**3GPP SA WG2 Meeting #161** **S2-2402984**

**Athens, February 26- March 1, 2024**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **23.247** | **CR** | **xxx** | **rev** | **-** | **Current version:** | **18.4.0** |  |
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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 | **x** | Core Network | **x** |

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| ***Title:***  | MBS Roaming |
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| ***Source to WG:*** | Nokia, Nokia Shanghai-Bell |
| ***Source to TSG:*** | S2 |
|  |  |
| ***Work item code:*** | TEI19\_MBS\_Roam |  | ***Date:*** | 2024-01-12 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-19 |
|  | *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)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | There are unresolved stage 1 requirements:**TS 22.146:***5.3 Availability**…**In case of roaming a user should also be able to subscribe and join Multicast Services that are provided in the home network and visited network, as allowed by the user's home environment.* |
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| ***Summary of change:*** | Enable Roaming UEs to receive MBS multicast and broadcast services provided in the VPLMN |
|  |  |
| ***Consequences if not approved:*** | Lacking support of stage 1 requirements related to MBS roaming support |
|  |  |
| ***Clauses affected:*** | 4.1, 6.4.2, 6.13, new 6.X, new 6.Y, new 6.Z, 7.2.9 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## 4.1 Overview of multicast and broadcast communication

Multicast and Broadcast Service (MBS) is a point-to-multipoint service in which data is transmitted from a single source entity to multiple recipients, either to all users in a Broadcast service area, or to users in a multicast group as defined in TS 22.146 [2]. The corresponding types of MBS session are:

- Broadcast MBS session

- Multicast MBS session.

The MBS architecture defined in clause 5 follows the 5G System architectural principles as defined in TS 23.501 [5], enabling distribution of the MBS data from the 5GS ingress to NG-RAN node(s) and then to the UE. The MBS architecture provides:

- Efficient usage of RAN and CN resources, with an emphasis on radio interface efficiency;

- Efficient transport for a variety of multicast and broadcast services.

Reception of Multicast/Broadcast Services provided in the VPLMN by roaming users is supported.

Reception of Multicast/Broadcast Services provided in the HPLMN is not supported for roaming users in this release.

Interaction between Multicast/Broadcast Service and support of deployments topologies with specific SMF Service Areas is not specified in this Release.

The collection and reporting of MBS specific charging information are not specified in this Release.

The MBS also provides functionalities such as local MBS service and location dependent MBS service, authorization of multicast MBS and QoS differentiation. Refer to clause 6 for more details.

MBS traffic is delivered from a single data source (e.g. Application Service Provider) to multiple UEs. Depending on many factors, there are several delivery methods which may be used to deliver the MBS traffic in the 5GS.

NOTE 1: For clarity, delivery methods are not referred to as unicast/multicast/broadcast but as described below. The term "unicast delivery" refers to a mechanism by which application data and signalling between the UE and the application server are delivered using PDU Session within the 3GPP network and using individual UE and application server addresses (e.g. IP addresses) between the 3GPP network and the application server. It is not equivalent to 5GC Individual MBS traffic delivery method defined in this clause.

Between 5GC and NG-RAN, there are two possible delivery methods to transmit the MBS data:

- 5GC Individual MBS traffic delivery method: This method is only applied for multicast MBS sessions. 5GC 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, hence for each such UE one PDU session is required to be associated with a Multicast MBS session.

- 5GC Shared MBS traffic delivery method: This method is applied for both broadcast and multicast MBS sessions. 5GC receives a single copy of MBS data packets and delivers a single copy of those MBS packets to an NG-RAN node, which then delivers the packets to one or multiple UEs.

The 5GC Shared MBS traffic delivery method is required in all MBS deployments. The 5GC Individual MBS traffic delivery method is required to enable mobility when there is an NG-RAN deployment with non-homogeneous support of MBS.

For the Multicast MBS session, a single copy of MBS data packets received by the CN may be delivered via 5GC Individual MBS traffic delivery method for some UE(s) and via 5GC Shared MBS traffic delivery method for other UEs.

Between the NG-RAN and the UE, two delivery methods are available for the transmission of MBS data packets over radio interface:

- Point-to-Point (PTP) delivery method: NG-RAN delivers separate copies of MBS data packets over radio interface to individual UE(s).

