBS service is started.

- The network shall support selection of MB-SMF or SMF (depending on solution) at session join.

- For N3 transport of the 5GC shared MBS delivery method, for unicast transport there shall be 1-1 mapping between MBS Session and GTP-U tunnel towards a RAN node, and for multicast transport there shall be 1-1 mapping between MBS Session and the GTP-U tunnel.

A reference architecture is provided in Annex A.3 of [7], reproduced as Figure 4.2.1-2 here:



Fig. 4.2.1-2: 5G MBS Reference Architectrue from TR 23.757

The MBSF performs the following functions:

- Service level functionality to support MBS, and interworking with LTE MBMS

- Interacting with AF and MB-SMF for MBS session operations, and transport.

- Selection of MB-SMF for MBS Session

- Controlling MBSU if the MBSU is used.

The MBSU performs the following functions:

- Modification of encoding of MBS data.

- Media anchor for MBS data traffic if needed.

NOTE: The MBSF and the MBSU may be co-located or deployed separately.

Editor’s Notes: The MBSF-U and MBSF-C could be a part of 5GMS AS and 5GMS AF respectively in 5G Media Streaming General Architecture as depicted in Figure 4.4-1.

### 4.2.2 Existing 3GPP work on Multimedia Broadcast/Multicast Service (MBMS)

The existing MBMS architecture in 3GPP allows data to be transmitted from a single source entity to multiple recipients. This section studies MBMS delivery methods, user services, and the procedure between content provider and BM-SC.

#### 4.2.2.1 MBMS Delivery Method

Four delivery methods are defined, namely download, streaming, transparent, and group communications. These delivery methods are used to transmit downstream service content received over the interface between Content Provider and BM-SC. The delivery method is set based on “Session Type” property, as described in tables 5.4A-2, 5.4A-3, 5.4A-4, 5.4A-5, and 5.4A-6 in TS 26.346.

The MBMS Delivery layer uses MBMS bearers or point-to-point bearers to deliver MBMS content to a receiving application. Bearers provide mechanism by which IP data is transported. MBMS bearers are defined in TS 23.246 and TS 22.146. It provides an efficient one-to-many manner to transport multicast and broadcast traffic. The MBMS Bearer Service is identified by TMGI. For example, in EPS, an MBMS bearer service could be used to transpot data for one or more MBMS download, streaming, transparent, or Group Communications sessions.

#### 4.2.2.2 MBMS User Service

The MBMS User service enables applications. It presents a complete service offering to the end-user, and allow end-user to activate or deactivate the service. For example, a PSS could use the streaming delivery method to deliver content to MBMS subscribers.

MBMS User service interfacs to the MBMS system via BM-SC, GGSN (for GPRS) or MBMS-GW (for EPS), and the UE, as depicted in Figure 4.2.2.2-1:



Figure 4.2.2.2-1: MBMS nework architecture model for EPS

MBMS User service procedures and protocols, including User Service Discovery/Announcement, User Service Initiation/Termination, and MBMS Data Transfer Procedure are specified in clause 5 of TS 26.346.

#### 4.2.2.3 xMB reference point between content provider and BM-SC

This section and next one study two existing 3GPP reference points between content provider and BM-SC. For group communications related services, the standard interface to and from BM-SC is MB2, specified in TS 29.468 [18] and TS 23.468 [19]. For services other than Group Communications, the standard reference point between the content provider and the BM-SC is defined in TS 26.348 [15]. Sections 4.2.2.3 and 4.2.2.4 review xMB interface and MB2 interface, respectively.

Figure 4.2.2.3-1 reproduced from TS26.348 [15] specified xMB interface between Content Provider and BM-SC. Using the xMB reference point and the procedures supported by BM-SC, content provider can authenticate and authorize BM-SC, create, modify and terminate a service or a session, query information, and deliver content to the BM-SC. The BM-SC may forward the received content for unicast delivery.

BM-SC, on the other hand, can use xMB reference point to authenticate and authorize a content provider, notify the content provider of the status of an MBMS user service usage, and retrieve content from the content provider.

The Content Provider can use four user plance procedures to ingest content to BM-SC. The details of these user plane procedures, including file push, file pull, RTP streaming, and transport are specified in clause 5.5 of TS 26.348 [15].

In file ingestion with Pull, the content provider provides the file URLs to the BM-SC and the BM-SC fetches the files using HTTP GET. In file ingestion with Push, the Content Provider pushes the files using HTTP PUT.



Figure 4.2.2.3-1: The xMB reference model

RTP streaming mode and transport mode are more relevant to legacy multicast live streaming

In RTP streaming mode, the BM-SC establishes an RTP session to the content provider and starts the streaming session to relay media streams.



Figure 4.2.2.3-2: MBMS Streaming with RTP

In transport mode, the BM-SC listens on one IP address and one port number to receive UDP packets. These UDP packets received over xMB-U interface are then transimitted to downstream using Transparent Delivery methods.

The transparent delivery method delivers application data units as part of UDP or IP flows over an MBMS bearer to the UE. This delivery method complemetns the download delivery method and streaming delivery methodand is particularly useful for multicast and broadcast of IP-based services for which the media codecs and application protocols are defined outside of this spec.There are two xMB-U options for the Transparent Delivery method.

In Transparent delivery with proxy, as depicted in Figure 4.2.2.3-3, the payload of UDP streams is opaque to the MBMS session and and MBMS client is expected to make the UDP payloads available to an applicatioin, without further knowledge on the content. The BM-SC re-wraps the UDP payload with an IP Multicast address and use MBMS bearer to deliver the UDP payload.

