3GPP TSG RAN Meeting #93e RP-21xxxx

Electronic Meeting, Sept. 13 - 17, 2021

Agenda Item: 9.3.2.4

Source: 3GPP RAN1 WG Vice-Chair

Title: Moderator's summary for email discussion [93e-19-MBS-WI]

Document for: Discussion

# 1 Introduction

The purpose of the email thread for which this document serves as a summary is to address the contributions on Rel-17 MBS.

# 2 Initial Round Discussion

To kick off the initial discussion, the following sub-sections provide general questions for collecting views on the issues brought up in the contributions. The views expressed can then be used to potentially discuss specific proposals in the next phase.

## 2.1 Rel-17 NR MBS Scalability Issues

The following observations were made in [1].

**Observation 1:** With growing numbers of UEs, signaling and processing the candidate UE lists for paging may consume valuable time.

**Observation 2:** With growing numbers of UEs, establishment of associated PDU Session Resources will consume valuable time.

**Observation 3:** With growing numbers of UEs, per-UE RRCReconfiguration for MBS resources will consume valuable time in highly populated cells/gNBs.

**Observation 4:** It is expected that multicast traffic reception in RRC\_IDLE/INACTIVE will enable to further improve 5GS responsiveness for multicast NR MBS.

**Observation 5:** With growing numbers of UEs, obligatory establishment of associated PDU Session Resources - just to provide joining information to RAN - 5GS capacity will be wasted.

**Observation 6:** With growing numbers of UEs it can be expected that paging resources might be blocked for more than one (complete) DRX cycle.

**Observation 7:** The Rel-17 MBS WID mentions transmission areas within a single gNB-DU, which in turns limits the number of cells and of UEs to be considered. This is the likely reason why scalability did not seem to be a concern so far. However, if and when the single gNB-DU limitation is lifted, the scalability issue will be very evident.

**Observation 8:** It would be beneficial to re-visit current concepts to ensure that mechanisms that are only applicable for interworking with non-supporting NG-RAN nodes do not have to be executed in case of homogenous NR MBS deployment.

Based on these observations, the following was proposed.

**Proposal 2.1-1:** We therefore propose for RAN to discuss the observations made in chapter 2 acknowledging the scalability issues described. Depending on the outcome of the discussion, it might be appropriate to draft an LS to the appropriate WGs to make them aware of these findings.

The following questions invite views on this aspect.

**Q1: Please provide your views on the following in the table below**

1. **General views on the observations listed above from** [1]**.**
2. **Based on the observations, is an LS to the appropriate WGs necessary?**
3. **If an LS is necessary, which WGs should the LS be sent to?**

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| **Company** | **Views** |
| Huawei, HiSilicon | Multicast, is intend to be introduced to ensure high QoS and good service experience, therefore the network must be able to perform special handling for each UE when required, e.g. using PTP transmission, support handover, etc.  We do not see the need to send LS to any WGs, as all these observations have already been taken into account during the discussion in related groups.  For the listed observations, our views are:  Ob1, Ob2，different solutions were discussed in RAN2/RAN3/SA2, the selection of the solution was made after comparing of different solutions. Note that it was agreed in RAN3#113-e: RAN3 continue the work based on current SA2 agreements, if any issues identified in RAN3 later, LS coordination or companies’ internal coordination with other groups are allowed.  Ob3, the configuration of PTP transmission should be set at per UE granularity, per UE RRC Reconfiguration is the best/only way to achieve that and there were no other ways proposed in WG discussions.  Ob4, it‘s a common understanding that the Multicast traffic reception in non-RRC\_CONNECTED will be discussed in R18 as there is no time to achieve this in Rel-17.  Ob5, the relationship between MBS Session ID and the UE context has to be provided to RAN anyway. Furthermore, this issue is completely outside RAN scope and there is no reason not to follow the conclusions and outcome of SA2 SI and WI.  Ob6, we do not understand the concern, is it assumed there will be simultaneous MBS session activation for a lot of MBS Sessions? Note that evaluation has already been made and takes into account before making the decision in RAN2.  Ob7: the R17 WID only limits the SFN to intra-gNB-DU case, there is no limitation for the transmission areas and inter-gNB mobility is supported in R17.  Ob8: we do not understand the concern, the following agreement was made in RAN3#112-e: Acknowledge that MBS related information within the associated PDU Session Resource Context may not include associated QoS flow information if interworking with non-supporting RAN nodes is not required; st3 details are FFS. |
| Intel | For observation 1, 2, 5, and 8, our understanding is that related decisions are within SA2 domain, and any related discussion on potential scalability issues should take place in SA2. There is no need for RAN to send LS to SA2.  For observation 3 and 4, our understanding is that they are related to multicast support for RRC\_INACTIVE. There is substantial support to specify multicast support for RRC\_INACTIVE in Rel-18 timeframe. We’re also OK to specify multicast support for RRC\_INACTIVE in Rel-17 if majority of companies agree. In that case, we prefer that multicast support for RRC\_INACTIVE is based on solution for broadcast to minimize the needed work.  For observation 6, our understanding is that RAN2 made decision on group paging after extension discussion, and we don’t see much need to reopen the discussion at this late stage of Rel-17.  For observation 7, we are not sure whether the intention is to change the intra-gNB-DU SFN condition in WID. It might not be desirable to broaden the deployment scenarios at this late stage of Rel-17. |
| Interdigital | With regard tot he observations, we agree that observations 1,2,3,5,and 6 are valid indeed and we support that they should be discussed in RAN2/3, time permitting. Otherwise, they can be discussed as optimizations in rel-18  As Huawei has indicated, the concerns raised in observations 4 and 7 (MBS support in IDLE/INACTIVE and SFN) seem to be within the rel-18 scope and there were a majority support for them in the pre-meeting R18 email discussion. So we don’t think we should discuss them in the R17 context  We are neutral with regard to the sending of the LSs. If they are to be sent, then RAN1/2/3 and SA2 seem the relevant ones. |
| MediaTek | We share the views with Huawei. We did not see the need to send LS to any WGs, as the issues pointed out in the document RP-212093 was discussed at WG level.  Specific to the scalability for supporting growing numbers of UEs for multicast services, RAN2 discuseed the possiblity to support the delivery of the multicast services to RRC\_Inactive/RRC\_Idle mode UEs, which was depriortized for Rel-17 and may be revisited again at Rel-18, accoring to the Rel-18 email discussion for NR MBS enhancement. |

