3GPP TSG-RAN WG3 #115-e R3-222472

Online, 21st February - 3rd March 2022

Agenda Item: 22.2.4

Source: Ericsson (moderator)

Title: CB: # MBS3\_BearerMgmt - Summary of email discussion

Document for: Approval

# Introduction

from chair notes:

**CB: # MBS3\_BearerMgmt**

**- Decision making node on MRB bearer type;**

**- F1-U tunnel options for various type of MRB defined in RAN2, especially the MRB with UE specific transmission (PDCP SR, re-transmission);**

**- Flow control for MRB;**

**- F1AP detailed design (per UE or per MBS session to provide MBS configuration)**

**- E1AP detailed design for Multicast (on shared tunnel, MRB ID, PDCP variables based on RAN2 progress)**

**- MCCH signaling procedure on F1.**

**- Agreeable TPs (F1/E1, on bearer management, MBS context exchange)?**

(E/// - moderator)

Summary of offline disc [R3-222472](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Inbox/R3-222472.zip)

# For the Chairman’s Notes

## First round proposals:

Propose the following:

Re-confirm the following principles:

a) For MC, Agree on a set of non-UE associated E1 procedures to control MBS Session Resources in the gNB-CU-UP for setup, modification and release. (last meeting agreement)

b) Define separation procedures for BC and MC in E1AP and F1AP. (last meeting agreement)

Further, along feedback from last meeting and design proposals seen so far:

c) MC: F1AP follows NGAP (overwhelming feedback last meeting)

d) use MBS session associated signaling connections on F1 and E1

agree on further protocol principles:

a) an MBS Session context may comprise several MBS Area Session IDs and such information is provided on E1 and F1 to control respective MBS Session contexts.

b) control of common/shared resources via common (MBS session) specific protocol functions, for MC and BC

apply NG-RAN architecture principles to NR MBS (agreed long ago)

a) Functional split between DU and CU for NR MBS: DU is responsible for functions related to PHY/MAC/RLC, CU is responsible for functions related to PDCP/SDAP.

b) the “MRB (bearer) type” decision concerning variants of Lower Layer configurations is decided by the DU, well knowing, not disputing, acknloweding, not forgetting re-confirming that the per-UE RRC configuration is triggered by the CU, which is the place from UE is RRC configured.

Follow stage 2 description for TS 38.401 as of R3-222060 [9] for BC and MC.

concerning RLC-AM based MRB bearer types:

a) confirm that RAN2 defined that PDCP Status Report for MRBs is to be used for mobility only (i.e. for PDCP PDUs lost during RRCReconfiguration). If Rel-17 supports PDCP Status Report for MRBs, this is only in that special case which requires ptp functions on F1-U for re-transmission only.

b) it seems that RAN2 defined ptp-only only for cases where neither the UE nor the network supports ptm. This not given in supporting NG-RAN nodes it is proposed to not support ptp-only MRB bearer type in Rel-17 (basically to not specify F1/E1 protocol support at all for that MRB bearer type). This also due to the controversy around that bearer type.

c) simplicity advocates for dealing with individual re-transmission on F1-U within the shared F1-U tunnel and not to setup F1-U for the sake of retransmissions only, but to indicate UL and DL the concerned C-RNTI/DU cell index in a new UL frame (for PDCP SR) and into PDU 0 (DL).

Samsung (TS 38.425 rapporteur) to start drafting TP for CR containing a) applicability of 38.425 functions for MRBs in general sections and b) some details on how to apply DDDS for MRBs

F1AP protocol structure: agreed on an NGAP-aligned F1AP protocol structure containing:

- Multicast Context Setup/Release/Modification

- Multicast Distribution Setup/Release/Modification

E1AP protocol structure:

- Broadcast Bearer Context Setup/Modification (UP/CP triggered)/Release (UP/CP triggered)

- Multicast Bearer Context Setup/Modification (UP/CP triggered)/Release (UP/CP triggered)

# Discussion - first round

## Re-confirmation of principles

Re-confirm the following agreed principles:

a) For MC, Agree on a set of non-UE associated E1 procedures to control MBS Session Resources in the gNB-CU-UP for setup, modification and release.

b) Define separation procedures for BC and MC in E1AP and F1AP.

