**3GPP T****SG-RAN WG2 Meeting #113 R2-210xxxx**

**E-meeting, 25th Jan– 5th Feb 2021**

**Agenda item: 8.1.1**

**Source: Huawei, HiSilicon**

**Title: Report of [Offline-037][MBS] MBS General (Huawei)**

**Document for: Discussion and Decision**

# Introduction

This document aims at gathering and summarizing companies’ views for the following offline discussion:

* [AT113-e][037][MBS] MBS General (Huawei)

      Scope: Based on R2-2102253, work on running CR to make it acceptable (based on previous meeting agreements). Address the issues needed to reply to SA2 LS, progress as much as possible, Come Back ON-line if needed. (note that the issue whether Multicast can be supported in Idle or inactive will be treated online).

      Intended outcome: Endorsable Running CR, Draft LS out, Report

      Deadline: In time for next online session for the items that need on-line attention, EOM for the rest.

Section 2 contains questions related to SA2 LS received by RAN2 in [1] and captured as editor’s notes in Clause 8 of TR 23.757 [2].

In Section 3, companies are requested to provide their concerns with the draft running 38.300 CR, taking version in [3] as the baseline for discussion.

# Discussion on the reply LS to SA2

* 1. Editor’s note on session leave idication (section 8.2.2.2 of TR 23.757)

- The UE shall indicate leaving an MBS session in CM-CONNECTED with RRC-CONNECTED state.

Editor's note: Whether the UE can stop receiving traffic of a multicast session without indicating leaving in CM-IDLE state or CM-CONNECTED with RRC-INACTIVE state relies on RAN WG feedback.

RAN2 did not agree to support the multicast session reception for RRC\_INACTIVE and RRC\_IDLE so far and this issue is supposed to be discussed online during this meeting. Nevertheless, the issue is discussed in the context of SA2 LS in [4], [5], and [6] with different views being expressed.

It should be noted that session join and leave are procedures handled by NAS layer at the UE and are currently assumed to be transparent for AS layer. From RAN2 perspective, it could be beneficial to keep it that way, i.e. session join/leave indication is triggered by NAS layer and processed as normal NAS signalling by AS layer. This way there is no impact to RAN2 specifications while SA2 can use the same procedures for multicast sessions regardless of whether multicast session is received in RRC Connected state or in RRC Idle/Inactive (if agreed to be supported).

**Question 1: Do companies agree that RAN2 should assume that session join/leave indications are transparent to AS layer and handled by upper layers in the same way regardless of the RRC state the UE is in?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if you disagree, please provide clarifications and an alternative proposal)** |
| **QC** | **Yes** | Using NAS SM procedure, UE can join/leave Multicast session. RAN relies on the information provided by CN, and the assumption from RAN is that any NAS indication from UE regarding multicast session join/leave procedure is transparent to RAN and is assumed to be processed at CN. |
| **MediaTek** | **Yes** |  |
| **Nokia** | **Yes** |  |
| **Kyocera** | **Yes** | We assume the gNB is notified by the CN when a UE joins/leaves a multicast session, although it’s out of RAN2 scope. |
| **CATT** | **Yes, with comments** | To control multicast transmission dynamically, RAN should be aware of which UE is receiving which multicast session on cell level.  So we suggest to reply to SA2 as following,  “RAN2 expects that UE should indicate join/leave an MBS session via NAS procedure regardless of the RRC state the UE is in, and subsequently 5GC should inform this to RAN.” |
| **Xiaomi** | **Yes** |  |
| **Spreadtrum** | **Yes** |  |
| **Ericsson** | **Yes, with comments** | The UE may have joined a multicast session that starts later, i.e. the UE is waiting in idle or inactive for the multicast session to start.  We think that the UE shall explicitly signal (at NAS layer) that it is no longer interested to receive the multicast data after the UE has joined a multicast session. Otherwise the network may spend unnecessary resources on such UE (e.g. try to page that UE when the multicast session starts). The whole point with multicast compared to broadcast is that the network knows if the UE is interested to receive the session. This obviously then should also cover the case when the UE is no longer interested.  Yes, Leave signalling is transparent to RAN but we are not sure if that is the point in this discussion. And we prefer to keep the Leave signalling at NAS level, i.e. no need for RRC signalling.  We support the suggestion provided by CATT. |
| **Lenovo, Motorola Mobility** | **Yes** | Session join/leave indications can be either NAS or application layer message and can be handled transparent to AS layer. E.g. if UE is in RRC inactive/idle state and would like to send MBS session join/leave message to CN, the UE can simply enters RRC connected following the legacy procedure. |
| **OPPO** | **Yes** | For multicast, the UE should notify the leaving via NAS, and 5GC will notify RAN to release the MBS configuration via RRC signalling. |
| **LG** | **Yes** |  |
| **Convida** | **Yes** | Session join/leave indications should be transparent to AS layer. If the UE is in RRC\_Idle or RRC\_Inactive, the UE can transition to RRC\_Connected to send these indications. Upon receiving these indications, core network should inform the RAN. |
| **Sharp** | **Yes** |  |
| **ZTE** | **Yes** | NAS procedure it is. |
| **Samsung** | **Yes, but** | Session join/leave signalling should be transparent to AS. But we think there may be RAN2 related signalling concerning interest indication or request to receive service by PTP, which are related with AS protocols. |
| **Intel** |  | We agree that MBS session join/leave is transparent to RAN2.  As concluded in SA2 TR23.757, when UE is receiving traffic from broadcast session, UE do not need to interact with network. Those RRC\_IDLE/INACTIVE UEs do not need to indicate leaving when they stop receiving traffic. As discussed in [Post-112e][069], majority companies agree that Delivery mode 2 can also be used for low QoS multicast services. In order to keep the UE behaviour the same in delivery mode 2 and keep it simple, from our understanding, RRC\_IDLE/INACITVE UEs also don’t need to indicate leaving multicast session indicating stop receiving traffic. |
| **vivo** | **Yes** | From our understanding, session join/leave indications are pure NAS layer procedures. Thus, these procedures should be transparent to AS layer and be independent of the UE’s RRC state. |
| **Huawei, HiSilicon** | **Yes** | We think session leave is needed regardless of the UE state in which the UE receives a multicast session (if we agree they can be received in RRC IDLE/INACTIVE as well). |
| **CMCC** | **Yes, but** | From our perspective, although session join/leave signalling should be transparent to AS, which is NAS procedure(multicast) or in application layer(broadcast), it is beneficial that gNb can be notified by CN the situation of UE’s join or leaving. |

**Summary:**

19 companies provided the reply toQ1: **“Do companies agree that RAN2 should assume that session join/leave indications are transparent to AS layer and handled by upper layers in the same way regardless of the RRC state the UE is in?”**:

* **Yes:** 18 companies. Main remarks from companies:
  + Session join/leave is a NAS procedure and should be performed regardless of the RRC state the UE is in.
  + RAN needs to be aware when the UE leaves the session not to waste resources on such UE.
  + Session join/leave should be transparent to RAN, but the CN should inform RAN about UE leaving the session.
* 1 company would like to align the behaviour of multicast session delivered over delivery mode 2 with broadcast session handling, i.e. no leave indication.

Based on this, the rapporteur proposes to make the following agreement and reply to SA2 accordingly:

**Proposal 1: RAN2 assumes that MBS session join/leave indications are sent using NAS signalling regardless of the RRC state the UE is in. 5GC should inform RAN about the UE leaving the MBS session.**

* 1. Editor’s note on security handling (section 8.2.2.2 of TR 23.757)

Editor's note: RAN and/or SA3 is assumed to determine the handling of the security for MBS traffic.

Regarding the security issue for MBS traffic, the work is being carried out by SA3 and summarised in TR 33.850 [7]. RAN2 can indicate that we are waiting for SA3 to conclude their study before discussing the security.

Question 2: Do companies agree to reply that RAN2 will wait for SA3 to finalize their study on security for MBS before discussing security aspects in RAN2?