## 2.2 Intra-DU SFN for Rel-17 NR MBS

Stating that intra-DU SFN for broadcast cannot be purely left up to network implementation and some essential components have to be specified to enable support of intra-DU SFN for broadcast, [2] proposed the following.

**Proposal 2.2-1:** To facilitate WG discussions,

* Revising the WID to include RAN1 into the relevant objective:
  + *Study the support for dynamic control of the Broadcast/Multicast transmission area within one gNB-DU and specify what is needed to enable it, if anything [RAN1, RAN2, RAN3]*
* Alternatively, confirm the support of intra-DU SFN in Rel-17 NR MBS and specify necessary components to enable its support.

**Q2: Please indicate your support or lack thereof for each of the following**

1. **Add RAN1 as a responsible working group for the objective relevant to intra-DU SFN as in the first bullet of proposal 2.2-1 above.**
2. **Agree in RAN#93e to confirm the support of intra-DU SFN in Rel-17 NR MBS and specify necessary components to enable its support as proposed in the second bullet of proposal 2.2-1 above.**

**Reasons, views in general and any alternate proposals in case you don’t support either of the above proposals may also be provided.**

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| **Company** | **Views** |
| LG1 | We do not support adding this proposal due to the following reasons:   * In WID, it is stated that *no standardized support specifically for SFN is provided in this WI. Any SFN operation is transparent to the UE, and any related synchronization is left to network implementation. The existing QCL framework (based on SSB and CSI-RS) is reused.* Thus, this restriction and assumption should be removed to support standard impact from intra-DU SFN for broadcast. * We wonder if the objective of dynamic control of the Broadcast/Multicast transmission area is really related to SFN because MBSFN is semi-statically configured in LTE MBMS. Dynamic control of the area seems related to dynamic cell on/off for non-SFN broadcast/multicast for RAN2/3. * We are reluntant to add more work at the last moment of this WI phase.   Alternatively, we think that standard work necessary for intra-DU SFN (as well as inter-DU SFN, if supported) could be considered in Rel-18 WI. |
| Huawei, HiSilicon | We support the proposal.  WID (RP-201038) implies support intra-DU SFN by transparent transmission and up to network implementation. We agree that the support of intra-DU SFN can be such that the UE is not aware of the SFN transmission, and thus that specifications don’t need to explicitly mention SFN transmission.  However, as shown in RAN1#106e, this does not mean that intra-DU SFN for broadcast can be supported without specification work, and in fact RAN1 contributions showed that it cannot be purely left up to network implementation and some essential components have to be specified to enable support of intra-DU SFN for broadcast for UEs in idle or inactive state, including：  - Configurable scrambling sequence initialization for PDCCH/PDSCH and DMRS sequence generator initialization for PDCCH/PDSCH for broadcast transmission for broadcast (as supported for RRC\_CONNECTED UE).  - Configuring TRS as QCL sources for broadcast transmission (as supported for RRC\_CONNECTED UE).  RAN plenary should at least allow specification work for the support of intra-DU SFN, with a WID revision at least in the justification part, which ambiguously implies that no specification works is needed for intra-DU SFN. |
| TCL communication Ltd. | We support the proposals.  Intra-DU SFN operation for broadcast in R17 MBS requires some specification work which may need the involvement of RAN1 WG. Therefore,we agree to confirm the support of intra-DU SFN in Rel-17 NR MBS and to add RAN1 responsibility to the WG objective related to intra-DU SFN. |
| Intel | We don’t think RAN1 should be added, and introducing additional work at this late stage is not good. Any leftovers can be handled in Rel-18. |