Further, along feedback from last meeting and design proposals seen so far:

c) MC: F1AP follows NGAP

d) use MBS session associated signaling connections on F1 and E1

Please provide your views below

|  |  |
| --- | --- |
| Company | Comment |
| Ericsson | yes, sure, of course |
| ZTE | Agree |
| Huawei | For a) we support to use non UE associated E1/F1 procedures to setup shared tunnels.  Fine for b)  For c), it is hard to say follow NGAP, could be similar, like shared tunnel establishment, for others we should reuse existing F1/E1 UE associated signaling as much as possible.  Fine for d) |

## Further development of principles

Given discussions partly on NG:

a) an MBS Session context may comprise several MBS Area Session IDs and such information is provided on E1 and F1 to control respective MBS Session contexts.

b) control of common/shared resources via common (MBS session) specific protocol functions, for MC and BC

Please provide your views below

|  |  |
| --- | --- |
| Company | Comment |
| Ericsson | wholeheartedly OK |
| ZTE | agree |
| Huawei | For a) disagree, as different MB-SMFs and/or MB-UPF may be assigned for different MBS service areas in an MBS session. Therefore for all interfaces, we think it is better to define the signaling per MBS Area session. |

## NG-RAN architectural principles for BC and MC

Functional split between DU and CU was designed in Rel-15 along the responsibility for the Uu protocol stack, with DU responsible for functions related to Lower Layers (PHY, MAC, RLC) and CU responsible for functions related to Higher Layers (PDCP, SDAP). The following is easily deducible for NR MBS along the basic agreement to follow NG-RAN architecture:

a) Functional split between DU and CU for NR MBS: DU is responsible for functions related to PHY/MAC/RLC, CU is responsible for functions related to PDCP/SDAP.

b) the “MRB (bearer) type” decision concerning variants of Lower Layer configurations is decided by the DU, well knowing, not disputing, acknowledging, not forgetting re-confirming that the per-UE RRC configuration is triggered by the CU, which is the place from UE is RRC configured.

Please provide your views below

|  |  |
| --- | --- |
| Company | Comment |
| Ericsson | a) and b) re-confirms Rel-15 and Rel-17 related decisions |
| ZTE | 1. agree. 2. CU might be able to propose the MRB configuration to DU, for example, suggestion split MRB or MRB with PTP only based on QoS requirement. In case of split MRB, DU choose whichever delivery method anyway. |
| Huawei | Fine for a)  Disagree with b) the bearer type should be decided by the CU. And as clarified by ZTE, for split MRB, it is up to DU to choose PTP and/or PTM.  As this is RRC based bearer type change, the bearer type of a MRB is a high layer configuration, which will be configured to UE via RRC signaling, it is straight forward to make such decision by the gNB-CU. Moreover, as mentioned in R3-222291that in case of bearer type change, the network may configure UE to send a PDCP status report. Therefore, CU is more suitable to decide this kind of bearer type change. |

## stage 2 for MC and BC

There are 3 papers dealing with stage 2 for TS 38.401: R3-222060 [9] (BC and MC), R3-222162 [15] (BC) and R3-222163 [16] (MC), whereas protocol design in [15] and [16] doesn´t follow principles agreed last meeting (a and b in 3.1). We propose to follow [9]

Please provide your views below

|  |  |
| --- | --- |
| Company | Comment |
| Ericsson | following [9] provides at least some sort of consistency from last meeting. |
| ZTE | we can start the discussion/drafting based on [9] which might be a good start point. |
| Huawei | Disagree, we support to use [15][16], and they aligned with principles.  For BC, last meeting we have already have stage3 TP agreed, it is better to use R3-222162 for BC stage2.  For MC, R3-222163 can be updated based on the agreements achieved in this meeting. |

## usage of RLC AM based MRB bearer types

a) confirm that RAN2 defined that PDCP Status Report for MRBs is to be used for mobility only (i.e. for PDCP PDUs lost during RRCReconfiguration). If Rel-17 supports PDCP Status Report for MRBs, this is only in that special case which requires ptp functions on F1-U for re-transmission only.

b) it seems that RAN2 defined ptp-only only for cases where neither the UE nor the network supports ptm. This not given in supporting NG-RAN nodes it is proposed to not support ptp-only MRB bearer type in Rel-17 (basically to not specify F1/E1 protocol support at all for that MRB bearer type). This also due to the controversy around that bearer type.

c) simplicity advocates for dealing with individual re-transmission on F1-U within the shared F1-U tunnel and not to setup F1-U for the sake of retransmissions only, but to indicate UL and DL the concerned C-RNTI/DU cell index in a new UL frame (for PDCP SR) and into PDU 0 (DL).