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| **Company** | **Yes/No** | **Comments (if you disagree, please provide clarifications and an alternative proposal)** |
| **QC** | **Yes** |  |
| **MediaTek** | **Yes** |  |
| **Nokia** | **Yes** |  |
| **Kyocera** | **Yes** |  |
| **CATT** | **Yes** |  |
| **Xiaomi** | **Yes** |  |
| **Spreadtrum** | **Yes** |  |
| **Ericsson** | **Yes** |  |
| **Lenovo, Motorola Mobility** | **Yes** |  |
| **OPPO** | **Yes** | The security protect function will be discussed in SA3, e.g. which node the security function will be located in. |
| **LG** | **Yes** |  |
| **Convida** | **Yes** |  |
| **Sharp** | **Yes** |  |
| **ZTE** | **Yes** | However, having security mechanism will bring some AS impacts, like PDCP Count sync between TX and RX, ciphering on PTP and PTM, and inter-gNB service continuity issues, etc..  We recommend not to have security functions in AS layer from RAN2 perspective, just like NR V2X Groupcast & Broadcast, and to assume it will be taken care of in app layer. However this needs to be notified to SA2/3. We suggest including the above concerns from AS layer in the LS to provide RAN perspective. |
| **Samsung** | **Yes** |  |
| **Intel** | **Yes** |  |
| **vivo** | **Yes** |  |
| **Huawei, HiSilicon** | **Yes** |  |
| **CMCC** | **Yes** |  |

**Summary:**

All companies agree to reply that RAN2 will wait for SA3 to finalize their study on security for MBS before discussing security aspects in RAN2. One company suggests to raise some issues in case the security functions are placed in AS layer. Rapporteur suggests that this can be discussed further once SA3 study is finalized or when SA3 requests RAN2 input on security.

**Proposal 2: RAN2 will reply that it will wait for SA3 to finalize their study on security for MBS before discussing security aspects in RAN2.**

* 1. Editor’s note on multicast session start notification (section 8.2.2.2 of TR 23.757)

- The 5GC shall be able to trigger NG-RAN nodes to notify session start/activation of an MBS session to UEs.

Editor's note: How the NG-RAN node notify session activation to UEs relies on RAN WG feedback.

In both [4] and [6], it is indicated that existing procedures can be reused depending on the RRC state the UE is in while the session start/activation is triggered by 5GC. In [5] on the other hand, it is indicated that the meaning of the session activation requires further clarification. However, it is rapporteur’s understanding that the editor’s note refers to both session start and activation and these terms are currently being utilized interchangeably by SA2.

Furthermore, this issue has again a dependency on whether and how the multicast session can be received by the UEs in RRC Idle and/or RRC Inactive state. Since this is to be discussed online, it is proposed to limit the discussion to the current agreement, i.e. the multicast sessions that require the UE to be in RRC Connected state to receive them.

**Question 3: For the multicast sessions that can only be received by the UE in the RRC Connected state, do companies agree that UE’s are notified about the session start/activation using:**

* **CN paging for RRC\_IDLE UEs**
* **RAN paging for RRC\_INACTIVE UEs**
* **RRC Reconfiguration message for RRC\_CONNECTED UEs**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if you disagree, please provide clarifications and an alternative proposal)** |
| **QC** | **Yes** | For RRC\_IDLE CN paging, we need to use Multicast Session ID (Example: TMGI) as Group ID.  For RRC\_INACTIVE RAN paging, we may need to use Group ID and we need additional enhancement to indicate CN vs RAN paging (since RRC\_INACTIVE UE behavior is different for CN and RAN Paging reception).  In our understanding, for RRC\_CONNECETD UEs, use of RRC Reconfig message is to provide MRB config if not already configured. Otherwise, there is no need of RRC Reconfig procedure. |
| **MediaTek** | **Yes** |  |
| **Nokia** |  | We probably do not need to agree on a list of possible alternatives at this stage and it is not clear whether session start and session activation means the same, which should be clarified by SA2. However, if a UE is allowed to be released to RRC\_IDLE or RRC\_INACTIVE when it joined a multicast session that can be received only in RRC\_CONNECTED, then a CN paging and RAN paging are needed. |
| **Kyocera** | **Yes** | For IDLE/INACTIVE UEs, we agree with QC in general that CN/RAN paging should be group-based e.g., by a multicast session ID, TMGI or G-RNTI.  For Connected UEs, we think RRC Reconfiguration is baseline in case the UE is not configured with MRB. We’re wondering if an activation indication (e.g., by MAC CE) is needed, if MRB is already configured but deactivated (if supported). |
| **CATT** | **Partially** | Yes on “RRC Reconfiguration message for RRC\_CONNECTED UEs”.  But for idle/inactive UEs, we understand there are two possible options:  Option 1:use CN paging for idle UEs and RAN paging for inactive UEs  Option 2: reuse MCCH based change notification mechanism which is expected to be used for delivery mode 2.  It seems both options are workable, so further discussions are needed.  Hence perhaps for now we can simply reply to SA2 that “RAN2 is working on solution(s) to notify session start/activation of an multicast session to UEs ” |
| **Xiaomi** |  | For the session start, this depends on the content of USD, given that the USD of LTE already includes the session start time which is relatively static. Regarding the session activation/deactivation, we think this can be transparent to the RAN. However we are open to the RAN solutions for the session activation/deactivation, if the UE power saving is proved. |
| **Spreadtrum** | **Partially** | We agree with Nokia that the meanings of session start and session activation should be clarified by SA2 first.  For the connected UE, the RRC Reconfiguration message can be used.  For IDLE/INACTIVE UEs, considering the signalling overhead of paging messages, the MCCH or DCI method can also be considered in future discussion. |
| **Ericsson** | **Partially** | We basically agree with what is proposed, except that we cannot use UE individual paging, which is not scalable for large groups, but some type of group paging is required, as explained in our contribution ([R2-2101736](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2101736.zip)). We think QC and Kyocera are pointing out the same issue.  We agree that RRC reconfiguration can be used for connected mode. |
| **Lenovo, Motorola Mobility** | **Yes with comment** | We assume rapporteur is suggesting to take the legacy CN paging, RAN paging, and RRC reconfiguration message as baseline since details need FFS. |
| **OPPO** | **Yes** | Furthermore, we also think the clarification should be necessary for session activation/start from SA2. |
| **LG** | **Yes** | Since CN knows which UE is interested in the multicast session via session join/leave procedure, existing CN paging can be used to page IDLE UEs without any enhancement, e.g. group paging.  For UEs in INACTIVE, RAN is aware of which UE is interest in the multicast session by receiving the MBS interest indication, and this information is stored in MBS context. Therefore, no enhancements is required for RAN paging to notify the session start/activation to INACTIVE UEs. |
| **Convida** | **Partially** | We are also not clear on how to interpret the difference between start and activation. From our understanding, in LTE the “start” term is used to indicate when transmission of an MBMS service begins, while the “activation” term is used to refer to when a UE has joined a multicast MBMS service. This distinction is not clear from TR 23.757 – furthermore they have a note:  *“NOTE 3: Whether the terms “stop/deactivated” or “start/activation” denote the same actions needs to be further clarified.”*  We agree with the spirit of the proposal that there will be a mechanism to notify the UEs about the session start, but feel it is too early to provide alternatives in the LS reply to SA2. In our view, we do agree that the alternatives listed are valid, but other alternatives are also possible. |
| **Sharp** | **Yes** | However as other companies say, some enhancement would be necessary for paging and/or RRC reconfiguration message. |
| **ZTE** | **Partially.** | Share the same concern of Nokia.  And we don't why the question is limited only to the cases of "multicast sessions that can only be received by the UE in the RRC Connected state".  Based on SA2 output, UE can always be released to IDLE if the Multicast session is deactivated by CN. If so, traditional paging can be our baseline. |
| **Samsung** | **Partially** | It seems there is no discussion so far for approaches especially for Idle and/or Inactive mode UEs, there are several options including individual or group (TMGI) based RAN/CN paging, SI or MCCH. Therefore, apparently it is too early to agree. Though RRC reconfiguration message for Connected mode UEs still seem fine. |
| **Intel** | **No** | 1. Although SA2 use “start” and “activation” interchangeably in TR23.757, in clause 8.2.2.2, it shows that “NOTE 3: Whether the terms "stop/deactivated" or "start/activation" denote the same actions needs to be further clarified”. From our understanding, session activation/deactivation is transparent to RAN. However, RAN is aware of traffic arrival/stop from CN, which is session start and stop (traffic start and stop).  In this case, we should wait for further clarification from SA2.  2. Moreover, we don’t agree CN paging and RAN paging is used to notify session start. For RRC\_INACTIVE/IDLE UEs who are going to receive multicast services in delivery mode 1 and go to RRC\_CONNECTED, SIB which includes gNB supported MBS service information can be used to inform the activation of MBS session. This is also explained in our contribution [5]. |
| **vivo** | **See comments** | Currently, RAN2 has not concluded that whether a UE operated in delivery mode 1 can be released to IDLE/INACTIVE or not when there is no ongoing data. In this sense, we think it is a bit early to discuss the potential solutions for both IDLE and INACTIVE.  For CONNECTED UE, we think the RRC reconfiguration message can implicitly indicate the session start/activation via MBS resources reconfiguration. No explicit indication is needed.  Take one step back, generally, we think these three options can be on the table for further discussion. Besides, we understand that MCCH notification alike mechanism can be a potential solution. |
| **Huawei, HiSilicon** | **Yes** | For the mutlicast sessions to be received in RRC Connected, we think reusing existing procedures should be the baseline. We are open to discuss enhancements such as group paging, but this would be just an optimization. |
| **CMCC** | **Yes** | From our perspective, the proposed list is basically reasonable, since from AS point of view, there is different from the session start and session activation. And the group based paging or DCI method can be further studied. |