| Interdigital | Similar to LG, we are not very supportive of adding extra specification work for enabling intra-DU SFN so late in R17. |
| MediaTek | We share the same view as LG. It was assumed to support intra-DU SFN by only network implementation during Rel-17 WID discussion.  We propose to postpone the support of intra-DU SFN to Rel-18 if physical layer change is a must.  The work load of Rel-17 MBS is high and we should not add new work load on top of current scope. |
| CBN | We support the proposal.  SFN is of great significance to solve the coverage problem and improve spectral efficiency. According to the actual deployment requirements of the network, we think it is necessary to make sure that intra-DU SFN is working in Rel-17 NR MBS. |
| Huawei, HiSilicon | We would like to have a second response to further explain our consideration.  We’d like first to clarify that intra-DU SFN for RRC\_CONNECTED UEs for mulitcast is already supported in Rel-17 with no standardized support specifically for SFN (i.e. align with WID). However, for MBS broadcast, some essential components (e.g., the srambling ID and TRS as QCL source configured by MCCH) was overlooked during WID drafting and were just identified in recent RAN1 meetings.. Such specification change is trivial. For example, RAN1 has agreed to configure an scrambling ID for the second DCI format and to support TRS as QCL source for power savings for RRC\_IDLE/INACTIVE UEs, all the remaining changes needed are to have an configurable scrambling ID for the first DCI format and reusing the same design from power saving feature or just moving the TRS configuration as for RRC\_CONNECTED UE into SIB/MCCH.  On the other hand, forward compatibility shall be secured, which has been stated in the WID:  *Any design decisions taken for this WI in Release 17 shall not prevent introducing the following features in future Releases:*   * *Standardised support of SFN over multiple cells above gNB-DU level;*   Not fully specifying the targeted support for intra-DU SFN in Rel-17 and leaving some of the work to Rel-18 (pending further agreement) would bring forward compatibility issue for Rel-18 inter-DU SFN and make the network deployment more complex and less efficient, e.g., network will have to transmit the SFN broadcast to Rel-18 UEs and transmit an additional copy to Rel-17 UEs which does not support intra-DU SFN in idle/inactive state....  Overall, we suggest RAN to allow spec work for intra-DU SFN for idle/inactive UEs, including:  *- Configurable scrambling sequence initialization for PDCCH/PDSCH and DMRS sequence generator initialization for PDCCH/PDSCH for broadcast transmission for broadcast (as supported for RRC\_CONNECTED UE).*  *- Configuring TRS as QCL sources for broadcast transmission (as supported for RRC\_CONNECTED UE).* |

## 2.3 Common Frequency Resource (CFR) for Broadcast

The issue of common frequency resource (CFR) for broadcast has been discussed for many meetings in RAN1. To make further progress, the following is proposed in [2].

**Proposal 2.3-1 (from RAN1#106e):** Support the following proposal from RAN1 chair notes:

Proposal:

For a configured/defined CFR for GC-PDCCH/PDSCH carrying MCCH and MTCH for broadcast reception with UEs in RRC IDLE/INACTIVE state.

* + Support Case-C
  + Working assumption: Support at least one of Case D and Case E.
    - Down-selection to be made at RAN1#106b-e
  + Note: Case C, D and E are defined in previous agreements

The following is an alternate proposal from [3] on the same issue.

**Proposal 2.3-2**: For a configured/defined CFR for GC-PDCCH/PDSCH carrying MCCH and MTCH for broadcast reception with UEs in RRC IDLE/INACTIVE state, Rel-17 MBS supports all of the following cases with a common configuration framework to accommodate different broadcast services with different requirements.