- Point-to-Multipoint (PTM) delivery method: NG-RAN delivers a single copy of MBS data packets over radio interface to multiple UEs.

NG-RAN may use a combination of PTP/PTM to deliver an MBS data packets to UEs.

NOTE 2: The PTP and PTM delivery methods are defined in RAN WGs.

As depicted in the following figure, 5GC Shared MBS traffic delivery method (with PTP or PTM delivery) and 5GC Individual MBS traffic delivery method may be used at the same time for a multicast MBS session.



Figure 4.1‑1: Delivery methods

For MBS broadcast communication, only 5GC Shared MBS traffic delivery method with PTM delivery is applicable.

For MBS multicast communication, if the NG-RAN node supports MBS, the network shall use the 5GC Shared MBS traffic delivery method for MBS data transmission.

NOTE 3: The exception is when the UE moves between NG-RAN node not supporting MBS (with 5GC Individual MBS traffic delivery method) and NG-RAN node supporting MBS, there is temporary co-existence between 5GC Shared MBS traffic delivery method and 5GC Individual MBS traffic delivery method. Refer to clause 6.3 for details.

For MBS multicast communication, the switching between 5GC Shared MBS traffic delivery method and 5GC Individual MBS traffic delivery method is supported. The UE mobility between RAN nodes both supporting MBS, and between a RAN node supporting MBS and a RAN node not supporting MBS is supported, for details see clause 6.3.

For MBS multicast communication, the switching between PTP and PTM delivery methods for 5GC Shared MBS traffic delivery shall be supported. NG-RAN is the decision point for switching between PTP and PTM delivery methods.

### 6.4.2 MBS subscription data in UDM

The information stored in the UDM as defined in clause 5.2.3.3.1 of TS 23.502 [6] is extended as follows:

- MBS subscription data for a UE as part of UE subscription data, as defined in Table 6.4.2-1, with keys defined in Table 6.4.2-2.

Table 6.4.2-1: MBS subscription data type

| Subscription data type | Field | Description |
| --- | --- | --- |
| MBS subscription data | MBS allowed | Indicates whether the UE is authorized to use a multicast MBS service. |
| MBS in VPLMN allowed | Indicates whether the UE is authorized to use a multicast MBS service provided by any VPLMN while it is roaming. “No” value can be overwritten for specific PLMNs via “VPLMNs where MBS is allowed” parameter |
| VPLMNs where MBS is allowed | Indicates VPLMNs where the UE is authorized to use a multicast MBS service provided by the VPLMN. |
| Allowed MBS Session ID(s) | Identifies the MBS Session(s) that the UE are allowed to join in HPLMN. |
| Allowed MBS Session ID(s) for VPLMN(s) | Indicates for each VPLMN for which MBS Session(s) that the UE is allowed to join are provisioned a separate list of related MBS session IDs |
| MBS assistance information | Indicates that the UE is preferred to be kept connected when the related MBS session the UE joined is active, which contains the related MBS Session ID(s) |

Table 6.4.2-2: MBS subscription data type keys

|  |  |  |
| --- | --- | --- |
| Subscription Data Types | Data Key | Data Sub Key |
| MBS Subscription data | SUPI | - |

## 6.13 MBS Security function

Security function may be used to protect MBS related signalling/data. Detailed descriptions of security requirements, procedures and handling for 5G Multicast/Broadcast Service (MBS) are provided in TS 33.501 [20].

MBS security function is implemented in the MBSF/MBSTF so that it can be applied only when MBSF/MBSTF are used (i.e. Configuration option 2 and 3). For configuration option 1 how to support MBS security is out of scope of this specification.

The following additions to the MBS procedures for multicast Session in the present specification apply if the functionalities of MBS security for control plane procedure for multicast as defined in TS 33.501 [20] is used:

- The multicast session security context, as defined in TS 33.501 [20], is used to protect MBS traffic of an MBS session. During the session establishment and when a UE joins, the multicast session security context contains MSK and MTK.

- The UEs in the MBS session use the received multicast session security context to process the protected MBS traffic.

- MBSF distributes the multicast session security context to the MB-SMF via the Nmbsmf\_MBSSession\_Create Request or Nmbsmf\_MBSSession\_Update Request message.