**Summary:**

19 companies replied to Q3: **“ For the multicast sessions that can only be received by the UE in the RRC Connected state, do companies agree that UE’s are notified about the session start/activation using:**

* **CN paging for RRC\_IDLE UEs**
* **RAN paging for RRC\_INACTIVE UEs**
* **RRC Reconfiguration message for RRC\_CONNECTED UEs**:”

Replies summary:

* Yes: 9 companies
* Partially: 6 companies
* No/more discussion is needed: 4 companies

Main comments from the companies which disagree or agree partially:

* There seems to be an agreement that RRC Reconfiguration can be used directly for the UEs which are im RRC Connected state already, i.e. no additional notification is required in this case
* OK with Paging, but legacy paging is inefficient and enhancements for group paging should be considered (4 companies): Kyocera, Spreadtrum, Ericsson. Sharp
* Clarification on whether the UE can be in RRC IDLE/INACTIVE after it joined the session is needed (6 companies): Nokia, Spreadtrum, OPPO, ZTE, Intel, vivo
* The difference between session start/activation and session stop/deactivation is unclear (4 companies): Nokia, Spreadtrum, Intel, Convida
* Paging is only one alternative and other mechanisms should be considered (4 companies): Convida, Intel, CATT, Samsung, vivo

Firstly, it seems non-controversial that in case the UE is already in RRC Connected state when the session starts/is activated, then there is no need for additional notification and UE gets informed about this fact by receiving RRCReconfiguration message containing the relevant MBS configuration. Therefore the following proposal is made:

**Proposal 3: If the UE which joined the multicast session is in RR CONNECTED state when the session is started/activated, the gNB sends RRC Reconfiguration message with relevant MBS configuration to the UE and there is no need for separate session start/activation notification.**Secondly, several companies indicated that it would be useful to get a clarification from SA2 on the following aspects:

1. Whether the UE can be released to RRC IDLE/INACTIVE state after it joined the session.
2. Whether and what the difference is between session start and session activation and between the session stop and session deactivation.

On the other hand, there is a majority of companies which already assume that session start/activation notification is required for UEs in RRC IDLE/INACTIVE and which propose to utilize Paging for this purpose, either legacy or group paging (13/18 companies). It is then proposed to agree the following:

**Proposal 4: RAN2 assumes that, in case there is a need to notify the UEs RRC IDLE/INACTIVE about the start and/or activation of a multicast session, CN/RAN paging is used for this purpose (FFS whether enhancements such as group paging are required).**

**Proposal 5: Request a clarification from SA2 on:**

1. **Whether the UE can be released to RRC IDLE/INACTIVE state after it joined the session.**
2. **Whether and what the difference is between session start and session activation and between the session stop and session deactivation.**
   1. Editor's note on 5GC SharedMBS delivery (section in 8.7 of TR 23.757)

Editor's note: How 5GC Shared MBS delivery is enabled for the UE will be developed with RAN WGs.

In rapporteur’s understanding, this note is more related to RAN3 work and RAN3 has already replied to this question to SA2 in a previous meeting in [8]:

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| *- SA2 agrees that for N3 transport of the shared delivery method of MBS data, GTP-U tunnelling using a transport layer IP multicast method and shared N3 (GTP-U) Point-to-Point tunnel shall be supported from MB-UPF to NG-RAN nodes. This tunnel can use either IP multicast transport (NG-RAN sends IGMP/MLD Join/Leave to a multicast router) or point-to-point unidirectional N3 tunnels from MB-UPF to NG-RAN nodes. 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.*  **Feedback:** RAN3 will develop protocol support to control both transmission modes for shared N3 transport between the MB-UPF and the NG-RAN. |

**Question 4: Do companies agree that RAN2 does not have to address the note on 5GC Shared MBS delivery in the reply LS to SA2?**

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| **Company** | **Yes/No** | **Comments (if you disagree, please provide clarifications and an alternative proposal)** |
| **QC** | **Yes** | It is RAN3 discussion. |
| **MediaTek** | **Yes** |  |
| **Nokia** | **Yes** | RAN3 issue. |
| **Kyocera** | **Yes** | We agree the rapporteur’s analysis. |
| **CATT** | **Yes** | Agree not to reply from RAN2 point of view.  By the way, RAN2 may also need to discuss on how to enable 5GC Shared MBS delivery on target cell after handover from RAN not supporting 5MBS to NG-RAN supporting 5MBS based on RAN3 conclusion. But anyway this should be discussed under agenda item on mobility. |
| **Xiaomi** | **Yes** |  |
| **Spreadtrum** | **Yes** |  |
| **Ericsson** | **Yes** | This is discussed in RAN3 (e.g. [R3-210632](https://www.3gpp.org/ftp/TSG_RAN/WG3_Iu/TSGR3_111-e/Docs/R3-210632.zip)) |
| **Lenovo, Motorola Mobility** | **Yes** |  |
| **OPPO** | **Yes** | It is up to RAN3. |
| **LG** | **Yes** | It is RAN3 work. |
| **Convida** | **Yes** |  |
| **Sharp** | **Yes** |  |
| **ZTE** | **Yes.** | This is RAN3 issue.  Just to clarify: the note itself is about "the handover from RAN not supporting 5MBS to NG-RAN supporting 5MBS", not in a normal case (MBS session establishment based on 5GC request). |
| **Samsung** | **Yes** | Up to RAN3. |
| **Intel** | **Yes** |  |
| **vivo** | **Yes** | It is out of RAN2 scope. |
| **Huawei, HiSilicon** | **Yes** |  |
| **CMCC** | **Yes** | It is up to RAN3 |

**Summary:**

All companies agree that there is no need to address the note on 5GC Shared MBS delivery in the reply LS to SA2.

**Proposal 6: RAN2 will not address the note on 5GC Shared MBS delivery in the reply LS to SA2.**

* 1. Editor's note on handover to non-MBS NG-RAN node (section in 8.7 of TR 23.757)

- During the inter supporting 5MBS NG-RAN node handover, minimization of data loss may be supported, e.g. by data forwarding, details for RAN WGs to decide.

Editor's note: It is FFS whether the support for lossless handover with data forwarding from source NG-RAN supporting 5MBS to the target NG-RAN not supporting 5MBS is needed, which needs confirmation by RAN.

Currently, RAN2 has agreed the following: ‘*R2 aim to support lossless handover for MBS-MBS mobility for service that requires this (TBD which detailed scenario but at least PTP-PTP)*’ and has not discussed MBS to non-MBS node handover yet. This editor’s note is discussed in several contribution, e.g. [4], [5], [6], [9], [10]. Many companies indicate that this scenario can be handled in a similar way as legacy handover, i.e. by switching the traffic from delivery via MRB to delivery via DRB either before or during the handover. However, it is also underlined that whether this can be done without data losses has to be further investigated and requires progress from other WGs, i.e. RAN3 and SA2.