* The CFR is larger than the initial DL BWP configured by SIB1.
* The CFR is the same as the initial DL BWP configured by SIB1
* The CFR is larger than CORESET#0 but smaller than the initial DL BWP configured by SIB1.

Note: The CFR fully contains CORESET#0.

**Q3: Please provide your answers to each of the following in the table below**

1. **Do you support the proposal 2.3-1 above?**
2. **Do you support the proposal 2.3-2 above?**

**Reasons, views in general and any alternate proposals in case you don’t support either of the above proposals may also be provided.**

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| **Company** | **Views** |
| LG1 | We generally support both proposals for progress. RAN1 already spent much time on this topic. If possible, we could change to one of the following alternative Proposal 2.3-1:  *Alt 1:*   * + *~~Working assumption:~~ Support at least one of Case D and Case E.*      - *Down-selection to be made at RAN1#106b-e*   *Alt 2:*   * + *~~Working assumption:~~ Support ~~at least one of~~ Case D and Case E.*      - *~~Down-selection to be made at RAN1#106b-e~~* |
| Huawei, HiSilicon | We support proposal 2.3-1 (from RAN1#106e).  “The common configuration framework“ in proposal 2.3-2 needs more WG discussion. The common ground of the discussion in RAN1 is proposal 2.3-1 which should be more agreeable within the group. |
| NTT DOCOMO | We support both proposals. For the proposal 2.3-1, we are fine with LG’s suggestion to make further progress as sufficient discussion has already been done in RAN1 for this issue. |
| TCL Communication Ltd. | We support both 2.3-1 and 2.3-2 proposals. We are also fine with LG’s suggestion as well. |
| Intel | We support Proposal 2.3-1. RAN1 has already spent an inoridante amount of time debating this issue and this Proposal 2.3-1 (which is already a compromise) should be agreeable to the group.  Additionally, companies have debated at length about Case C vs. Case E and our view is that by configuring a wider initial BWP for MBS-capable UEs (e.g., via MBS specific SIBx), the use case of Case E can already be handled under the signaling paradigm of Case A, C. Furthermore, when CFR is smaller than initial BWP, i.e., Case D, appropriate FDRA can be used to schedule the MCCH/MTCH using Case A/C based configuration. So we do not support Case D.  We do not support Proposal 2.3-2. |
| Interdigital | We support both proposals. |
| MediaTek | We support proposal 2.3-1 (from RAN1#106e).  One additonal comment is we did not see the need to couple the CFR with initial BWP, even though the CFR should be overlapped with Coreset0. Then our proposal is to discuss the size of CFR independently.  **New Proposal: CFR can be configured with any size as long as it covers Coreset0.** |

## 2.4 Lossless HO for Rel-17 MBS

Lossless HO support for Rel-17 MBS is discussed in [4] with the following observations.

**Observation 1 No comprehensive evaluation on PDCP SN sync’s impacts to RAN and SA WGs.**

**Observation 2 No consensus achieved on PDCP SN sync’s impacts in RAN2/RAN3 so far.**

**Observation 3 PDCP SN sync brings significant architectural impacts, e.g., violating existing QoS modeling, NG-U tunnel design.**

**Observation 4 There are still variations for PDCP SN sync even it is agreed.**

**Observation 5 SA2 does not pursue lossless mobility from the architectural perspective.**

**Observation 6 Only basic mobility support is pursued for Rel-17 WI of NR MBS.**

**Observation 7 Overall implementation impact should be limited, in order to facilitate implementation and deployment for Rel-17 WI of NR MBS.**

**Observation 8 Only seamless handover where packet loss is allowed but service reception is continued, is pursued for Mission Critical Services over 5G MBS.**

**Observation 9 In SA1 spec that defines 5G MBS requirement TS 22.261, lossless HO support is not found either.**

**Observation 10 Reliable Multicast (without packet loss) is still a problem unsolved and won’t be solved in the short term in IP world.**

**Observation 11 Requirement on lossless HO support for NR MBS is not clear, and results in unnecessary and no-so-productive discussion in WGs.**

Based on these observations the following is proposed in [4].

