3GPP TSG-RAN WG2 Meeting #116bis-e ***R2-220xxxx***

Electronic Meeting, Jan 17 – 25, 2022

**Agenda item: 8.1.3.3**

**Source: MediaTek**

**Title: [AT116bis-e] [026][MBS] UE capabilities (MediaTek)**

**Document for:**  **Discussion**

# 1. Introduction

This paper is to trigger the following email discussion of UE capabilities in MBS:

* [AT116bis-e][026][MBS] UE capabilities (MediaTek)

Scope: Initial discussion on MBS UE capabilities, Identify easy agreements (can be agreed offline), discussion points and points that may need LS to other working group(s). Coordination may be needed between this discussion and the main UE caps discussion.

Intended outcome: Report

Deadline: Friday W1 for parts that need concrete action at current meeting by online CB, otherwise EOM.

## 1.1 Contacts

Contact person for each participating company:

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| Company | Name | Email Address |
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# 2. Discussion

## 2.1 Capabilities for multicast and broadcast reception

Since RAN1 has agreed to have separate capabilities for multicast and broadcast. From RAN2 perspective, it is reasonable to support separate reception for MBS multicast and broadcast service. From the rapporteur’s understanding, UE capabilities for broadcast and multicast should be separate and let RAN2 confirm this understanding.

#### Question 1: Do companies agree to support separate capabilities for MBS Broadcast and MBS Multicast?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes | It is what RAN1 has agreed, and functionally the two delivery modes can be decoupled. |
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## 2.2 Maximum G-RNTIs / G-CS-RNTI for multicast/broadcast

During the discussion of Rel-17 MBS, RAN2 agreed to support one-to-one mapping between G-RNTI/G-CS-RNTI and MBS session. Then, at RAN2#114-e meeting, RAN2 agreed that in order to receive multiple MBS services, UE need to support multiple G-RNTIs and/or G-CS-RNTIs and it is FFS whether this depends on UE capability (R2-2106687 LS to RAN1).

In RAN2#116e, one-to-many mapping between G-RNTI and MBS sessions is agreed. The network can map multiple sessions to the same G-RNTI and UE can join multiple session at the same time. There should be some constraints for network to map all UE interested sessions to one G-RNTI.

Meanwhile, monitoring multiple G-RNTI/G-CS-RNTIs actually puts a lot of burden for UEs receiving MBS services. From the rapporteur’s understanding, in order to simplify the UE implementation, it is preferred to limit the maximum number of G-RNTIs/G-CS-RNTIs (or their combination) for UE to monitor, and this should be jointly discussed with RAN1.

Before we get the input from RAN1, RAN2 can initially discuss the issue.

#### Question 2: Should the UE provide the maximum number of G-RNTIs / G-CS-RNTIs he can simultenously monitor to the network as UE capability?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes | This can be a capability, and based on this number(s) the network can decide whether it needs to map different MBS services to one Multicast MRB, if the number of supported G-RNTIs is fewer than the interested MBS multicast services.  We may need to further discuss whether this number is across multicast and broadcast if the UE supports both features, or they are separate numbers for multicast and broadcast. |
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#### Question 3: Companies are invited to provide the views on the actual maximum number of G-RNTIs/G-CS-RNTIs (or their combination) for UE to simultenously monitor?

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| **Company** | **Comments** |
| Huawei, HiSilicon | Can be INTEGER (1..4) as a baseline, and open for discussion. |
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## 2.3 Multicast split-bearer capability

For reliability of multicast service, it was agreed in RAN2#113e that split-MRB architecture is introduced for multicast reliability with one common PDCP entity and two separate RLC entities. One MRB can be configured with PTM only or PTP only or split-MRB architecture. In MBS stage-2 running CR R2-2111605, the detailed configurations for multicast MRB are supported:

* Multicast MRB with DL only RLC-UM or bidirectional RLC-UM configuration for PTP transmission;
* Multicast MRB with RLC-AM entity configuration for PTP transmission;
* Multicast MRB with DL only RLC-UM entity for PTM transmission;
* Multicast MRB with two RLC-UM entities, one DL only for PTP transmission and the other DL only RLC-UM entity for PTM transmission as described in section 16.x.5.5;
* Multicast MRB with three RLC-UM entities, one DL RLC-UM entity and one UL RLC-UM entity for PTP transmission and the other DL only RLC-UM entity for PTM transmission as described in section 16.x.5.5;
* Multicast MRB with two RLC entities, one RLC-AM entity for PTP transmission and the other DL only RLC-UM entity for PTM transmission as described in section 16.x.5.5.

