**3GPP T****SG-RAN WG2 Meeting #115-e R2-XXXXXXX**

**E-meeting, 9th – 27th August 2021**

**Agenda item:** 8.1.1

**Source:** Huawei, HiSilicon

**Title:** RRC open issues

**Document for:** Discussion and Decision

# 1 Introduction

This document aims at capturing open issues that need to be addressed for the MBS RRC CR, based on the current status of the WI progress. The list, provided in section 3, is based on the editor’s notes/FFSes captured in the MBS running RRC CR after Phase 1 the following e-mail discussion:

* [Post114-e][074][MBS] RRC running CR (Huawei)

      Scope: This is a first attempt to capture MBS in RRC, based on current agreements. Collect comments, Identify open issues and proposals that should be addressed to settle a good baseline version running CR.

      Intended outcome: Report, with Open issues and proposals for the progress of Stage-3, Draft CR to be used as a baseline for further work (endorsable if possible).

      Deadline: Long

Furthermore, section 2 of this document contains additional clarifications on the MBS related radio bearers definitions proposed in the draft version of the running CR, as well as some questions to the companies with respect to this aspect. The companies are invited to reply to those questions in Phase 2 of the discussion.

## 1.1 Company contact details

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| Company | Contact details (name, e-mail) |
| Kyocera | masato.fujishiro.fj@kyocera.jp |
| MediaTek | xuelong.wang@mediatek.com |
| CATT | zhourui@catt.cn |
| Convida Wireless | DiGirolamo.Rocco@convidawireless.com |
| Lenovo, Motorola Mobility | zhangcc16@lenovo.com |
| Samsung | shrivastava@samsung.com |

# 2 Discussion on radio bearers for MBS

There were numerous comments raised during Phase 1 of the discussion about definitions of radio bearers used for MBS and about how to configure MRB. In the draft RRC CR, the rapporteur proposed the following definitions:

* Broadcast Radio Bearer (BRB): A radio bearer configured for MBS broadcast reception.
* Multicast Radio Bearer (MRB): A DRB that is configured for MBS multicast reception.

It was also proposed to reuse existing DRB configuration structure and procedures to avoid having to replicate those for MRB. This is possible thanks to MRB being very alike a DRB and DRB related configurations and procedures being directly applicable to MRB as well. Otherwise, the procedures such as e.g. MRB addition/modification or MRB release would have to be specified separately, most likely by just copying the corresponding procedures for DRBs. Similarly the IEs used to configure DRB and MRB are the same and with the current approach, as copied below, unnecessary replication of these parts is avoided.

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| *RadioBearerConfig* information element  -- ASN1START  -- TAG-RADIOBEARERCONFIG-START  RadioBearerConfig ::= SEQUENCE {  srb-ToAddModList SRB-ToAddModList OPTIONAL, -- Cond HO-Conn  srb3-ToRelease ENUMERATED{true} OPTIONAL, -- Need N  drb-ToAddModList DRB-ToAddModList OPTIONAL, -- Cond HO-toNR  drb-ToReleaseList DRB-ToReleaseList OPTIONAL, -- Need N  securityConfig SecurityConfig OPTIONAL, -- Need M  ...  }  SRB-ToAddModList ::= SEQUENCE (SIZE (1..2)) OF SRB-ToAddMod  SRB-ToAddMod ::= SEQUENCE {  srb-Identity SRB-Identity,  reestablishPDCP ENUMERATED{true} OPTIONAL, -- Need N  discardOnPDCP ENUMERATED{true} OPTIONAL, -- Need N  pdcp-Config PDCP-Config OPTIONAL, -- Cond PDCP  ...  }  DRB-ToAddModList ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-ToAddMod  DRB-ToAddMod ::= SEQUENCE {  cnAssociation CHOICE {  eps-BearerIdentity INTEGER (0..15),  sdap-Config SDAP-Config  } OPTIONAL, -- Cond DRBSetup  drb-Identity DRB-Identity,  reestablishPDCP ENUMERATED{true} OPTIONAL, -- Need N  recoverPDCP ENUMERATED{true} OPTIONAL, -- Need N  pdcp-Config PDCP-Config OPTIONAL, -- Cond PDCP  ...,  [[  daps-Config-r16 ENUMERATED{true} OPTIONAL -- Cond DAPS  ]],  [[  mrb-Flag-r17 ENUMERATED{true} OPTIONAL -- Cond MRB ]]  -- Editor’s note: FFS whether MRB flag is required or some other configuration can be resued for the UE to distinguish DRB from MRB.  }  DRB-ToReleaseList ::= SEQUENCE (SIZE (1..maxDRB)) OF DRB-Identity  SecurityConfig ::= SEQUENCE {  securityAlgorithmConfig SecurityAlgorithmConfig OPTIONAL, -- Cond RBTermChange1  keyToUse ENUMERATED{master, secondary} OPTIONAL, -- Cond RBTermChange  ...  }  -- Editor’s note: FFS how security is configured for MRB (pending SA3 input).  -- TAG-RADIOBEARERCONFIG-STOP  -- ASN1STOP |

Whether the flag is needed may still depend on whether there will be any MRB specific configuration that has to be provided, depending on future discussions, as captured in the relevant EN.

