3GPP TSG-RAN WG3 #112e R3-212707

Online, 17 – 27 May 2021

Agenda Item: 22.2.5

Source: Lenovo, Motorola Mobility (moderator)

Title: Summary of Offline Discussion on MBS Service Area

Document for: Approval

# Introduction

This paper provides summary of offline discussion on MBS transmission area.

**CB: # 43\_MBS\_ServiceArea**

**- (ZTE)**

**SAI list, together with cell list can be both used to identify the MBS area.**

**For Multicast, the area information can be SAI list, cell list, or both.**

**For Broadcast, whether Area Session identifiers will be available to RAN node will be of SA2 decision.**

**Wait for RAN2 progress about the content of PTM configuration, and whether it should be area specific.**

**For CU/DU split scenario, gNB-CU needs to determine which gNB-DU should be involved and initiate the MBS session/context setup procedure with gNB-DU.**

**During MBS session/context setup procedure, CU needs to indicate the MBS area info (a list of cell IDs or UEs) to involved DU.**

**F1-U tunnel may be set up for each MRB between CU and DU. This F1-U tunnel could be shared among multiple cells that support this MRB**

**- (Len,Moto)**

**MBS service area information (e.g. cell list or tracking area list) is included in the multicast session resource establishment related messages to support multicast service available within a limited area.**

**To support the multicast service available within a limited area, the following impacts on handover are expected:**

**- Source gNB provides the MBS service area information (e.g. cell list or tracking area list) to target gNB in Handover Request message as a part of MBS session context;**

**- Source gNB prioritizes a cell within the MBS service area as the target cell;**

**- Target gNB performs MBS session admission control according to the MBS service area information.**

**Area Session ID(s) with MBS service area information besides MBS Session ID are included in the multicast session resource establishment related messages to support local multicast service with location-dependent content.**

**details on using Area Session ID to distinguish delivery data content for different local MBS service areas need further study.**

**discuss whether the same concept as LTE MBMS Service Area with MBMS Service Area Identities can be reused.**

**gNB-DU can schedule the multicast traffic among multiple cells using same G-RNTI and radio resources (i.e. called MC-PTM mode).**

**up to the gNB-CU to decide which mode is configured to the UE i.e. PTP mode only, SC-PTM mode only, MC-PTM mode only, or both PTP and SC-PTM/MC-PTM modes.**

**up to the gNB-CU to decide on the MBS data transmission area of an MBS session.**

**- Chair: whether to port LTE MBMS concepts to MBS? Impacts on CU-DU function split? Further details?**

(Len - moderator)

Summary of offline disc [R3-212707](file:///D:\\work\\2020\\RAN3\\112\\CB\\Inbox\\R3-212707.zip)

# For the Chairman’s Notes

# Discussion

The following agreements have been made in previous meetings:

*Control of the Broadcast/Multicast area (within one gNB-DU):*

An MBS session is denoted by an MBS session identifier unique within the PLMN

For multicast, the gNB determines the area in which MBS user data needs to be provided by knowledge of the UEs that have joined the MBS Session

For multicast, the area in which MBS user data needs to be provided may be further limited by the multicast service area; input from SA2 expected

For multicast, the area in which the MBS user data needs to be provided is deduced from UE Context data

Broadcast session is associated with Broadcast service area which is provided by 5GC.

On NG-C interface, Broadcast service area info (e.g. a list of cell IDs) is indicated in the NGAP MBS session resource signaling, for broadcast sessions. FFS for multicast session

*FFS: whether to introduce the concept of "MBS transmission area" in RAN; FFS whether CU or DU determines the MBS transmission area. To be continued...*

## MBS Service Area Information

As discussed in [1] and [2], the following MBS service area information may be indicated in the NGAP related signalling:

- MBMS Service Area Identities;

- Cell List;

- Track Area list;

- Area Session ID.