The last 3 MRB configurations have a split bearer with two RLC entities, which should be indicated by a separate UE capability. However there is also a proposal in R2-2200819 saying that these MRB configuration can be mandatory for UE multicast reception.

#### Question 4: Do companies agree to use one UE capability to indicate the support of the split-bearer configurations for MRB and how, or it is a mandatory MRB for UE multicast reception?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Mandatory | For unicast, split DRB (with one UL path) is a mandatory feature without capability signalling, so it has no additional efforts for the UE to support split MRBs which is downlink only. |
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## 2.4 UE capability for maximum MRB number

In the TS 38.306, it is captured that the maximum number of DRBs that a NR UE shall support is 16, For one MAC entity, the maximum number of DRBs is 8. Since MRB is introduced, the maximum number of MRBs supported by the UE need to be discussed.

Considering the legacy UE capability for DRBs, MBS UE may reuse a total number of configured MRB+DRB=16 with some additional note in the TS 38.306. As part of total 16 MRBs + DRBs, the default number of supporting MRB can be 4, according to R2-2200531.

As indicated by R2-2200819, for some use cases and UEs, it would be beneficial to have a possibility to support additional MRBs, which may be useful for UEs which would be receiving multiple MBS sessions simultaneously. Additional MRBs support is based on UE capability.

#### Question 4: Do companies agree to reuse a total number of configured MRB+DRB=16 as the maximum number of radio bearers?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon |  | MRB+DRB=16 should be the maximum number that the UE is mandatory to support, and the UE is optional to support >16 MRB+DRBs. |
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#### Question 5: Do companies agree to set the default number of supporting MRBs to 4?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes | This is in case max number of MRBs + DRBs = 16, as proposed in R2-2200531. We can further discuss the supported MRB number if MRBs + DRBs > 16 |
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#### Question 6: Do companies agree to introduce an optional UE capability of*maxMRB-Add* for additional MRBs support?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes | It is beneficial if the UE can support more MRBs, and this can be optional to UE. |
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## 2.5 Mandatory UE features for Broadcast

As described in R2-2200819, the network is not able to know the capabilities of the UEs receiving MBS broadcast in RRC\_IDLE/INACTIVE in the cell. Therefore, it is necessary to specify a set of basic MBS broadcast capabilities that have to be supported by all the MBS broadcast enabled UEs. The basic feature set include not only those basic L2 features (mandatory without capabilities), but also some features which are currently mandatory with capability signalling, as shown below:

* PDCP short SN;
* RLC UM with short SN
* RLC UM with long SN
* DRX with long DRX cycle

#### Question 7: Do companies agree the above mandatory UE features with capability signaling in broadcast?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes | As MBS broadcast needs to support RRC\_IDLE/RRC\_INACTIVE UEs, the transmission cannot be based on UE capability reporting. It is necessary to make some well-supported features mandatory for MBS broadcast, so that the network the network can be free to configure these features.  The optional features can hardly if not at all be configured for MBS broadcast, as the network doesn’t know if the idle/inactive UEs support them. |
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For broadcast, as described in R2-2200819, ROHC is currently an optional function of UE. It may increase the complexity of UE if it is considered as a mandatory for UE supporting broadcast. On the other hand, if it remains optional for MBS, then it is unclear how the network may determine whether it may use ROHC for a certain MBS session or not.

If ROHC is considered as a mandatory capability for UE to receive broadcasts service, the number of ROHC context sessions and the required ROHC profiles should be limited to reduce the impact on the UE.

#### Question 8: Companies are invited to provide the views on whether ROHC is treated as a basic MBS broadcast capability or not

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes | RoHC should be treated as a basic MBS broadcast feature; otherwise, the network cannot use it at all, as it doesn’t know if an idle/inactive UE support it. |
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## 2.6 ROHC

In general, since ROHC can be operated at the PDCP entity in both DRB and MRB, the ROHC capabilities can be shared across all bearers configured for a UE. For “continueROHC-Context”, “supportedROHC-Profiles” and “uplinkOnlyROHC-Profiles”, no extra clarification is needed, as the capability bit per UE can be used for MRB and DRB. The maximum number of ROHC header compression context sessions can be across DRBs and MRB (i.e. per UE).