During Phase 1 of the discussion, several companies expressed preference to separate MRB configuration and procedures from DRB configuration and procedures. However, as explained above, this comes at the cost of additional specifications complexity and the benefits of such separation are unclear. Companies are requested to provide their view on this issue in the table below.

**Question 1: Please indicate whether you are OK with reusing DRB configuration for MRB (for multicast) (similarly as proposed in the current draft of the running CR) or if you prefer to have them configured separately, and why.**

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| **Company** | **Comments (preference and reasoning)** |
| **Kyocera** | We prefer to have a separate MRB configuration from the DRB configuration.  We think it can avoid any impact (including possible errors) to the existing DRB procedures, which is rather simple for the UEs supporting MBS functionality as well as those not supporting MBS functionality. In addition, LTE eMBMS just had (SC-)MRB which is completely different from DRB. We assume the same concept can be reused for NR MBS. |
| **MediaTek** | Aseparate MRB configuration structure and procedures is preferred. It may lead to redundant text in the spec, but it presents a clean configuration for MRB and may increase the readability of the specs. |
| **Intel** | We prefer to have separate configuration of MRB and DRB to have clean specification and to avoid confusion. DRB is associated with unicast PDU session, and some of the DRB configurations (e.g. *cn-Association* and *drb-Identity*) might not be applicable to MRB. Reusing DRB configuration for MRB requires adding some clarifications/restrictions on which fields are not applicable to MRB, and is not clean conceptually. |
| **CATT** | MRB configuration is separated from DRB configuration structure in RRC message.  1. For unicast, DRB is always associated with a PDU session, and it is dedicate to a UE. On the other hand, MRB is always associated to MBS session, and typically it is common for all the UEs. So MRB and DRB should be separate term and it is not suitable to create any connection between them.  2. Due to the differentiation between MRB and DRB, some mandatory IEs in DRB configuration structure may be not applicable to MRB. |
| Qualcomm | MRB is associated with Shared MBS session and DRB is associated with Unicast PDU session. There are many differences between DRB Vs MRB configuration Ex: HARQ enable/disable, No need of SDAP config, PTM RLC/PTP RLC within same cell, security, DRB ID space shared or not shared, DRB-MRB switching etc. Having separate MRB procedure will be clean approach and we can avoid writing too many exceptions in DRB procedure. Thus we prefer to have separate procedure text for MRB. |
| Convida | We prefer a separate MRB configuration. We agree with the comments from others that it would allow us to tailor the configuration to MBS and avoid having to add text to configuration details that are only for MRB or DRB. Although there would be some redundancy between the details of the two configurations, we think the added clarity a separate MRB configuration would bring, would be beneficial. |
| Lenovo, Motorola Mobility | Only from IEs structure point of view, reusing DRB configuration with a ‘MRB flag’ seems working and has less standard impact. However, the issue is also relevant to MRB ID allocation, MRB reconfiguration to DRB and other expects:  -Whether a same MRB ID is used for all the relevant UE or different MRB ID can be used for different UE needs further discussion.  - whether the value range of MRB ID can be shared with current DRB ID, which may need more evaluated in RAN3 e.g. between gNB-CU and gNB-DU.  - the MBS session should be reconfigured to the associated PDU session before/during handover to MBS non-supporting node.  - whether the security configuration is needed or can be the same with DRB needs more input from SA3.  Decoupling the MRB configuration from the DRB configuration seems more clean and can avoid unexpected backwards compatible issue. We also prefer separate MRB configuration compared to DRB |
| Samsung | We prefer to have separate MRB configuration from the DRB configuration to ensure clean and clear specification. As has been pointed by many comments earlier there are differences between MRB and DRB configuration parameters and details. |

Another issue that was raised is whether to define multicast and broadcast radio bearers separately (i.e. have MRB and BRB as proposed in the current draft of the running CR) or to have a single MRB definition covering both multicast and broadcast radio bearers. The main reason for separating those definitions in the proposed CR is because broadcast RBs and multicast RBs are configured and delivered via completely different procedures and messages and they have different configuration structure. For example, multicast RB is controlled by the network via RRCReconfiguration so RB addition/modification and release procedures can be reused. Broadcast radio bearer related procedures on the other hand, are triggered by a UE itself based on the MBS services of interest and configuration in MCCH message. There are no commonalities from signaling/procedures point of view between BRB and MRB, as can be clearly seen in the current running CR. Furthermore, in case MRB covers both broadcast and multicast radio bearers, then there might be a need to distinguish those anyway, e.g. by saying “MRB carrying broadcast session” or “MRB carrying multicast session”. Considering these explanations, companies are requested to express their view on the definition of radio bearers for MBS.

