**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?**

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| **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** |  |

* 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** |  |

* 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. |

* 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** |  |

* 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** |  |

* 1. Editor's note on handover to non-MBS NG-RAN node (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?**

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| **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** |  |

* 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.

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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** | 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** |  |

* 1. Summary

TBD

# 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.**

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| **Company** | **Issue / problematic fragment** | **Clarification of the concern** | **Proposed solution (e.g. alternative wording)** |
| **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” |
| **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. |
| 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. |
| 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). |
| 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. |

# 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