**3GPP TSG RAN WG2 Meeting #120 R2-2212xxx
Toulouse, France, 14th – 18th Nov. 2022**

**Agenda item: 8.11.4**

**Source: CATT**

**Title: [Pre120][604][eMBS] Summary of AI 8.11.4 RAN sharing scenarios (CATT)**

**WID/SID: NR\_MBS\_enh-Core**

**Document for: Discussion and Decision**

# 1. Introduction

RAN3 has sent a LS on on resource efficiency for MBS reception in RAN sharing scenario [1]. This document provides a summary of companies’ contributions [2-12] on the topic. It also gives several proposals for further discussions in the meeting.

# 2. Summary

**Question (1): Does RRC support in Rel-17 configuration of an MBS broadcast session, which is associated with multiple TMGIs?**

**Summary of company proposals**

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| --- | --- |
| CATT [3] | It is already supported in Rel-17 that multiple TMGIs are mapped to the same PTM configuration. From RAN2 point of view there is no need to enhance the mapping between the TMGI and PTM configuration for resource efficiency for MBS reception in RAN sharing scenario. |
| HW [4] | RAN 2 confirm configuration of each MBS broadcast session is provided separately for each TMGI. However, most of the configuration parameters including DRX configuration, PDSCH configuration and MTCH-SSB mapping window are configured as an index to one item in the list of configurations and the list is configured per cell, i.e. these configurations are not repeated for each session in case the same settings are used by these sessions. |
| NEC [5] | Based on the current RRC spec, each MBS broadcast session can only be configured by one TMGI. |
| Nokia [6] | Based on ASN.1 coding it is possible to signal an MBS broadcast session with multiple TMGIs, . Additionally, if one would associate a session with multiple TMGIs, it would require signaling all the parameters for the session as many times it is associated to different TMGIs. As the signaling is done in broadcast channel this should be avoided, if possible. |
| Samsung [7] | RAN2 confirms that an MBS session can be associated with multiple TMGIs. |
| Ericsson [8] | No, each session is associated with a single TMGI, i.e. there is a one-to-one mapping between session and TMGI. But it is possible to configure the same session multiple times, each with a different TMGI. A possible ASN.1 optimization for this use case was discussed for Rel-17 during RAN2#119-e but not agreed [3]. Introduction of a signalling optimization in Rel-18 creates non backwards compatibility issues with Rel-17 UEs. But it is possible to introduce ASN.1 optimizations that work for Rel-18 UEs only, but then the resource efficiency of MBS reception in RAN sharing scenario is only be available for Rel-18 UEs. |
| Intel [9] | For Q1 of RAN3 LS, RAN2 to reply that MBS broadcast session is uniquely identified by TMGI. However, it is possible that different TMGIs can be mapped to the same PDCCH/PDSCH resources. |
| CMCC [10] | RRC in Rel-17 doesn’t support an MBS broadcast session with multiple TMGI. |
| xiaomi [11] | No. In Rel-17, an MBS broadcast session is only associated with one TMGI. |
| ZTE [12] | Rel-17 RRC configuration for broadcast is designed per broadcast session (i.e., per TMGI); ASN.1 enables that part of the common configuration can be associated with multiple TMGIs. |

**Observations and suggested proposal**

Firstly, based on company answers, it seems not easy to simple answer this question from RAN3 with ‘yes’ or ‘no’, but it may be better to clearly tell RAN3 how the current configuration in the RRC spec works.

Second, there seems to be different views regarding the signaling overhead.

**Proposal 1 Start with the following for answer to Q1:**

**“In the RRC ASN.1, the PTM configuration (e.g. g-RNTI/MRB list/mtch-SchedulingInfo/pdsch-Config, etc.) is configured per TMGI value, for a list of TMGIs. So, it is supported that multiple TMGIs are provided with the same PTM configuration.”**

**Can discuss if anything needs to be added on signaling overhead.**

**Question (2): RRC supports the indication whether a neighbour cell provides the broadcast service on MTCH. Given the size of the mbs-NeighbourCellList to which the mtch-NeighbourCell in each MBS-SessionInfo item refers to, it is possible that not all neighbour cells can be indicated. This size-limitation would presumably be more acute in RAN sharing scenarios, at the border between a shared area and a non-shared area or similar. Can it be assumed that service continuity is also supported towards a neighbour cell not indicated in the mbs-NeighbourCellList?**