**Question 5: Do companies agree that:**

1. **From RAN2 perspective, mobility between the source gNB supporting MBS and target gNB not supporting MBS can be achieved by switching the traffic from delivery via MRB to delivery via DRB either before or during the handover.**
2. **Whether and how this can be done without data losses has to be further investigated and requires progress from other WGs, i.e. RAN3 and SA2.**

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| **Company** | **Yes/No** | **Comments (if you disagree, please provide clarifications and an alternative proposal)** |
| **QC** | **Yes** | NR MBS loss-less HO from source gNB supporting MBS to target gNB “not” supporting MBS can be supported in 2 steps.  - Step 1: source gNB switches Multicast delivery from PTM RLC to PTP RLC link and  - Step 2: perform unicast loss-less HO from source gNB PTP to target gNB unicast DRB.  NR MBS loss-less HO from source gNB “not” supporting MBS to target gNB supporting MBS can be supported in 2 steps.  - Step 1: Perform unicast loss-less HO from source gNB unicast DRB to target gNB PTP RLC leg.  - Step 2: Target gNB switches Multicast delivery from PTP RLC leg to PTM RLC leg. |
| **MediaTek** | **Yes** |  |
| **Nokia** | **Yes** | For the purpose of answering the LS, the high level description from the rapporteur above is good enough. |
| **Kyocera** | **Yes** | We agree the rapporteur’s analysis. |
| **CATT** | **Yes** | Agree to answer the LS with this.  And for the two options mentioned by Rapporteur to perform the handover from MBS cell to non-MBS cell,  Option 1: switching the traffic from delivery via MRB to delivery via DRB before the handover  Option 2:switching the traffic from delivery via MRB to delivery via DRB during the handover  We understand which option to choose should be discussed further under the agenda item on mobility, but not here. |
| **Xiaomi** | **Yes** |  |
| **Spreadtrum** | **Yes** |  |
| **Ericsson** | **Yes, but** | First of all, we note that the SA2 note speaks of "lossless handover with data forwarding **from source NG-RAN supporting 5MBS to the target NG-RAN not supporting 5MBS**" and the question speaks of "**mobility between the source gNB supporting MBS and target gNB not supporting MBS**", which means that the SA2 note is for support in one direction while the moderator speaks of support in both directions. The moderator goes beyond the SA2 note.  In our contribution [9] we state:  Like the basic case of mobility between two MBS supporting nodes, depending on service requirements, lossless HO may be needed also in case of handover between an MBS supporting and non-MBS supporting nodes. For handling lossless, it is assumed that legacy mechanisms (e.g., SN status transfer, data forwarding, PDCP status reporting) can be used. However, as in the basic MBS-MBS mobility, there is need of synchronization of PDCP SN between source and target. This may not be the case if the UE moves from a non-MBS to MBS nodes. RAN2 should wait for progress in RAN3 on this topic before discussing lossless handling for these mobility scenarios.  For the case of mobility **from a NG-RAN supporting MBS to NG-RAN not supporting MBS,** a question is when to configure/setup radio resources associated with the unicast PDU session used for individual delivery. For example, setting up radio resources for the associated unicast PDU session before the actual HO would unnecessarily waste resources. It is therefore desired to have a full unicast PDU session setup (including RAN part, i.e., associated radio resource configuration) ready right before the source sends the non-MBS target HO request, i.e., when the source makes a handover decision. This can be left to network implementation.  Similarly, for the case of mobility **from a NG-RAN not supporting MBS to NG-RAN supporting MBS**, after switching from unicast PDU session to MBS session with MRB setup, it is proposed that RAN node should release radio resources associated with the unicast PDU session, i.e., used for individual delivery. Detailed solution can be left to network implementation.  In conclusion, mobility can be achieved between the two cells in the scenario raised by the moderator. However, that does not mean RAN2 needs to specify anything. To determine that, RAN2 should consider if:   * it is feasible to specify it (e.g. whether it is too complex given the allocated time in RAN2); or * whether it can be left to implementation (e.g. the necessary signalling already exists, and it is only a matter for an implementor to use it wisely). |
| **Lenovo, Motorola Mobility** | **Yes** |  |
| **OPPO** | **Yes** |  |
| **LG** | **Yes** | For 1), since it has no impact on RAN2 spec, we can support it. However, it requires the source gNB supporting MBS to convert the MRB to the DRB associated PDU session. We needs to receive the confirmation on this NW behaviour from other WGs, e.g. RAN3 and SA2.  For 2), if the MRB traffic is switched to DRB before HO, legacy lossless-HO mechanism for DRB can be used as it is, so it doesn’t require further progress of other WGs. |
| **Convida** | **Yes** | We agree with the assessment of the rapporteur. However, we have some hesitation as to whether the proposed response addresses the question from SA2. The Editor’s note seems to ask if lossless HO for the case of mobility from a NG-RAN supporting MBS to an NG-RAN not supporting MBS, is needed:  *Editor's note: It is FFS whether the support for lossless handover with data forwarding from source NG-RAN supporting 5MBS to the target NG-RAN not supporting 5MBS is needed, which needs confirmation by RAN.*  In our view, such support may be beneficial for some MBS services. Perhaps the Reply LS should indicate that from RAN2 perspective such support may be beneficial, and also suggest that mobility solutions are possible, but whether and how this can be done without data losses has to be further investigated. |
| **Sharp** | **Yes** |  |
| **ZTE** | **No** | More input is needed from SA2 to see:  - if a session management level operation comes first before an MRB becomes DRB  Before that we don't see it makes sense to agree on anything, considering the session management is still not stable in the call flow in 23.757 clause 8.  Suggest to focus on the solutions of MBS to MBS first. |
| **Samsung** | **Yes** |  |
| **Intel** |  | Since there’s no discussion in RAN2 around MBS to non-MBS handover, we suggest replying SA2 as below:  “**RAN2 has not started discussion on handover between NG-RAN node supporting 5MBS and NG-RAN node not supporting 5MBS**”. |
| **vivo** | **Yes** | For high-reliable MBS services, legacy PDCP SN status report/Retransmission, data forwarding, and SN status transfer can be used for lossless handover in the above-mentioned case.  Besides, the continuity between the source MBS session and target unicast PDU session, e.g. GTP-U tunnel and CN SN, should be studied and guaranteed by SA2 and RAN3. |
| **Huawei, HiSilicon** | **Yes** | We think these procedures are very similar (or even the same) as legacy handover from RAN2 perspective and it should be straightforward to agree this. Whether there are not data losses in the process can be discussed firther and input from other WGs is required first. |
| **CMCC** | **Yes** | We basically agree the proposal, but anyway, the official conclusion in the RAN2 meeting is needed. Of course, RAN3 should be involved. |

**Summary:**

19 companies replied to Q5**: “Do companies agree that:**

1. **From RAN2 perspective, mobility between the source gNB supporting MBS and target gNB not supporting MBS can be achieved by switching the traffic from delivery via MRB to delivery via DRB either before or during the handover.**
2. **Whether and how this can be done without data losses has to be further investigated and requires progress from other WGs, i.e. RAN3 and SA2.”**

Summary of the replies:

* Yes: 16 + 1 “yes, with comments”
* No/too soon to reply: 2 companies

Main comments from the companies:

* The details need to be discussed within mobility AI (including whether there is an impact to specificatons or not)
* The note in TR 23.757 is about “whether the support for lossless handover with data forwarding from source NG-RAN supporting 5MBS to the target NG-RAN not supporting 5MBS **is needed**”

Based on this, it is proposed to agree on the following and reply to SA2 accordingly:

**Proposal 7: RAN2 assumes that:**

1. **From RAN2 perspective, mobility between the source gNB supporting MBS and target gNB not supporting MBS can be achieved by switching the traffic from delivery via MRB to delivery via DRB either before or during the handover.**
2. **Whether and how this can be done without data losses has to be further investigated and requires progress and input from other WGs, i.e. RAN3 and SA2.**
3. **RAN2 assumes that whether lossless handover is needed for mobility between the source gNB supporting MBS and target gNB not supporting MBS should be decided by SA2.**
   1. Editor's note on PTP/PTM switching (section in 8.7 of TR 23.757)

For delivery method switching not due to mobility, the following principle are agreed,

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

Editor's note: Whether any assistance information from CN is needed, e.g. for PTP/PTM delivery method decision and switching, needs further confirmation when the relevant conclusion is reached in RAN WGs.