### MBS Service Area Identities

In LTE eMBMS, a MBMS Service Area is identified by MBMS service area identities and the format is defined in TS 36.443:

#### 9.2.3.6 MBMS Service Area

The MBMS Service Area IE consists of a list of one or several MBMS Service Area Identities where each MBMS Service Area Identity is frequency agnostic and can be mapped onto one or more cells.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| IE/Group Name | Presence | Range | IE type and reference | Semantics description |
| MBMS Service Area | M |  | OCTET STRING | Value part coded per MBMS Service Area AVP as defined in TS 29.061 [9]. |

In LTE, the MBMS Service Area consists of a list of one or several MBMS Service Area Identities and where each MBMS Service Area Identity is frequency agnostic and can be mapped onto one or more cells. The MBMS Service Area Identities are configured in eNB per cell. The eNB provides the information to MCE and MCE forwards it to MME. The MBMS GW and MCE can provide MBMS service data transmission filtering based on the mapping between cells and MBMS Service Area.

In LTE, the MBMS Service Area is also used for other purposes, e.g. for MBMS Interest Indication. To avoid the need to read MBMS related system information and potentially (SC-)MCCH on neighbour frequencies, the UE is made aware of which frequency is providing which MBMS services via MBSFN or SC-PTM through the combination of the following MBMS assistance information:

- user service description (USD): in the USD, the application/service layer provides for each service the TMGI, the session start and end time, the frequencies and the MBMS service area identities belonging to the MBMS service area;

- system information: MBMS and non-MBMS cells indicate in SystemInformationBlockType15 the MBMS SAIs of the current frequency and of each neighbour frequency.

The MBMS SAIs of the neighboring cell may be provided by X2 signalling (i.e. X2 Setup and eNB Configuration Update procedures) or/and OAM.

For NR MBS, it is still not clear whether the SAI concept can be reused or not. It also impacts on RAN2 discussion of the MBS IDLE Mobility and MBS Interest Indication for broadcast session. In order to speed up the discussion, it would be better that RAN3 should make a decision on this and sends a LS to SA2 and SA4 for definitions of SAIs.

From rapporteur’s point of view, we think the SAIs should be applied to broadcast session.

**Question 1: Do you agree that MBS Service Area Identities (SAIs) should be used as MBS service area information for multicast session(s)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | FFS | The use of SAI for multicast service is not clear, on the one hand, the actual transmission area of multicast session is dynamic, so it does not need to be similar to LTE, from eNB to MCE, then to MME to determine the area of MBS transmission; On the other hand, currently RAN2 supports only reception for connected UEs, service continuity is completely controlled by network. So there is no need for introduction of continuity mechanisms similar to LTE. |
| Ericsson | FFS | we see some values in abstracting (RAN) cell IDs in service areas, but this is probably of secondary importance at this time. |
| Nokia | FFS |  |
| ZTE | FFS | depends on SA2 further input on how to define a local area for Multicast. |

**Question 2: Do you agree that MBS Service Area Identities (SAIs) should be used as MBS service area information for broadcast session(s)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | The SAI is useful for broadcast session, which can reduce signaling overhead over Uu, using it to identify a specific service area can avoid from serving cell broadcasting all TMGI information at adjacent frequency. |
| Ericsson |  | see Q1 |
| Nokia | FFS |  |
| ZTE | Yes | using SAI reduces the overhead over air interface for service awareness. |

**Question 3: If the answer is yes to Q1 or Q2, do you think a need of LS to SA2 and SA4 for checking the feasibility of SAIs for NR MBS?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | SMF is also required to notify UE the SAI information via announce, so SA2 needs to confirm whether to continue LTE mechanism for NR broadcast, using SAI to identify a broadcast service area. |
| Ericsson |  | see Q1 |
| Nokia | No |  |
| ZTE | Yes |  |

### Cell List

SA2 has agreed to support of multicast service available within a limited area. A Local MBS service is an MBS service provided in one or several MBS service area(s). An MBS service area is identified by a cell list or a tracking area list. Only UEs within the MBS service area may receive the MBS service, while UEs outside the MBS service area are not allowed to receive location specific content. It is straight forward that the core network needs to provide the MBS service area to gNB so that the gNB only provides the service in the MBS service area.

In LTE SC-PTM, a cell list was introduced to identify a specific service area.

From rapporteur’s point of view, we think a list of cell IDs should be used for local multicast and broadcast session.