#### Question 9: Do companies agree that the maximum number of RoHC/EHC contexts are across all DRB/MRBs configured with RoHC/EHC for a UE ?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes, but.. | It should be clarified that it is across DRBs and Multicast MRBs.  For Broadcast MRBs, the number of supported RoHC/EHC contexts should be a separate capability. This is because the network doesn’t know how many RoHC/EHC contexts are used by a UE for broadcast MRBs, so if the number is also shared with broadcast MRBs, the network doesn’t know how many contexts are left for DRBs and multicast MRBs, when the UE is also receiving broadcast. |
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## 2.7 Multicast DRX

As described in R2-2200357, since RAN2 agreed that “For PTM transmission, a multicast DRX pattern is configured on a per G-RNTI(s) basis (i.e. independent of UE-specific DRX for unicast transmission).” Given that unicast DRX has optional UE capability, it is natural to introduce optional UE capability for multicast DRX.

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| Definitions for parameters | Per | M | FDD-TDD DIFF | FR1-FR2 DIFF |
| ***multicstDRX-r17***  Indicates whether the UE supports multicast DRX, as specified in TS 38.321 [8]. A UE supporting this feature shall also support Dynamic scheduling for multicast (RAN1 FG 33-2). | UE | No | No | No |

#### Question 10: Do companies agree to introduce optional UE capability for multicast DRX?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes/No | We have a preference to make it mandatory (at least for long DRX cycle), but no strong view. |
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Meanwhile, there is a discussion within R2-2200819 on the mandatory setting for multicast-capable UEs with long DRX cycle. Then RAN2 is asked to confirm this view.

#### Question 11: Do companies agree that MBS DRX with long DRX cycle is mandatory for multicast capable UEs?

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| **Company** | **Answer (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Yes | We have a preference to make it mandatory to UE considering its power saving benefits to UEs. |
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## 2.8 MBS reception on Scell and non-serving cell

For UE capability of receiving broadcast service in RRC connected state, last meeting RAN2 send a LS to RAN1 to check the feasibility of MBS broadcast reception on SCell:

* From RAN2 point of view, the UE may receive MBS broadcast service from SCell in intra-PLMN case and if supported this may be a separate UE capability. Send an LS to RAN1 to ask to check the feasibility of MBS broadcast reception on SCell.
* From RAN2 point of view, the connected UE may if supported receive MBS broadcast service from non-serving cell in intra-PLMN case, under the condition this does not have any impact to operation on serving cell(s). This may be a separate UE capability. Send an LS to RAN1 to ask to check the feasibility.

It is expected that the LS will be handled in RAN1#107bis-e meeting. Therefore, RAN2 can wait for RAN1’s feedback regarding the UE capabilities for MBS broadcast reception from SCell or non-serving cell.

Then rapporteur think s that no discussion is needed for this issue during this RAN2 meeting.

## 2.9 Other issues

#### Question 12: Companies are invited to comment if there are any other issues for MBS UE capabilities that needs to be discussed during this email discussion.

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| **Company** | **Answer (Yes/No)** | **Comments** |
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# 4. Summary

# 5. Reference

[1] R2-2200237 Discussions on NR MBS UE Capabilities CATT discussion Rel-17

[2] R2-2200357 UE capabilities for Rel-17 MBS Intel Corporation discussion Rel-17

[3] R2-2200400 UE capabilities for MBS Samsung

[4] R2-2200531 MBS UE capability for supporting MRBs Qualcomm India Pvt Ltd

[5] R2-2200579 UE capabilities for NR MBS TD Tech, Chengdu TD Tech discussion Rel-17

[6] R2-2200819 Discussion on UE capabilities for MBS Huawei, HiSilicon discussion Rel-17

[7] R2-2200827 Discussion on UE capability for NR MBS MediaTek inc. discussion Rel-17

[8] R2-2200874 RAN2 UE Feature List for NR MBS CMCC discussion Rel-17

[9] R2-2200906 MBS BWP UE capability and MBS resources Sony discussion Rel-17

[10] R2-2200979 MBS Capabilities Ericsson

[11] R2-2201261 Discussion on UE capabilities for MBS vivo discussion Rel-17

[12] R2-2201380 Discussion on MBS support on MRDC Xiaomi Communications discussion Rel-17

[13] R2-2201384 UE capability for ROHC and EHC Xiaomi Communications discussion Rel-17