**Question 2: Please indicate whether you prefer to have separate definitions of broadcast radio bearer and multicast radio bearer or a single radio bearer covering both broadcast and multicast, and why.**

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| **Company** | **Comments (preference and reasoning)** |
| **Kyocera** | We still prefer to have a single radio bearer, i.e., MRB, for both broadcast and multicast sessions.  The two delivery modes, i.e., DM1 and DM2, certainly have different aspects in signalling and procedure, as the rapporteur explained. However, we think it’s RAN2 common understanding that DM1 and DM2 are not defined in the specification. As for the separate radio bearer, i.e., MRB and BRB, it can be just seen as specifying DM1 and DM2 from a different angle, which is different from RAN2’s assumption. So, we think there is no need to specify the differences.  We think it’s still FFS whether DM2 can also support multicast sessions, and also it still needs to discuss whether MCCH can be delivered via RRC Reconfiguration. Depending on the outcomes of these discussions, the differences between DM1 and DM2, and between MRB and BRB, would blur. Even if these features are not supported in this release, we think such a potential commonality should be taken into account for future proofing.  In addition, LTE eMBMS just had (SC-)MRB for both multicast and broadcast sessions, which should be the baseline for NR MBS. |
| **MediaTek** | We think there is no need to distinguish the MRB and BRB at AS level, since it is already identified at QoS/session level. If a MBS session is multicast session, its mapped MRB is for Multicast (DM-1); If a MBS session is broadcast session, its mapped MRB is for Broadcast (DM-2). |
| **Intel** | We prefer to have a single radio bearer covering both broadcast and multicast, with the aim of forward compatibility. As can be seen from contributions submitted to RAN Rel-18 workshop, many companies prefer to support multicast in RRC\_INACTIVE. It is expected that the radio bearer architecture for multicast in RRC\_INACTIVE would be very similar to that of broadcast. The name of BRB might be confusing if it is used for multicast considering MRB is defined for multicast only. It would be good to have Rel-17 definition ready for the potential introduction of multicast in RRC\_INACTIVE in Rel-18. |
| **CATT** | We prefer to use MRB (i.e. MBS radio bearer) for both multicast and broadcast.  In our understanding, the key characteristic of MRB is that it is associated to MBS session and used for carrying MBS data, which is common for multicast and broadcast on this point.  The MRB concept does not necessarily need to be associated with any specific signaling/procedures. It can be configured with different signaling/procedures for delivery mode 1 and delivery mode 2 respectively. |
| **Qualcomm** | Since we need to specify MCCH signaling and broadcast radio bearer procedures , which is independent of dedicated signaling based MRB procedures, we are OK to have BRB specified separately to avoid confusion in procedure description. |
| **Convida** | We prefer to use MRB (i.e. MBS radio bearer) for both multicast and broadcast.  We understand the concerns of the Rapporteur. However in our view, the MBS radio bearer configuration is not entirely related to whether the MBS session is multicast or broadcast, but rather on how the network wants to deliver this session to the UEs, for example, based on the QoS required for the service. We expect that some multicast services with lower QoS requirements will likely be transmitted using similar radio bearer configuration as for broadcast services. |
| **Lenovo, Motorola Mobility** | We share similar understanding as Kyocera. The essential difference is whether the service can be received in RRC\_CONNECTED only or in all RRC\_CONNECTED/INACTIVE/IDLE, instead of if the service is multicast or broadcast. We might also support multicast in RRC INACTIVE/IDLE in the future. |
| **Samsung** | We prefer to use MRB commonly for both multicast and broadcast. Distinction is clear between DM1 and DM2. However, multicast and broadcast services need not be differtiated or compartmentalized to specific RRC states and delivery modes e.g. multicast can be considered for RRC\_IDLE/RRC\_INACTIVE state and other delivery mode in future. |

# 3 List of RRC open issues

A list of open issues/editor’s notes to be added here.