**Summary of company proposals**

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| CATT [3] | In Rel-17, if a neighbour cell is not indicated in the mbs-NeighbourCellList, UE may request unicast reception of the service before moving to the cell. However, RAN2 understand that if, according the RAN3 description, that the size-limitation would be more acute in RAN sharing scenarios, then the above mentioned unicast-based mechanism may have resource efficiency issue if UE requests unicast reception to a cell that actually provides MBS broadcast service(s) using PTM transmission. |
| HW [4] | If there is a neighbour cell not indicated in the mtch-NeighbourCell, it is up to UE implementation to determine what to do to ensure the service continuity, e.g. the UE may trigger to establish unicast PDU session in application layer or may read SIB1/SIB20 of neighbour cell in advance. |
| NEC [5] | The neighbour cell information is an optional optimization to let UE be aware of the broadcast information in advance during cell reselection procedure (e.g., UE can re-connect with network for requesting unicast (DRB) if the broadcast service is not provided). Even if a neighbour cell is not indicated in the mbs-NeighbourCellList, as long as this neighbour cell can provide the same service, then service continuity is also supported. Furthermore, SIB1 which contains the mapping between the current and/or neighbouring carrier frequencies and MBS FSAI can also be considered. |
| Nokia [6] | It should be noted that it is possible to signal a list including up to 8 neighbour cells and that list includes both intra- and inter-frequency cells and these 8 neighbour cells are commonly used by all the MBS-SessionInfo instances i.e. common for all the TMGI. In Release 17, it is up to UE implementation to utilize neighbour cell information as it sees fit and it is optional for network to provide it and service continuity should also work without providing MBS-NeigbourCellList |
| Samsung [7] | RAN2 confirms that service continuity may not be guaranteed towards a neighbour cell not indicated in mbs-NeighbourCellList. |
| Ericsson [8] | The presence of mbs-NeighbourCellList only improves the service continuity between supporting and non-supporting MBS nodes. In case a neighbour cell list near the border of shared area would indicates neighbours in the non-shared area of different operators, it would only improve the cell re-selection in case the strongest/best ranked cell in the non-shared area belongs to the operator of the UE. A neighbour cell list is not a pre-requisite to enable service continuity |
| Intel [9] | For Q2 of RAN3 LS, RAN2 to reply that it is up to UE implementation to ensure service continuity if UE reselects a neighbour cell not indicated in the mbs-NeighbourCellList. |
| CMCC [10] | For neighbour cells not indicated by the network, UE may request unicast reception of the service before moving to a cell, and the service continuity can be supported, no matter whether it is in RAN sharing scenario. |
| xiaomi [11] | No, service continuity is not supported towards a neighbour cell not indicated in the mbs-NeighbourCellList. Besides, from RAN2 point of view, the only size-limitation for mbs-NeighbourCellList to include all neighbour cells is the PDCP SDU size which the maximum supported size is 9000 bytes. |
| ZTE [12] | Service continuity which is best effort for broadcast, might be supported towards a neighbour cell not indicated in the mbs-NeighbourCellList, based on mechanism like frequency prioritization. |

 **Observations and suggested proposal**

Firstly, it seems great majority of the companies think service continuity is still supported (or may be supported) towards a neighbor cell not indicated in the mbs-NeighbourCellList. Few companies suggested to answer “No” directly.

Second, multiple companies suggest that using mbs-NeighbourCellList for service continuity is optional or an optimization, or it is up to UE implementation what to do if a neighbor cell is not part of the list.

Then, some companies think the size limitation issue mentioned by RAN3 should also be discussed and proposed to response to this issue as well. This can be further discussed.

**Proposal 2 Start with the following for answer to Q2:**

**“From RAN2 point of view, it is optional for network to provide mbs-NeighbourCellList and it is up to UE implementation how to utilize such information for service continuity. For example, if a neighbour cell is not indicated in the mbs-NeighbourCellList, UE may request unicast reception of the service before moving to the cell.**

**Can discuss whether/how to respond to the issue of size-limitation that is raised in the RAN3 LS.**

**Question (3): Is there any significant limitation from RRC point of view if the TMGI as received by the 5GC contains a PLMN/SNPN ID not broadcast in SIB1?**

**Summary of company proposals**

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| --- | --- |
| CATT [3] | From RRC point of view there is no restriction that the TMGIs for the broadcast services that UE is interested to receive or being receiving should contain PLMN ID broadcasted in SIB1. |
| HW [4] | The gNB can signal the explicit PLMN ID in TMGI using explicitValue, if the received PLMN ID in TMGI is not included in SIB1. MBS cannot work in SNPN scenario based on current RRC specification, regardless of whether the NID is included in SIB1 or not. |
| NEC [5] | For PLMN case, if the TMGI as received by the 5GC contains a PLMN ID not broadcast in SIB1, then the PLMN index can not be used as this is a per-cell configuration. For SNPN case, since there is no NID specified in TMGI field, it is not supported for identifying a TMGI from RAN2 point of view at least for now. |
| Nokia [6] | There is no problem caused for UE if UE receives TMGI that has PLMN/SNPN that is not broadcast in SIB1 as there is no UE functionality defined to check PLMN/SNPN ID from the TMGI |
| Samsung [7] | RAN2 confirms that there is no significant limitation from RRC point of view if the TMGI as received by the 5GC contains a PLMN/SNPN ID not broadcast in SIB1. |
| Ericsson [8] | In case the PLMN index cannot be used, it increases the MBSInterestIndication message, Paging message and MCCH size size, but it does not create inter-operability problems. |
| Intel [9] | For Q3 of RAN3 LS, RAN2 to reply that from RRC point of view, there is no limitation if the TMGI received by the 5GC contains a PLMN ID not broadcast in SIB1, but Rel-17 TMGI signalling does not support the case that SNPN ID is not signalled in SIB1. |
| CMCC [10] | Though from RRC point of view, TMGI contains a PLMN/SNPN ID not broadcast in SIB1 can be provided to UEs, the final identification is in NAS, which is out of RAN2 scope. Besides, if this adopted, the impacts to Rel-17 UEs should be taken into consideration. |
| xiaomi [11] | * No, there is no significant limitation from RRC point of view.
* Rel-17 supports TMGI containing a PLMN not broadcast in SIB1. As for the TMGI containing a SNPN not broadcast in SIB1, it can be supported via introducing a new type of TMGI in Rel-18.
 |
| ZTE [12] | For one PLMN or SNPN ID that is not broadcast in SIB1, the overhead optimization defined by RAN2 does not apply, e.g., in MCCH the explicit TMGI will be presented. |