Regarding the assistance information from CN to RAN for PTP/PTM decision and switching, it has been answered in the reply LS from RAN2 in R2-2011271. The conclusion was:

*RAN2 agreed that at least information of MBS services/groups subscribed by the UE (e.g. TMGI) and QoS requirements of a MBS service should be provided to RAN for MBS operation in general. RAN2 has not concluded whether any information from CN is needed, e.g. for PTP/PTM delivery method decision and switching.*

**Question 6: Do companies agree there is no need to further reply to SA2 on assistance information from CN to RAN on PTP/PTM delivery method decision and switching?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if you disagree, please provide clarifications and an alternative proposal)** |
| **QC** | **Yes** |  |
| **MediaTek** | **Yes** |  |
| **Nokia** | **Yes** | Perhaps a pointer towards that reply would help though. |
| **Kyocera** | **Yes** |  |
| **CATT** | **Yes** | No need to further reply for now. |
| **Xiaomi** | **Yes** |  |
| **Spreadtrum** | **Yes** |  |
| **Ericsson** | **Yes** |  |
| **Lenovo, Motorola Mobility** | **Yes** |  |
| **OPPO** | **Yes** |  |
| **LG** | **Yes** |  |
| **Convida** | **Yes** |  |
| **Sharp** | **Yes** |  |
| **ZTE** | **Yes** | **No need to further reply for now, basically the same LS comes to RAN2/3 again. It shall be the same answer as last time: "Detail information e.g. for PTM PTP switch if any is FFS"** |
| **Samsung** | **Yes** |  |
| **Intel** | **Yes** |  |
| **vivo** | **Yes** |  |
| **Huawei, HiSilicon** | **Yes** |  |
| **CMCC** | **Yes** |  |

**Summary:**

All companies agree there is no need to further reply to SA2 on assistance information from CN to RAN on PTP/PTM delivery method decision and switching.

**Proposal 8: RAN2 will not provide further reply to SA2 on assistance information from CN to RAN on PTP/PTM delivery method decision and switching.**

* 1. SA4’s question on SYNC and ROHC

In their LS, SA2 quotes SA4 question where SA4 asks the view on the need of SYNC and/or RoHC support in the MBSF-U. Regarding the SYNC issue, it is clarified in the WID on NR Multicast and Broadcast Services that [3]:

‘*SFN provides synchronized delivery of user plane packets over the air from different cells. 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*.’

Based on WID, MBSFN can be supported by implementation within a gNB-DU. Therefore, SYNC is not required in Rel-17. Furthermore, RAN3 has the agreement, ‘*No SYNC protocol for this release*’. It is hard to speculate whether MBSFN would be supported in later releases in future. However, it is clear that the SYNC is not supported in Rel-17.

Regarding the ROHC issue, RAN2 has agreed to support ROHC in PDCP layer and this can be informed to SA2 and SA4.

Question 7: Do companies agree to reply to SA2/SA4 that:

1. SYNC protocol is not needed in Rel-17 as RAN has agreed that MBSFN is up to network implementation within one gNB-DU
2. RAN2 has agreed that ROHC is to be located in RAN.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if you disagree, please provide clarifications and an alternative proposal)** |
| **QC** | **Yes** |  |
| **MediaTek** | **Yes** |  |
| **Nokia** | **Yes** |  |
| **Kyocera** | **Yes** | However, we’re just wondering if RAN2 really needs to reply about SYNC protocol, i.e., it’s up to RAN3 to respond it. |
| **CATT** | **Yes** |  |
| **Xiaomi** | **Yes** |  |
| **Spreadtrum** | **Yes** |  |
| **Ericsson** | **Yes** | **Suggestion:**  SYNC protocol is not supported in the specifications in Rel-17 |
| **Lenovo, Motorola Mobility** | **1)Yes**  **2) No** | 1) is fine for us.  2) Regarding ROHC, SA2 captured in their TR 23.757 8.2.2.2 that ROHC for MBS traffic is supported by the 5GS.   |  | | --- | | TR 23.757 8.2.2.2  - ROHC for MBS traffic is supported by the 5GS, e.g based on AF request.  - MBSF-C and MBSF-U functionality is supported based on A.3.  Editor's note: Coordination with SA4 is required to determine MBSF-C and MBSF-U functionality. |   Therefore, RAN2 is suggested to revisit the last time agreement:  - RoHC (at least U-mode) can be configured for NR MBS bearers. This is applicable for Mcast, assume this is applicable also to broadcast.  - RoHC is located at PDCP.  We understand the current ROHC support is only for multicast services. RAN2 is also suggested to discuss the handling of ROHC for broadcast services. |
| **OPPO** | **Yes** | RAN3 has agreed that no SYNC is needed in this release in RAN3#109 meeting. |
| **LG** | **Yes** |  |
| **Convida** | **Yes** |  |
| **Sharp** | **Yes** |  |
| **ZTE** | **Yes** |  |
| **Samsung** | **Yes** | 2) Since RAN2 agreed to have PDCP, we can still keep ROHC for MBS-PDCP. In our understanding, SA2’s discussion on ROCH was not based on the layer-2 design with PDCP decided by RAN2 as well as ROHC in PDCP. |
| **Intel** | **Yes** |  |
| **vivo** | **Yes** |  |
| **Huawei, HiSilicon** | **Yes** |  |
| **CMCC** | **Yes** |  |

**Summary:**

All companies agree with the suggested reply for SYNC protocol and all but one of the companies agree on the proposed reply for RoHC. However, the rapporteur would like to point out that TR 23.757 speaks that ROHC for MBS is supported by the 5GS, not 5GC and RAN is part of the 5GS (5G system). Therefore, there is no contradiction between RAN2 agreement and TR 23.757. The following is then proposed, considering the rewording suggestion from one of the companies:

**Proposal 9:** R**eply to SA2/SA4 that:**

1. **SYNC protocol is not supported in the specifications in Rel-17**
2. **RAN2 has agreed that ROHC is to be located in RAN.**
   1. Summary of Phase 1 of the discussion

Based on the discussion, the following proposals are made:

**Proposal 1: RAN2 assumes that MBS session join/leave indications are sent using NAS signalling regardless of the RRC state the UE is in. 5GC should inform RAN about the UE leaving the MBS session.**

**Proposal 2: RAN2 will reply that it will wait for SA3 to finalize their study on security for MBS before discussing security aspects in RAN2.**

**Proposal 3: If the UE which joined the multicast session is in RR CONNECTED state when the session is started/activated, the gNB sends RRC Reconfiguration message with relevant MBS configuration to the UE and there is no need for separate session start/activation notification.Proposal 4: RAN2 assumes that, in case there is a need to notify the UEs RRC IDLE/INACTIVE about the start and/or activation of a multicast session, CN/RAN paging is used for this purpose (FFS whether enhancements such as group paging are required).**

**Proposal 5: Request a clarification from SA2 on:**

1. **Whether the UE can be released to RRC IDLE/INACTIVE state after it joined the session.**
2. **Whether and what the difference is between session start and session activation and between the session stop and session deactivation.**

**Proposal 6: RAN2 will not address the note on 5GC Shared MBS delivery in the reply LS to SA2.**

**Proposal 7: RAN2 assumes that:**

1. **From RAN2 perspective, mobility between the source gNB supporting MBS and target gNB not supporting MBS can be achieved by switching the traffic from delivery via MRB to delivery via DRB either before or during the handover.**
2. **Whether and how this can be done without data losses has to be further investigated and requires progress and input from other WGs, i.e. RAN3 and SA2.**
3. **RAN2 assumes that whether lossless handover is needed for mobility between the source gNB supporting MBS and target gNB not supporting MBS should be decided by SA2.**

**Proposal 8: RAN2 will not provide further reply to SA2 on assistance information from CN to RAN on PTP/PTM delivery method decision and switching.**

**Proposal 9:** R**eply to SA2/SA4 that:**

1. **SYNC protocol is not supported in the specifications in Rel-17**
2. **RAN2 has agreed that ROHC is to be located in RAN.**
   1. Phase 2 of the discussion

For all of the issues discussed there was either a consensus or a clear majority and it seems that most, if not all of the proposals summarized in phase 1 of the discusion can be agreed offline without further online discussion. However, the companies are requested to flag the proposals they find controversial in the table below for further online/offline discussion. As usual, companies are requested to consider the views from other companies and the status after phase 1 of the discussion.