- The SMF interacts with the MB-SMF to obtain the multicast session security context. The MB-SMF provides the security context in the Nmbsmf\_MBSSession\_ContextStatusSubscribe response message and in the Nmbsmf\_MBSSession\_ContextStatusNotify request message.

- If the UE is authorized to join the Multicast MBS session, the SMF shall provide the multicast session security context to the UE in N1 SM container if it received the multicast session security context from the MB-SMF.

- When the MSK needs to be updated, MBSF shall send the updated multicast session security context to the MB-SMF, and then the MB-SMF shall trigger the session update as specified in clause 7.2.6 to provide the updated multicast session security context to the UEs in the related MBS session. The updated multicast session security context shall contain an updated MSK and may contain an updated MTK in addition.

NOTE 1: If no MSK but only the MTK is to be updated, the session update described in the previous bullet is not triggered and the MTK is updated as defined in TS 33.501 [20].

NOTE 2: Interaction between MBSF and MBSTF will be defined in TS 33.501 [20] and TS 26.502 [18].

NOTE 3: The additions to the user plane procedure to support the security function for multicast and broadcast can be used as defined in TS 33.501 [20].

NOTE x: For reception of Multicast/Broadcast Services provided in the VPLMN by roaming users, user plane procedures for key distribution as specified in Annex W.4.1.3 of TS 33.501 [20] are not supported. Thus, Security mechanisms for MBS traffic transmission as specified in Annex W of TS 33.501 [20] are not available for MBS broadcast.

## 6.X Access to MBS multicast sessions provided by the VPLMN while roaming

A roaming UE may request to join an MBS multicast session provided by the VPLMN using a local breakout PDU session (with DNN and S-NSSAI according to the service announcement or configuration related to the VPLMN).

The UE requires a permission to access MBS services provided by a VPLMN while roaming, which is stored as part of its subscription data in the UDM.

For an MBS session that is only open to selected UEs, if a roaming user is to be entitled to access that MBS session, the AF creating the MBS session in the VPLMN identifies a roaming user and uses a NEF in the HPLMN of the roaming user for the provisioning of the multicast MBS Session Authorization information related to that user. It includes the VPLMN ID when provisioning the multicast MBS Session Authorization information related to that user.

When the SMF in the VPLMN receives a join request for the inbound roaming UE, it authorizes the join request based on the subscription data of the UE retrieved from the UDM in the HPLMN and configured policies of the VPLMN whether to allow access to the MBS session for inbound roaming UEs (that can apply to any HPLMN or be specific to a HPLMN).

## 6.Y Access to MBS broadcast sessions provided by the VPLMN while roaming

A roaming UE may receive data of an MBS broadcast session provided by the VPLMN based on information received in the service announcement.

### 7.2.9 AF provisioning multicast MBS Session Authorization information

The AF provisions the multicast MBS session authorization information for multicast MBS sessions that are not open to "any UE". The procedure specified in clause 4.15.6.2 of TS 23.502 [6] is reused with the following enhancements:

- The AF may provision the MBS Session Authorization information to the 5GC. The MBS Session Authorization information is associated with a group of UEs.

Table 7.2.9-1: MBS Session Authorization information

|  |  |
| --- | --- |
| Parameters | Description |
| MBS Session Authorization information | One or more MBS Session IDs. |
|  | A group of UEs identified by an External Group ID. |
|  | For MBS sessions provided in a VPLMN, VPLMN ID |

- The AF may support multicast MBS group membership management and provide parameters as described in Table 7.2.9-2.

Table 7.2.9-2: Multicast MBS group membership management parameters

|  |  |
| --- | --- |
| Parameters | Description |
| List of GPSI | List of multicast group members, each member is identified by GPSI. |
| External Group ID | Identifier for multicast MBS group. |

- If a new multicast MBS group is created, the UDM shall assign a unique Internal Group ID for the multicast MBS group and include the newly assigned Internal Group ID in the Nudr\_DM\_Create Request message.

- If the AF is authorised by the UDM to provision the MBS Session Authorization information, the UDM resolves the GPSI of each MBS session group member to SUPI, and requests to create, update or delete the provisioned MBS Session Authorization information as part of the MBS subscription data for each SUPI via Nudr\_DM\_Create/Update/Delete Request message, and the message includes the provisioned MBS Session Authorization information.