**Question 4: Do you agree that a list of cell ID should be included in the NGAP MBS session resource related signaling to indicate MBS service area information for multicast session(s)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | At least for local MBS service, a list of cell ID should be included in the NGAP MBS session resource related signaling to indicate MBS service area information. |
| Ericsson |  | see Q1 |
| Nokia | Partly | Should be included optional (if service area defined for the MBS session) when setting up the MBS context in NG-RAN node (PDU session setup /modify request) |
| ZTE | Yes but | depends on SA2 further input on how to define a local area for Multicast.  cell list is a reasonable choice anyway for precise local area definition. |

Another issue is whether the list of cell ID can also be applied to broadcast sessions or not.

**Question 5: Do you agree that a list of cell ID should be included in the NGAP MBS session resource related signaling to indicate MBS service area information for broadcast session(s)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | It has been agreed in RAN3#110 meeting: On NG-C interface, MBS service area info (e.g. a list of cell ID) is indicated in the NGAP MBS session resource signalling, at least for broadcast sessions. |
| Ericsson |  | see Q1 |
| Nokia | Yes |  |
| ZTE | Yes | a reasonable choice for precise area definition. |

### Tracking Area List

As specified in the section 6.2 of TS 23.247, a Local MBS service is an MBS service provided in one or several MBS service area(s). An MBS service area is identified by a cell list or a tracking area list.

**Question 6: Do you agree that a list of tracking area ID should be included in the NGAP MBS session resource related signaling to indicate MBS service area information for multicast session(s)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | A list of tracking area ID can provide area identification with bigger granularity. So we are fine with the two kinds of area identifications for local multicast service. |
| Ericsson |  | the gNB needs to have knowledge of the service area ID or the mapping of that ID to actual cells or both |
| Nokia | Partly | Should be included optional (if service area defined for the MBS session) when setting up the MBS context in NG-RAN node (PDU session setup /modify request). |
| ZTE | FFS | depends on SA2 further input on how to define a local area for Multicast. |

Another issue is whether the list of tracking area ID can also be applied to broadcast sessions or not.

**Question 7: Do you agree that a list of tracking area ID should be included in the NGAP MBS session resource related signaling to indicate MBS service area information for broadcast session(s)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | Similar consideration as Q6, we are also fine with the two kinds of area identifications for broadcast service. |
| Ericsson |  | tracking areas, if applicable, are for sure a proper way to indicate the extent of the service area. |
| Nokia | Yes |  |
| ZTE | No | Seems not necessary if SAI is already there. |

### Area Session ID

As specified in the section 6.2 of TS 23.247, a location dependent MBS is a local MBS that is provided in several MBS service areas. The location dependent MBS service enables distribution of different content data to different MBS service areas. The same MBS Session ID is used but a different area session ID is used for each MBS service area. The area session ID is used, in combination with MBS Session ID, to uniquely identify the service area specific part of the MBS service within 5GS. The network supports the location-dependent content distribution for the location dependent MBS services, while UEs are only aware of the MBS service. When UEs move to a new MBS service area, content data from the new MBS service area shall be delivered to the UE, and the network ceases to deliver the content data from the old MBS service areas to the UE. The area session ID is allocated by MB-SMF in MBS Session Establishment procedure. MB-SMF allocates area session ID for each MBS services area which is unique within the MBS session.

As specified in the section 7.2.4.2, the SMF requests the AMF to transfer a message to the RAN node using The Nsmf\_PDUSession\_UpdateSMContext (Area Session ID, location area) to transfer the multicast info to RAN node additionally includes the Area Session ID and location area. The RAN uses the received MBS Session ID and Area Session ID to determine the localized multicast distribution context and whether the user plane for the multicast group/context and location area distribution is already established.

**Question 8: Do you agree that area session ID should be included in the NGAP MBS session resource related signaling to indicate MBS service area information for both local dependent multicast and broadcast session(s)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | Following the conclusion of SA2, an area session ID should be included in the NGAP MBS session resource related signaling to indicate local MBS service. |
| Ericsson |  | the gNB needs to have knowledge of the area session ID or the mapping of that ID to actual cells or both |
| Nokia | Yes | If defined for the MBS session |
| ZTE | FFS | for Multicast: depends on SA2 further input on how to define a local area for Multicast.  for Broadcast: depends on SA2 further discussion. It seems not very stable even in 23.247 as far as we know. It can be updated any time, therefore we suggest an FFS. |

## Mobility for local MBS

SA2 has agreed to support of multicast service available within a limited area. Only UEs within the MBS service area may receive the MBS service, while UEs outside the MBS service area are not allowed to receive location specific content. To support the multicast service available within a limited area, the following impacts on handover are expected:

- Source gNB provides the MBS service area information (e.g. cell list or tracking area list) to target gNB in Handover Request message as a part of MBS session context;

- Source gNB prioritizes a cell within the MBS service area as the target cell;

- Target gNB performs MBS session admission control according to the MBS service area information.