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Non-agreeable proposal | Clarifications / suggestions | Rapporteur summary / reply |
| AT&T | *Issue 1*: It is premature to include „activated“ in Proposal 3, before receiving answer from SA2, per Proposal 5.2, on session „activation“. It may be the case that „deactivation“ will not always require immediate change/release of the RRC configuration from all UEs, thus „activation“ would not always require sending of the RRC Reconfiguration message to all UEs to re-establish the configuration.  *Issue 2*: Regarding Proposal 5.1: For public safety, it may be necessary to temporarily transition certain UEs from RRC\_CONNECTED to RRC\_INACTIVE/RRC\_IDLE and have them continue to temporarily receive PTM in those states, when the # of UEs in the cell exceeds the connected UE admission capacity of the cell. The bidirectional RRC connected < - > idle transitions are RAN & UE functionality, transparent to SA2, as SA2 does not track RAN congestion. | *Issue 1*: suggest remove agreement on „activated“ from Proposal 3, until SA2 responds and clarifies „activation“ and „deactivation“, per Proposal 5.2.  *Suggested text* for **Proposal 3**: **If the UE which joined the multicast session is in RRC CONNECTED state when the session is started, the gNB sends RRC Reconfiguration message with relevant MBS configuration to the UE and there is no need for separate session start notification. FFS for activation.**  *Issue 2*: RAN2 does not need to ask SA2 for permission to release a UE to idle, whether with continuity of PTM reception or without (i.e. „normal“ idle). Such a request would put SA2 in the position of being requested to comment on RRC states. Instead, RAN2 should decide on how to accomplish the functionality and then inform SA2. (There are already technical proposals submitted, e.g. R2-2101737 Proposals 1,2,3; and there may be other solutions proposed, as well). Notification from RAN to CN may be in order, such that CN could record a permanent „UE leave“ or a temporary UE change of level of service, (e.g. longer time to obtain the floor in case of PTT key activation) and further provide CN-paging, if necessary.  *Suggested action*: For now, do NOT include Proposal 5.1. in the LS to SA2. Once RAN2 has an agreement, it can be communicated to SA2, as appropriate. | Issue 1: OK, please see the revised proposal.  Issue 2: OK, I removed the first bullet from proposal 5. |
| Ericsson2 | *Issue 1:* We have the same view as AT&T (*issue 2*) for proposal 5, i.e. RAN2 should consider the use case when admission control limits are reached with high number of multicast UEs in connected mode as indicated by SA6 in LS ([R2-1916280](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_108/Docs/R2-1916280.zip)). | *Issue 1:* Bullet 1 of Proposal 5 can be removed as suggested by AT&T. Or alternatively it is clarified that bullet 1 considers release due to data inactivity (and that RAN2 still discusses other use cases, e.g. congestion).  @HW/CATT concerning bullet 1 of Proposal 5:  Perhaps three cases can be identified:   1. Mulitcast UE is waiting for multicast session to start in idle/inactive. Agree with CATT that SA2 has taken this use case into account 2. Multicast UE is released to idle/inactive mode due to data inactivity after the multicast session has started. This is an FFS in RAN2 (as indicated to reply LS to SA2 [R2-2011271](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Inbox/R2-2011271.zip)) 3. Multicast UE can receive multicast data in idle/inactive. This is FFS in RAN2 (The applicability of delivery mode 2 to multicast sessions is FFS). | Issues 1: OK, I removed the first bullet from proposal 5. Let’s discuss further cases in future. |
| Qualcomm | Issue1: Question 5.1 has two different aspects.  1st: when UE joins Multicast session and session is not yet started/activated by 5GC. In this case, there is no issue to to release the UE into either RRC\_IDLE/INACTIVE states and paging can be used to alert UEs to enter into RRC\_CONNECTED state.  2nd: To our understanding, after Multicast session starts, whether RRC\_IDLE state UE is allowed to receive Multicast data has dependecny on CN context presense (To our understanding, SA2 architecture assumes UEs in NAS CM\_CONNECTED state can receive Multicast services (i.e not in CM\_IDLE state). RAN2 can only discuss whether UE is allowed to receive Multicast data while in RRC\_INACTIVE state and reception of Multicast data in RRC\_IDLE (CM\_IDLE) has SA2 architecture dependency. If we want any clarification, we need to take these 2 different aspects into account. | Issue1: Proposal 5.1 need to be rephrased by taking following points into consideration.  “Whether the UE can be released to RRC IDLE/INACTIVE state after it joined the session and Multicast session is not yet started/activated by 5GC.”  “Whether the UE is allowed to receive Multicast data while in CM\_IDLE/RRC\_IDLE state.” | Issue 1: Bullet 1 of P5 is removed based on comments from others.  Whether the UE is allowed to receive Multicast data while in CM\_IDLE/RRC\_IDLE state is to be discussed by RAN2 already. If we do agree this, then we will have to inform SA2 as there is definitely big impact on them. |
| CATT | Issue 1: Proposal 4  Issue 2:bullet 1 of Proposal 5  Issue 3:  Bullet 3 of Proposal 7, | Issue 1:for P4,  As we explained in ph1,Paging is only one of the possible solutions, further comparison on the pros/cons between solutions is necessary.  it should be determined directly here but be discussed as part of mechanism of delivery mode 1. There is no rush to decide it for now as SA2 even did not ask question on paging.  Issue 2: Bullet 1 of Proposal 5 is not necessary and should be deleted. SA2 already has conclusion on this.  In 23.757, 8.2.2.2,,there is clear statement as following,   |  | | --- | | -The MBS Session may be deactivated when the MB-UPF detects no multicast data for a configurable period. When the MBS Session is deactivated by 5GC, the MBS Session context is kept in 5GC, but the AN resource with context and N3 tunnel for 5GC Shared MBS delivery method are released. UEs that have joined that multicast session can become IDLE: |   Issue 3:  For bullet 3 of Proposal 7  Whether lossless handover is needed for mobility between the source gNB supporting MBS and target gNB not supporting MBS should be decided by RAN2 and RAN3. Just like for MBS-MBS scenario,it is RAN2/RAN3 to decide whether lossless is supported. | Issue 1: This indeed has dependency on the reception in RRC IDLE discussion. Let’s see how this concludes before deciding how to reply to this quesiton.  Issue 2: OK, removed.  Issue 3: I think such requirements should be provided by SA2 and RAN2 can discuss the impact/feasibility. However, it is OK to remove this bullet. |
| Intel | Issue 1: Proposal 3, on “there’s no need for separate session start/activation notification"  Issue 2: Remove Proposal 4,  Issue 3: Proposal 5 bullet 1, we share the same view as CATT (issue 2) | Issue 1: As suggested in previous comments, SA2 has a clear note that the difference between activation/start and deactivation/stop needs further clarification in SA2 (NOTE 3 and NOTE5 in 8.2.2.2 TR23.757). Moreover, from RAN2 perspecitve, for a RRC\_CONNECTED UE, session activation represents this UE is allowed to join the multicast session, however, this UE can switch to RRC\_IDLE/INACTIVE if there’s no data is transmitted; however, session start means multicast traffic is started and UE starts to receive data from multicast session. Hence, we suggest to change proposal 3 as below:  **Proposal 3: If the UE which joined the multicast session is in RR CONNECTED state when the session is started/activated, the gNB sends RRC Reconfiguration message with relevant MBS configuration to the UE ~~and there is no need for separate session start/activation notification~~.**  Issue 2: During phase 1 discussion, 6 Companies (Xiaomi, CATT, Spreadtrum, Convida, Samsung, vivo, Intel) mentioned there are other options (Paging, SIB, MCCH, DCI, etc) to notify UEs in RRC\_IDLE/INACTIVE state about session start/activation. It is still early to draw the conclusion since we yet start this discussion in RAN2. Hence, **we suggest to remove Proposal 4** and reply SA2 after RAN2 further discussion/comparison among different options.  Issue 3: We share the same view as CATT that SA2 concluded that UE in multicast session can become CM\_IDLE. Moreover, CN does not distinguish between RRC\_INACTIVE and RRC\_CONNECTED. Whether or not UE can be release to RRC\_INACTIVE after it joined the session is a RAN decision. Hence, **we also suggest to remove Proposal 5.1**. | Issue 1: I am not sure about the concern. In any case, I followed suggestions from AT&T and reworded the proposal.  Issue 2: OK to discuss this further based on the outcome of the discussion on RRC states for mutlicast session.  Issue 3: OK. |