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| **Issue** | **Relevant section in TS 38.331** | **Rapporteur’s suggestions on how to address** |
| The definitions/acronyms of radio bearers related to MBS need to be agreed and aligned between TS 38.331 and TS 38.300. | Definitions and abbreviations in sections 3.1. and 3.2, but also terms are used throughout the document. | Topic discussed in section 2 of this document. |
| FFS whether there is a single capability for both MBS Broadcast and MBS Multicast or a single MBS capability. | Section 5.x.1.1 and potentially other places in CR. | Resolve once UE capabilities topic is addressed. |
| FFS whether to keep MCCH-RNTI name or use another one. | Section 5.x.1.2 and potentially other places in the CR. | Discuss based on contributions. |
| FFS where MCCH search space parameter is configured. | Section 5.x.1.2 and potentially other places in the CR. | Resolve after receiving layer 1 parameters list from RAN1. |
| The RNTI used for the notification mechanism is pending RAN1 decision (i.e. whether MCCH-RNTI is reused or a dedicated notification RNTI is specified). At least in case RAN1 decides to utilize RNTI other than MCCH-RNTI for MCCH change notification, MCCH change notification is sent in the first MCCH monitoring occasion of each MCCH repetition period. | Section 5.x.1.3 | Wait for RAN1 conclusion on RNTI used for MCCH change notification. |
| RAN2 agreed that that MCCH change notification mechanism is used to notify the changes of MCCH configuration due to session start and due to modification of an ongoing session’s configuration (provided RAN1 confirms a separate bit in DCI can be used for this). FFS on whether this notification can be reused for modification of other information carried by MCCH, if any. | Section 5.x.1.3 | Resolve after clarifying whether/what additional information is carried by MCCH. |
| FFS on modification of other information carried by MCCH, if any. | Section 5.x.2.2 | Resolve after clarifying whether/what additional information is carried by MCCH. |
| FFS whether any SDAP configuration need to be provided to the UE for MBS broadcast radio bearer. | Section 5.x.3.1 and potentially other places in the CR. | Discuss based on companies contributions. |
| FFS which PDCP and RLC parameters are configurable (if any) and which are specified in section 9.1.1 (if any). | Section 5.x.3.3, 6.3.x, 9.1.1. | Discuss based on companies contributions. |
| FFS whether sessionId is used in NR MBS. | Section 5.x.3.3, section 6.3.x. | Discuss based on companies contributions (may require input from other WGs) |
| FFS what physical layer configuration parameters are included in the *mbs-SessionInfoList,* if any. | Section 5.x.3.3 and potentially other places in the CR. | Resolve after receiving layer 1 parameters list from RAN1. |
| FFS whether MRB flag is required or some other configuration can be reused for the UE to distinguish DRB from MRB | Section 6.3.2 | Discuss based on companies contributions (this is also dependent on MBS related RBs definitions) |
| FFS how security is configured for MRB (pending SA3 input). | Section 6.3.2 | Wait for SA3 conclusion on security for MBS. |
| FFS whether to keep G-RNTI in RLC-BearerConfig or move it to another place and how the UE can be aware of RLC entity to G-RNTI mapping in case G-RNTI is configured in another place. | Section 6.3.2 | Discuss based on companies contributions (this topic has relation to other discussions, e.g. PTM leg deactivation). |
| FFS whether mtch-SchedulingInfo is provided in MBS-SessionInfo IE or another place (e.g. depending whether the DRX configuration can be common for multiple MBS sessions). | Section 6.3.x | Discuss based on companies contributions (this topic has relation to other discussions, e.g. DRX for MBS). |
| FFS whether TMGI definition from LTE is reused. | Section 6.3.x | Discuss based on companies contributions (may require input from other WGs) |
| One-to-one mapping between G-RNTI and MBS session is supported in NR MBS. Other mappings FFS | Section 6.3.x | Discuss based on companies contributions. |
| For NR MBS delivery mode 2, LTE SC-PTM DRX scheme is used as baseline. The exact configuration parameters are FFS. | Section 6.3.x | Discuss based on companies contributions. |
| FFS whether if this field is absent (*mtch-schedulingInfo*), the MTCH may be scheduled in any slot. | Section 6.3.x | Discuss based on companies contributions. |
| Maximum number of MBS sessions provided in MBS broadcast in a cell, maximum number of MBS broadcast RBs configured for one MBS service, maximum number of paging groups in a paging message | Section 6.4 | Discuss based on companies contributions after RRC CR becomes stable. |
| Whether SDAP is used for MTCH. | Section 9.1.1 | Discuss based on companies contributions. |
| The values applicable to t-Reordering for MTCH. | Section 9.1.1 | Discuss based on companies contributions. |

# 4 Reference