From rapporteur’s point of view, this part can be discussed as lower priority but it would be better to collect the companies’ view.

**Question 9: Do you agree the principle of mobility handling for multicast session available within a limited area?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | We are fine with the principle of mobility handling for local multicast session. |
| Ericsson |  | For Xn HO, I guess the source gNB should be in the position to decide whether requesting MRB resources handing over is within the limits of the local MBS service area. If this is not possible, the 5GC would need to reject the setup of MBS Session Resources in the target node/cells. |
| Nokia | partly | We agree on the principle but not on the three bullets above. But details to be ironed out. |
| ZTE | see detailed comments. | Source gNB provides the MBS service area information (e.g. cell list or tracking area list) to target gNB in Handover Request message as a part of MBS session context; // ZTE: We assume source node knows whether target is in the local area or not beforehand:  - if the target is out of the local area, source might not deliver the MBS context at all;  - if the target is in the local area, it is reasonable to include the local area info as part of the MBS context and deliver it to the target.  Source gNB prioritizes a cell within the MBS service area as the target cell; // ZTE: the HO shall always prioritize connectivity over Multicast reception. That said, this can be network implementation before RAN2 confirms that there will be some kind of prioritization for multicast reception.  Target gNB performs MBS session admission control according to the MBS service area information. // ZTE: if source node knows whether target is in the local area or not beforehand, it seems not necessary for target to have admission control based on the local area info. |

## PTM Configuration per area in RAN

As discussed in [1], PTM configuration per area means the PTM configuration of one MBS session is shared among cells, rather than the configuration are determined by a single cell as in LTE SC-PTM. The PTM configuration might include: G-RNTI, time/frequency allocation, and bearer configuration. In [2], it is defined as MC-PTM mode. In SC-PTM mode, the gNB schedules the multicast traffic in a single cell via a cell specific G-RNTI. In the MC-PTM mode, the gNB schedules the multicast traffic among multiple cells using a same G-RNTI and radio resources among these cells. And the MC-PTM is network implementation and transparent to UEs.

**Question 10: Do you agree that the gNB-DU can schedule the multicast traffic among multiple cells using a same PTM configuration (including G-RNTI and radio resources) among these cells (i.e. called MC-PTM mode)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | No | For MC-PTM mode, it should be firstly discussed in RAN2. |
| Ericsson |  | this is not for RAN3 to discuss |
| Nokia | No | Out of scope. |
| ZTE |  | Wait for RAN2 inputs. |

## MBS service area management over F1

For the CU/DU split scenario, the gNB-CU may need to further determine which gNB-DU should be involved. When MBS session starts, CU may initiate the MBS session/context setup procedure towards DU1 and DU2 respectively. The multicast/broadcast area info should be delivered to from CU to involved DU.

**Question 11: Do you agree that for the CU/DU split scenario, the gNB-CU needs to determine which gNB-DU should be involved and initiate the MBS session/context setup procedure with the corresponding gNB-DU?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | At least for broadcast session, the actual transmission area should be delivered to involved DUs and a non UE associated procedure can be used for carrying the information related to MBS service area. |
| Ericsson |  | impacts depends on discussions for F1 |
| Nokia | partly | OK for broadcast only. |
| ZTE | Yes | At least for broadcast session |

**Question 12: Do you agree that during MBS session/context setup procedure, the gNB-CU needs to indicate the MBS area info (a list of cell IDs or UEs) to involved gNB-DU.?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| CATT | Yes | At least for broadcast session, a non UE associated procedure can be used for carrying the information related to MBS service area. |
| Ericsson |  | impacts depends on discussions for F1 |
| Nokia | No | Don’t see why list of UEs. |
| ZTE | Yes | however MBS area info content can be FFS. |

# References

1. R3-211546 MBS service area (ZTE)
2. R3-212185 MBS Service Area Management (Lenovo, Motorola Mobility)