Summary of Phase 2:

Proposals with no comments which can be deemed as agreeable:

|  |
| --- |
| **Proposal 1: RAN2 assumes that MBS session join/leave indications are sent using NAS signalling regardless of the RRC state the UE is in. 5GC should inform RAN about the UE leaving the MBS session.**  **Proposal 2: RAN2 will reply that it will wait for SA3 to finalize their study on security for MBS before discussing security aspects in RAN2.**  **Proposal 6: RAN2 will not address the note on 5GC Shared MBS delivery in the reply LS to SA2.**  **Proposal 8: RAN2 will not provide further reply to SA2 on assistance information from CN to RAN on PTP/PTM delivery method decision and switching.**  **Proposal 9:** **Reply to SA2/SA4 that:**   1. **SYNC protocol is not supported in the specifications in Rel-17** 2. **RAN2 has agreed that ROHC is to be located in RAN.** |

Proposals modified based on companies comments, which the rapporteur believes can be agreeable without further online discussion:

|  |
| --- |
| **Proposal 3: If the UE which joined the multicast session is in RR CONNECTED state when the session is started~~/activated~~, the gNB sends RRC Reconfiguration message with relevant MBS configuration to the UE and there is no need for separate session start~~/activation~~ notification for this UE. FFS for session activation.**  **Proposal 5: Request a clarification from SA2 on:**   1. **~~Whether the UE can be released to RRC IDLE/INACTIVE state after it joined the session.~~** 2. **Whether and what the difference is between session start and session activation and between the session stop and session deactivation.**   **Proposal 7: RAN2 assumes that:**   1. **From RAN2 perspective, mobility between the source gNB supporting MBS and target gNB not supporting MBS can be achieved by switching the traffic from delivery via MRB to delivery via DRB either before or during the handover.** 2. **Whether and how this can be done without data losses has to be further investigated and requires progress and input from other WGs, i.e. RAN3 and SA2.** 3. **~~RAN2 assumes that whether lossless handover is needed for mobility between the source gNB supporting MBS and target gNB not supporting MBS should be decided by SA2.~~** |

The following proposal has dependency on discussion on RRC states for multicast session reception. It is proposed to postpone further discussion on this aspect until the conclusion is made for multicast session reception in RRC IDLE/INACTIVE state.

|  |
| --- |
| **Proposal 4: RAN2 assumes that, in case there is a need to notify the UEs in RRC IDLE/INACTIVE about the start and/or activation of a multicast session, CN/RAN paging is used for this purpose (FFS whether enhancements such as group paging are required).** |

# Discussion on the running stage-2 CR

To be able to update the running stage-2 CR it is proposed to proceed in a following way:

1. Phase 1: Companies are requested to express their concerns in the table below keeping in mind the following principles:
   1. Please clarify the reason for concern and offer a solution (e.g. removal of something, alternative wording etc.)
   2. Please consider input from other companies and if you disagree with the proposals, please indicate so also with a clarification and a solution that could be satisfactory also to other companies.
   3. Please remember this is a running CR, so it should express the current status of work based on current agreements.
2. After Phase 1 input is gathered, discussion rapporteur summarizes the proposal and prepares an updated running CR for discussion.
3. Phase 2: Discussion on the updated running CR.