* 

Figure 4.2.2.3-3: Transparent Delivery with Proxy mode

The following Session Properties allow the configuration of this xMB-U mode:

*- Session Type* is set by the Content Provider to *Transport-Mode.*

*- Delivery Mode Configuration for user plane* (Session Type specific property) is set by the Content Provider to *Proxy.*

*- Session Description Parameters for User Plane* (Session Type specific property) is set by the Content Provider and contains the UDP flow mapping descriptions.

- When *Session Announcement Mode* (Session Type specific property) is set by the Content Provider to *SACH*, the BM-SC will add according session description into the SACH. In this case the MBMS Client (cf. TS 26.347) will offer the service to an application.

- When *Session Announcement Mode* (Session Type specific property) is set by the Content Provider to *Content Provider* then the Content Provider is responsible to announce services to UEs (e.g. using GC1). The BM-SC provides at least the TMGIs as value of the *Delivery Session Description Parameters* property.

In Transparent Delivery with Forward-Only mode in Figure 4.2.2.3-4, the transport protocol on top of IP is opaque to the MBMS session and an MBMS client is expected to make the UDP payloads available to an application. In this mode, the BM-SC is not aware of the IP Multicast layer beyond UDP layer in the Content Provider.



Figure 4.2.2.3-4: Transparent Delivery with Forward-Only

The following Session Properties allow the configuration of this xMB-U mode:

- Session Type is set by the Content Provider to Transport-Mode.

- Delivery Mode Configuration for user plane (Session Type specific property) is set by the Content Provider to Forward-only.

- Session Description Parameters for User Plane (Session Type specific property) is set by the Content Provider and contains the UDP flow mapping descriptions.

- When Session Announcement Mode (Session Type specific property) is set by the Content Provider to SACH, the BM-SC will add according session description into the SACH. In this case the MBMS Client (cf. TS 26.347) will offer the service to an application.

- When Session Announcement Mode (Session Type specific property) is set by the Content Provider to Content Provider then the Content Provider is responsible to announce services to UEs (e.g. using GC1). The BM-SC provides at least the TMGIs as value of the Delivery Session Description Parameters property.

Table 4.2.2.3-1 summarizes the xMB-U procedures and corresponding delivery methods specified in TS 26.348:

Table 4.2.2.3-1: xMB User Plane procedures and delivery options

|  |  |
| --- | --- |
| xMB User Plane procedure | xMB Delivery mode |
| File ingestion with Pull | Download |
| File ingestion with Push |
| DASH content ingestion with Pull |
| DASH content ingestion with Push |
| HLS content ingestion with Pull/Push |
| RTP streaming | MBMS streaming |
| Transport | Transparent delivery |
|  |  |

#### 4.2.2.4 MB2 reference point

MB2 referecen point, specified in TS 29.468 [18] and TS 23.468 [19], is used when MBMS network provides Group Communication Services (such as MCPTT) delivery to the UE [16], as shown in Figure 4.2.2.4-1.



Figure 4.2.2.4-1: MBMS network architecture model for GCS Delivery

Editor’s Note: For services other than Group Communications, the standard reference point between the content provider and the BM-SC is defind in TS 26.348, and reviewed in section 4.2.2.3.

The MB2 interface carries both control and user plane data, and provides a standardized way for external entity, e.g. GCS AS to connect to BM-SC. A high level reference model of the architectural elements relevant to understand the MB2 reference point is shown in Figure 4.2.2.4-2, reproduced from [18]. More complete reference models for GCSE are contained in TS 23.468 [19].



Figure 4.2.2.4-2: Reference model for MB2 reference point

For MBMS delivery, the MB2 interface provides:

- MB2‑C procedures defined in TS 23.468 [19], 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.

The MBMS session is identified by TMGI and Flow Identifier, which are assigned by TMGI upon request of the AS function.

The MB2-U Protocol stack is specified in clause 7 of TS 29.468 [18], as reproduced in Figure 4.2.2.4-3:



Figure 4.2.2.4-3: The user plane protocol stack

MB2-C protocol is a Diameter based protocol as defined in RFC 6733 [20] and in TS 29.468 Annex B [18]. BM-SC is the Diameter server in the sense that it is the network element that handles action requests and sends notifications. The AS function acts as the Diameter client in the sense it is the network element requesting actions and handles notification from the BM-SC. Transport protocol of Diameter messages over MB2-C interfaces make use of SCTP or TCP.

#### 4.2.2.5 MBMS Application Programming Interface and URL

Figure 4.2.2.5-1 (reproduced from TS 26.347 [21]) provides a graphical overview of the Application Programming Interface (API) and URL between the MBMS client and MBMS-aware Application (MAA), referred to as MBMS Application Programming Interfaces (MBMS-APIs). MBMS-aware Application communicates with the MBMS client through MBMS-APIs in the user space. MBMS-URL is a universal resource locator that enables a general application to access resoruces delivered through an MBMS User Service using the MBMS URL handler which translates the MBMS-URL to a sequence of MBMS-API calls.



Figure 4.2.2.5-1: MBMS Application Programming API

Details of the following MBMS-APIs can be found in TS 26.347 [21]:

* File Delivery Application Service API.
* Media Sreaming Service API.

- MBMS Packet Delivery Service API.

END OF CHANGES