**Proposal 2.4-1:** Rel-17 NR MBS does not pursue lossless handover.

**Q4: Please indicate your support or lack thereof for pursuing lossless handover in Rel-17 NR MBS in the table below. Reasons and general views related to this topic may also be provided.**

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| **Company** | **Views** |
| Huawei, HiSilicon | We do support lossless handover in R17, by supporting PDCP SN sync and supporting data fowarding between MBS supporting nodes.  The “lossless handover“ mentioned in this topic, is to address data loss caused by different deliever pogress between different gNBs for a MBS service. This is a different purpose than for MBSFN, since for NR, inter-gNB SFN is not supported in R17 and different gNBs schedule the same MBS service data seperately. As the radio conditions, cell load, service priority among the ongoing services are different in different gNBs/cells, if we do not support “lossless handover“, once a UE moves from one gNB to another, there could be a human perceivable packet loss. Furthermore, in some cases the communication is not between human, e.g. V2X, which has higher relaibility requirement. The issue that is mentioned about misalignement of QoS flows mapping to MRBs has been raised and discussed already in WG discussions. It can be easily avoided by proper network configuration and implementation and the flexibility of QoS flows mapping is of much lesser importance in this case than avoiding the data loss during mobility.  SA2 also clearly states in their specifications that minimization of data loss has to be achieved with details to be decided by RAN WGs.  **It has already been agreed in RAN2 and RAN3 to support PDCP SN sync, together with some details of the solution:**   * RAN3#110-e meeting agreement:   + For multicast, in order to allow the UE to detect loss of data or duplication of data, RAN3 shall continue discussing solutions to support alignment of PDCP SNs in between gNBs.   + RAN3 will work on concepts to enable coordinated assignment of PDCP SNs to MBS user data packets within a gNB and between gNBs (to be coordinated with RAN2 if needed). Details FFS. * RAN2#112-e meeting agreement:   + In order to support the lossless handover for 5G MBS services, at least DL PDCP SN synchronization and continuity between the source cell and the target cell should be guaranteed by the network side to realize. The design of specific approach to realize this can be involved with WG RAN3. * RAN3#113-e meeting agreement:   + Source and target gNBs derive synchronized PDCP SN from sequence number and the solution is FFS.   And it has alreday been agreed in RAN2 to support data forwarding:   * RAN2#112-e meeting agreement:   From network side, the source gNB may forward the data to the target gNB and the target gNB will deliver the forwarding data. Meanwhile, the SN STATUS TRANSFER should be extended to cover the PDCP SN for MBS data; Then (TBD after or in parallel) the UE receives the MBS in the target cell by the target cell according to target configuration. |
| TCL communication Ltd | We support the proposals.  There is a clear requirement to support minimization of data loss during MBS mobility in SA2 ;on the top of that, there is also a good progress in lossless handover topic in both RAN2 and RAN3. Therefore, we support lossless handover in Rel-17 NR MBS |
| Intel | We support pursuing lossless handover in Rel-17 NR MBS, at least for lossless handover between MBS-supporting gNBs. Such support does not require much additional RAN2 work, while RAN3 needs to agree on solutions PDCP SN synchronization across source and target gNBs. The QoS mapping aspect discussed in [4] can be ensured by implementation e.g. data from one TMGI is always mapped to one MRB (instead of split to multiple MRBs which can cause PDCP SN async among gNBs). Discussion might be needed on whether to support lossless handover during handover between MBS-supporting gNB and non-MBS-supporting gNB. |
| Interdigital | We do not support the proposal and think that avoiding/minimizing lossless HO is essential for some MBS use cases. Also, as Huawei has indicated, we already have agreements from several previous meetings and it makes more sense to discuss/agree on any remaining aspect to avoid/minimize lossless handover in the coming few WG meetings, rather than revert these agreements. |
| MediaTek | We think lossless handover for MBS can be supported at some scenarios in a easy way. For example, if PTP can be configured for a UE at both source gNB and target gNB, the lossless handover for that MBS service may be supported via legacy unicast HO mechanism.  We propose to discuss the issue at WG level and identify the cases to support lossless handover for MBS for Rel-17. |
| CBN | We support lossless handover in Rel-17 NR MBS.  We think that multicast should be a reliable transmission to avoid service continuity problems caused by UE mobility. Lossless handover should be an important requirement for multicast. Moreover, RAN2/3 has agreed to support this feature, and the technical scheme is relatively simple and effective. So it is necessary to standardize lossless handover between gNBs in Rel-17 NR MBS. |

# 3 Intermediate Round Discussion

## 3.1 Moderator summary

# 4 Final Round Discussion

## 4.1 Moderator summary

# 5 Conclusion

# 6 References

1. RP-212093 The State of Rel-17 NR MBS Ericsson, AT&T
2. RP-212267 Discussion on the progress of Rel-17 NR MBS Huawei (rapporteur)
3. RP-212414 Discussion on CFR configuration for Rel-17 MBS ZTE, Nokia, Nokia Shanghai Bell, Qualcomm, vivo, Convida Wireless
4. RP-212415 Views on lossless HO for Rel-17 MBS ZTE, Sanechips