**Companies are requested to provide their concerns and suggestions for the running CR as captured in [3], in the table below.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Company** | **Issue / problematic fragment** | **Clarification of the concern** | **Proposed solution (e.g. alternative wording)** | **Rapporteur summary/suggestions:** |
| **QC** | Issue1: 16.x.1  Issue2: 16.x.2.5:  PDCP status report is supported.  Issue 3: 16.x.2.4 Configuration | Issue1: certain multicast services may have high reliability requirement but may be delay tolerant. Suggest adding “high latency” as well.  Issue 2: Better wording needed.  Issue 3: missing Editor Note | Issue 1: In case of multicast session with QoS requirement of high reliability, high or low latency, the UE can receive MBS data in RRC\_CONNECTED with mechanisms to guarantee required QoS requirement, e.g. feedback/retransmission and/or PTP assistance, if needed  Issue2: Suggested rewording as “UE is allowed to send PDCP status report during multicast loss-less HO”.  [Nokia]: disagree with the addition because a. not a new mechanism, b. the UE is not “allowed” but configured.  Issue 3: Suggest adding Editor’s Note as “ FFS how multicast configuration is provided for supporting Multicast reception in RRC\_CONNECTED state” | Issue 1: It seems there is a number of companies indicating that it is not appropriate to refer to high/low QoS in the normative text, so it is proposed to adopt the wording from AT&T for this paragraph.  Issue 2: Rapporteur agress the current wording is not appropriate for the normative text. It is suggest to adopt the following wording, considering the concern from Nokia as well:  “The UE may be configured by the network to provide PDCP status report for an MRB during a handover.” |
| **MediaTek** | **Issue 1:** 16.x.1 General | **Issue 1: for** the transmission of MBS service, even though we may not use delivery mode ½ in the text but we need to align the expression for both cases. | **Issue 1: proposed wording**   * **In case of** the transmission for MBS service with QoS requirement of high reliability and/or low latency, the UE can receive MBS data in RRC\_CONNECTED with mechanisms to guarantee required QoS requirement, e.g. feedback/retransmission and/or PTP assistance, if needed. * **In case of** the transmission of MBS service with QoS requirement of low reliability and/or latency- tolerant , the UE can receive MBS data in RRC\_IDLE/RRC\_INACTIVE/RRC\_CONNECTED and neither feedback/retransmission nor PTP assistance for reliability guarantee is needed. | Issue 1: Similar as issue 1 from QC – it does not seem appropriate to refer to hig/low QoS in the normative text. |
| AT&T | *Issue 1*: 16.x.1, the two sentences starting with “In case of”  *Issue 2*: 16.x.1 and other places | *Issue 1*: Use of subjective and undefined terms such as “high” and “low” reads like marketing, not technical text, including reference to low reliability as a “requirement”. Technically, the sentences may be inaccurate, as same QoS (in terms of packet loss and delay) that can be achieved in M mode via HARQ and/or PTP, can also be achieved in B mode using fixed lower modulation/coding and quick repeat.  *Issue 2*: While use of the word “session” aligns terminology with SA2 today, it may cause mis-alignment for RAN2 in the future, if SA2 adds new features and/or RAN2 defines new stuff, lifts restrictions or adds optimizations. In addition, and for example, the word “session” is overloaded and often implies “connection”, which looks strange for MBS which normally uses connectionless UDP protocol. | *Issue 1*: suggest remove all QoS/reliability references that could be technically inaccurate or interpreted negatively towards broadcast mode:  “**In case of** broadcast session, the UE can receive MBS data in RRC\_IDLE, RRC\_INACTIVE and RRC\_CONNECTED.”  “**In case of** multicast session, the UE can receive MBS data in RRC\_CONNECTED and use additional assistance mechanisms like feedback/retransmission and/or PTP delivery.”  *Issue 2*: suggest use the terms “MBS delivery”, “multicast delivery” and “broadcast delivery” in lieu of “MBS session”, “multicast session” and “broadcast session”, respectively. | Issue 1: The wording is supported by several companies, so it is proposed to adopt it.  Issue 2: Since the session is used by SA2 and RAN3 currently, it seems to make sense to keep this term in RAN2 as well. As long as it is used in the context of MBS, there shoud be no confusion about it. |
| Nokia | 1. Terminology  2. High Level Description in 16.x.1  3. PTP/PTM switch  4. Configuration | 1. Several terms are used to cover the same thing :  1A.NG-RAN/NG-RAN node  1B. 5G MBS Service / MBS service  2. Convoluted   * 3. Not clear | 1A. Stick to gNB as NG-RAN node has a broader scope than gNB.  1B. Stick to MBS service  2A. We understand the intention was to reuse what SA2 has agreed in 23.757. We would prefer simply importing the definitions untouched.  2B. It seems odd to say that the UE can receive. It would be better to say that the UE is configured to receive.  3A. PTP and PTM have been used extensively e.g. in 36.300 without being defined so perhaps we do not need those definitions?  3B. If we do, the definition of PTP should be corrected “NG-RAN individually delivers separate copies of MBS data packet to UEs” instead of “NG-RAN delivers separate copies of MBS data packet over radio to individual UE”.  3C. “are available for the transmission of MBS packet flows over radio via NG-RAN” does not seem to be bring any value and should be removed. Also not clear what a packet flow is, nor what alternative to the radio there is for transmission.   * 3D. The whole text could be simplified by “For multicast delivery to a given UE, the gNB decides whether to use point-to-point (PTP) or point-to-multipoint (PTM). | 1A/1B. OK  2A. OK, this seems cleaner.  2B. It seems that we often say UE/gNB receives data/information/et.c in stage-2 specificaitons, so not sure about the concern. It is proposed to adopt the proposal from AT&T for this fragment, which is supported by several companies.  3A/3D. It seems useful to calrify a bit more what PTP and PTM means, so the rapporteur suggest to keep this part unless there are other concerns.  3B/3C. OK |
| Xiaomi | 1. Protocol architecture for broadcast | 1. No section is reserved for the protocol architecture for broadcast | We can have a new section or re-structure the section a little bit to allow the inclusion of the protocol architecture for broadcast. | OK |
| Ericsson | 1. High Level Description in 16.x.1  2. Editorials | 1a. Similar issues as identified by AT&T, i.e. the use of “high” / “low” is ambiguous, and we share the view that with different means similar quality can be achieved via broadcast or multicast (perhaps cell border performance is challenging).  1b. We do not understand what is meant with “specific data content”. We think not all UEs in the geographical area can receive the broadcast session. We wonder if there can be different geographical areas for different broadcast sessions? A dedicated set of UEs can receive a multicast session, not the multicast service. The term "deliver" is used, but it is perhaps better to clarify who can receive it? We wonder if it would not be more clear to say "UE that has joined a multicast session" instead of “dedicated UEs”, or are there cases where a UE can receive multicast data without joining a session? The reference TX 23.xxx refers to a to be created specification by SA2, i.e. not TR 23.757. We wonder if these aspects should be specified when SA2 has written TS 23.xxx?  2. Editorials | 1a. We support the wording suggested by AT&T  1b. We are not sure how this paragraph should be corrected, because some issues are not clear to us.  2.  The UE can receive the MBS configuration for broadcast session in RRC\_IDLE/RRC\_INACTIVE/. | 1a. OK  1b. It has been suggested by Nokia to reuse the definitions from SA2 and it is proposed to follow this suggestion which should address the issues.  2. OK to correct the editorial, but was the RRC CONNECTED state removed purposely?  @rapporteur: it is our understanding that broadcast reception in connected mode was not agreed (yet). Did we overlook/mis-interpreted some agreement? |
| Convida | 1. 1. 16.x.1 General   2. Editorial | 1A. The cases for the transmission of the MBS service are not exhaustive  1B. We agree with some of the other companies that use of the terms low and high reliability may not be clear.  1C. We are not sure if we need to include the latency aspect  2.See suggested changes/comments in red | 1A. We may add an Editor’s Note that there are additional cases of transmission. For example the case   * multicast session with QoS requirement of low reliability and/or low latency   1B. Not sure how best to address this. Perhaps use of terms “QoS requirements requiring lossless delivery” and “QoS requirements not requiring lossless delivery”  2. Section: 16.x.2.1 Architecture The overall NG-RAN architecture specified in section 4 of applies for NR MBS.  Comment: this refers to section 4 of TR23.757? Section: 16.x.2.4 Configuration Comment: missing Editor’s Note Section: 16.x.3.1 Architecture The overall NG-RAN architecture specified in section 4 of applies for NR MBS.  Comment: this refers to section 4 of TR23.757?  Section 16.x.3.4 Configuration  The UE can receive the MBS configuration for broadcast in RRC\_IDLE/RRC\_INACTIVE/RRC\_CONNECTED. | 1A/1B/1C. It is suggested to use the simplified language proposed by AT&T. This way we can avoid having to mention all the new cases related to QoS.  2. Section 4 seems to refer to section 4 of 38.300. However this could be removed and we can wait for RAN3 input to this section.  It seems clear what configuration section is for, so no need for EN.  Editorial will be corrected. |
| ZTE | Issue 0. Terms.  Issue 1. Structure.  Issue 2. Lossless support in 16.x.2.5 | Issue 0. We share the same view as what AT&T has proposed in Issue 1.  Issue 1. Not necessary to have the mirror clauses structure for Multicast and Broadcast. Broadcast and Multicast share a lot in common, especially in RAN, like PTM delivery in Uu, radio protocol, RAN architecture. We are not so sure if we are going to have duplicated two separate clauses for the common part.  issue 2. Lossless support is still being evaluated in RAN2. We believe what we had only concluded in last meeting is about "aiming" to support lossless handover, but not like the one we are having here which sounds like that RAN2 "SHOULD" support lossless handover. A "SHOULD" means whatever it takes, we are going to do it, but "aiming" at something, means we will evaluate first and let's see if we can do it. | Issue 0. Support what AT&T has proposed in issue 1.  Issue 1. Our suggestion would be like, to have a common clause for the common part, and some extra clauses for specific design to each, like PTP/PTM switch for Multicast only.  Issue 2. Our suggestion is either we keep the "aim"...part but this might seem not necessary for a stage 2 spec.. or we leave the details on mobility as it is in the Annex, as we are still in a very early stage to say so. | Issue 0. OK  Issue 1. Indeed, it seems there will be common parts for bordcast and multicast session reception, so it might indeed make sense to go this way. Rapporteur will try to consider this when providing an updated CR.  Issue 2. “Aim to” like language is not appropriate for the specifications. We have already made an agreement allowing us to achieve lossless HO, e.g. PDCP SN synchronization. So the current text correctly expresses current status. Of course, if we identify a major technical obstacle and lossless HO turns out to be impossible, then this will have to be removed duringfurther updates to the running CR. |
| **Intel** | structure of CR | In email discussion “[Post112-e][069][MBS] Delivery mode 2”, majority companies agreed that delivery mode 2 can also support the transmission of multicast sessions. Revised structure is needed. | revise structure after discussion of “[Post-112e][069][MBS] delivery mode 2”. | It seems the comment is similar to the one from ZTE and indeed the structure could be simplified regardless of the decision on multicast session support in RRC IDLE/INACTIVE. |
| **vivo** | 1. 16.x.2.5/16.x.3.5  2. 16.x.2.4/16.x.3.4 | 1. We think the service continuity (16.x.2.5/16.x.3.5) is belonging to the scope of transmission and reception of multicast/broadcast session (16.x.2.3/16.x.3.3)  2. We think the configuration section should be organized in prior to the transmission and reception part. This is because the MBS service can only be received after obtaining the NW configuration. | 1. The subclause 16.x.2.5/16.x.3.5 should be moved under the section 16.x.2.3/16.x.3.3, respectively. For example,  16.x.2.3.5 service continuity  16.x.3.3.2 service continuity  2. Exchange the section number between 16.x.2.4/16.x.3.4 and 16.x.2.3/16.x.3.3 | 1/2. Similarly as with other restructuring proposals, the rapporteur will consider these proposals when working on the updated CR. |

# References

1. S2-2009235, LS on 5MBS progress and issues to address, SA2 # 142 e-meeting.
2. TR 23.757, Study on architectural enhancements for 5G multicast-broadcast services.
3. R2-2102253, 38.300 Running CR for MBS in NR, CMCC
4. R2-2101185, Discussion on the SA2 LS and the reply LS, Huawei, HiSilicon
5. R2-2101051, MBS L2 Architecture, Control Plane and SA2 LS Discussion, Intel Corporation
6. R2-2101719, Discussion on SA2 LS on 5MBS Progress and Issues to address, CMCC
7. 3GPP TR 33.850, Study on security aspects of enhancements for 5G Multicast-Broadcast Services (MBS)
8. R3-207059, Response LS on RAN impact of FS\_5MBS Study, Source: RAN3
9. R2-2101171, Mobility for NR MBS, Ericsson
10. R2-2100085, Open Issues on Mobility with Service Continuity, CATT, CBN