**Observations and suggested proposal**

Firstly, great majority thinks there is no restriction that the TMGIs for the broadcast services that UE is interested to receive or being receiving should contain PLMN ID broadcasted in SIB.

Secondly, multiple companies propose to tell RAN3 that MBS cannot work in SNPN scenario based on current RRC specification.

Then, some companies mentioned that for the case the signaling overhead is higher as it is not possible to rely on plmn-Index which is shorter than explictValue.

**Proposal 3 Start with the following for answer to Q3:**

**“From RRC point of view there is no restriction that the TMGIs for the broadcast services that UE is interested to receive or is receiving should contain PLMN ID broadcasted in SIB1.”**

**Can discuss whether to add that the current RRC specification does not support MBS in the SNPN scenario.**

**Can discuss whether anything needs to be added on signaling overhead.**

# 3. Conclusion

Based on the summary in section 2, the following are proposed for further discussions.

**Proposal 1 Start with the following for answer to Q1:**

**“In the RRC ASN.1, the PTM configuration (e.g. g-RNTI/MRB list/mtch-SchedulingInfo/pdsch-Config, etc.) is configured per TMGI value, for a list of TMGIs. So, it is supported that multiple TMGIs are provided with the same PTM configuration.”**

**Can discuss if anything needs to be added on signaling overhead.**

**Proposal 2 Start with the following for answer to Q2:**

**“From RAN2 point of view, it is optional for network to provide mbs-NeighbourCellList and it is up to UE implementation how to utilize such information for service continuity. For example, if a neighbour cell is not indicated in the mbs-NeighbourCellList, UE may request unicast reception of the service before moving to the cell.**

**Can discuss whether/how to respond to the issue of size-limitation that is raised in the RAN3 LS.**

**Proposal 3 Start with the following for answer to Q3:**

**“From RRC point of view there is no restriction that the TMGIs for the broadcast services that UE is interested to receive or is receiving should contain PLMN ID broadcasted in SIB1.”**

**Can discuss whether to add that the current RRC specification does not support MBS in the SNPN scenario.**

**Can discuss whether anything needs to be added on signaling overhead.**

# 4. Reference

1. R2-2211168 LS on resource efficiency for MBS reception in RAN sharing scenario (R3-226084; contact: CATT) RAN3 LS in Rel-18 NR\_MBS\_enh To:RAN2 Cc:SA2
2. R2-2211244 [Draft] Reply LS on resource efficiency for MBS reception in RAN sharing scenario CATT LS out NR\_MBS\_enh-Core To:RAN3 Cc:SA2
3. R2-2211245 Discussions on RAN3 LS on resource efficiency for MBS reception in RAN sharing scenario CATT, CBN discussion NR\_MBS\_enh-Core
4. R2-2211513 Discussion on the RAN3 LS on resource efficiency for MBS reception in RAN sharing scenario Huawei, HiSilicon discussion Rel-18 NR\_MBS\_enh-Core
5. R2-2211612 Discussion on RAN sharing scenarios for MBS NEC Europe Ltd discussion Rel-18 NR\_MBS\_enh-Core
6. R2-2211972 RAN sharing and response to RAN3 Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_MBS\_enh-Core
7. R2-2212057 Discussion on RAN sharing scenario Samsung discussion Rel-18
8. R2-2212306 RAN sharing scenarios Ericsson discussion Rel-18 NR\_MBS\_enh-Core
9. R2-2212577 Discussion on RAN3 LS on MBS RAN sharing Intel Corporation discussion Rel-18 NR\_MBS\_enh-Core
10. R2-2212630 Discussion on RAN3 LS CMCC discussion Rel-18 NR\_MBS\_enh-Core
11. R2-2212740 Discussion on the “LS on resource efficiency for MBS reception in RAN sharing scenario” from RAN3 (R3-226084) Xiaomi discussion Rel-18
12. R2-2212927 RAN2 on network sharing for Broadcast session ZTE, Sanechips discussion Rel-18 NR\_MBS\_enh-Core