Please provide your views below:

|  |  |
| --- | --- |
| Company | Comment |
| Ericsson | OK to a, b and c |
| ZTE | 1. based on RAN2 agreements in RAN2 116-e: "In order to minimize the loss during MRB bearer type change, NW may configure UE to send a PDCP status report for the MRB bearer type change;" the PDCP SR shall not be limited to mobility case but for any scenarios where MRB bearer type change is needed. As long as there is a RLC AM PTP leg after MRB reconfig, PDCP SR is possible. 2. RAN2 does not make such assumption. There is no controversy based on company inputs. 3. simplicity asks for not messing up the shared tunnel. |
| Huawei | Disagree  RAN2 agreements:   * In order to minimize the loss during MRB bearer type change, NW may configure UE to send a PDCP status report for the MRB bearer type change;   For MRB configured by upper layers to send a PDCP status report in the uplink (field *statusReportRequired* in PDCP-Config IE in RRC), the receiving PDCP entity shall (based on the RRC reconfiguration message from the network) trigger a PDCP status report in case of MRB type change;  NW is required to configure a bidirectional PTP leg (e.g. either PTP-only MRB or split MRB) if *statusReportRequired* is provided. It is up to network in which case *statusReportRequired* is configured.   * The SR can be configured only if PTP AM (with Uplink) is in the new configuration. * EHC is supported for MRB for cases when feedback path is available (UL RLC) and it is expected that no further optimizations are needed.   It could be understood that the PDCP retransmission is supported after RRC based MRB bearer type change, and after handover the target gNB needs to transmit some packets to the UE to fill the gap via PTP leg, to support all of these, it is needed to establish UE specific F1-U tunnel for at least MRB with PTP AM leg. Same proposal can be found in R3-222163, R3-221784 and R3-222277.  **Proposal 1: the shared F1-U tunnel is also used for PTM only MRB and PTP only MRB.**  **Proposal 2: establish UE specific F1-U tunnel for at least MRB with PTP AM leg, to support PDCP retransmission after RRC based MRB bearer type change, and PTP data transmission after mobility.** |

## TS 38.425 and flow control

Several papers consider flow control and general adaptations of TS 38.425. It is proposed that the TS rapporteur (Samsung) starts to collect common sense TPs (or creates new ones) that

- state applicability of 38.425 functions for MRBs in general sections

- details rules for DDDS function for MRBs

in a way that first leaves out discussions on individual F1-U bearers for RLC AM entities of an MRB.

(btw: please consider the 1:1 mapping between Radio Bearer and F1-U /NR user plane protocol instance, we shouldn’t change that principle for MRBs)

Please provide your views below:

|  |  |
| --- | --- |
| Company | Comment |
| Ericsson | OK to start with drafting |
| ZTE | we didn't find any technique issue on F1-U support on various type of MBR as in R3-222322.  if companies do have concern on flow control we agree to leave out it for now and not define anything for flow control for MRB. |
| Huawei | Considering of the TPs provided in  In R3-222165, R3-222253 and R3-222291, it is proposed to:  **Reuse existing ‘Highest successfully delivered NR PDCP Sequence Number’ for the MRB configured with RLC AM PTP leg, and reuse the existing ‘Highest transmitted NR PDCP Sequence Number’ for MRB configured without RLC AM PTP leg.**  And then capture related TP into TS38.425. |

## NGAP principles applied to F1AP on procedure level

Along principles commonly agreeable at last meeting it is proposed to apply the same procedure structure for MC on F1AP as on NGAP

- a) Multicast Context Setup/Release/Modficiation

- b) Multicast Distribution Setup/Release/Modification

- c) reuse existing F1 procedures to manage the multicast MRB related context

Please provide your views below:

|  |  |
| --- | --- |
| Company | Comment |
| Ericsson | OK to start with that, including a DU initiated MC Context Release procedure. |
| ZTE | OK but, we might need a DU initiated MC Context modification too. |
| Huawei | Disagree with a)  Support b) and c) |

## E1AP protocol structure

Following the agreement to have non-UE associated procedures for UP context control on E1AP, separate for MC and BC the following protocol structure is proposed for E1AP

- a) Broadcast Bearer Context Setup/Modification (UP/CP triggered)/Release (UP/CP triggered)

- b) Multicast Bearer Context Setup/Modification (UP/CP triggered)/Release (UP/CP triggered)

- c) reuse existing E1AP procedures to manage the multicast MRB related bearers

Please provide your views below:

|  |  |
| --- | --- |
| Company | Comment |
| Ericsson | yes, very fine |
| ZTE | Agree. |
| Huawei | Disagree with a)  Support b) and c) |

* 1. Others

### Shared NG-U Establishment for Multicast

In NGAP, the Distribution Setup procedure and Distribution Release procedure were introduced in the BL CR to establish and release the shared NG-U tunnel, as discussed in R3-222163, R3-221989 and R3-222112, in case of gNB-CU-CP and gNB-CU-UP split case, an non UE associated gNB-CU-CP initiated Class 1 E1AP procedure should be introduced to establish the shared NG-U tunnel:



Proposal. For Multicast, to support shared NG-U transport, it is needed to introduce a non UE associated Class1 CU-UP initiated E1AP procedure, e.g. named as Shared NG-U Distribution Setup procedure, and a non UE associated Class1 CU-CP/CU-UP initiated E1AP procedure, e.g. named as Shared NG-U Distribution Release procedure.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Clarification |
| Huawei | agree |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Initial value of HFN and reference SN over E1AP

In R3-221991, it is mentioned that in order to avoid PDCP HFN desynchronization, RAN2 agreed that a reference SN together with the initial value of HFN can be configured by the gNB by RRC. As specified in the RRC running CR, a *multicastHFN-AndRefSN* IE is introduced in the PDCP-Config IE:

***multicastHFN-AndRefSN***

Indicates the initial value of HFN and reference PDCP SN associated to this HFN for multicast MRB PDCP window initialization as specified in TS 38.323 [5]. The value is composed of a HFN(MSBs) and the PDCP SN(LSBs). The size of the HFN part in bits is equal to 32 minus the length of the PDCP SN configured in *pdcp-SN-SizeDL*.

In case of CU-CP and CU-UP split architecture, the gNB-CU-CP has no idea about the latest PDCP count value of an MRB and so that it is not able to configure the initial value of HFN and the reference SN to the UE. The gNB-CU-UP need to provide the initial value of HFN and reference SN to the gNB-CU-CP during MRB setup procedure.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Clarification |
| Huawei | agree |  |
|  |  |  |
|  |  |  |
|  |  |  |

### F1AP Signaling structure on MBS Group Paging

In 38.413 BL CR, a list of Multicast Group Paging Area in which the same set of UEs is to be paged in the Ng group paging message. In R3-222081, it is proposed to introduce a list of Multicast Group Paging Areas in XnAP RAN Paging message and F1AP Paging message.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Clarification |
| Huawei | agree |  |
|  |  |  |
|  |  |  |
|  |  |  |

### Shared NG-U termination information exchange/coordination

As discussed in R3-222060, the follows are proposed in case of shared NG-U terminations,

* the 5GC may provide information about one or several already established NG-U termination that can be shared among gNBs. In return, gNBs may offer NG-U terminations to be shared. This has impact on E1
* alternatively, the gNB-CU-UP may provide information for which TMGIs pre-configured NG-U terminations are available to be used.
* the MBS QoS Flow to MRB mapping proposed by the gNB-CU-CP may be overwritten by the gNB-CU-UP in case an NG-U termination is already existing, if the gNB-CU-CP allows it.

|  |  |  |
| --- | --- | --- |
| Company | Answer | Clarification |
| Huawei | Disagree | The CU-CP should be aware of the common CU-UP based on OAM configuration, we do not see the need to do such kinds of enhancements.   * for multicast, as the shared NG-U establishment is triggered by the CU-UP, in case of common CU-UP, the CU-UP will not trigger the distribution setup procedure if there is an established shared NG-U. * for broadcast, in case of IP multicast, the common CU-UP will only join the IP multicast group once, and in case of unicast distribution, the same DL address will be provided, or the RAN node do not need to provide DL address as it is optional IE. |
|  |  |  |
|  |  |  |
|  |  |  |

# Conclusion, Recommendations [if needed]

If needed

# References

1. [R3-221782](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-221782.zip) MBS MCCH over F1 (NEC)
2. [R3-221783](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-221783.zip) (TP to TS 38.473 BL CR) MCCH over F1 (NEC)
3. [R3-221784](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-221784.zip) F1-U tunnel for PTP leg (NEC)
4. [R3-221785](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-221785.zip) (TP to TS 38.473 BL CR) F1-U tunnel for PTP leg (NEC)
5. [R3-221989](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-221989.zip) (TP to TS 38.463 BL CR) Bearer Management for Multicast (Lenovo, Motorola Mobility, Huawei, Qualcomm Incorporated)
6. [R3-221990](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-221990.zip) (TP to TS 38.460 BL CR) Bearer Management for Multicast (Lenovo, Motorola Mobility, Huawei, Qualcomm Incorporated)
7. [R3-221991](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-221991.zip) Configuration of initial value of HFN and reference SN over E1AP (Lenovo, Motorola Mobility)
8. [R3-221992](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-221992.zip) (TP to TS 38.425 BL CR) Remaining issues on Flow control and F1-U tunnel (Lenovo, Motorola Mobility)
9. [R3-222060](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222060.zip) [TP for BL CR 38.401] Multicast and Broadcast F1 and E1 stage 2 (Ericsson)
10. [R3-222061](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222061.zip) [TP for BL CR 38.463] Multicast and Broadcast E1AP functions (Ericsson)
11. [R3-222494](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Inbox/R3-222494.zip) [TP for BL CR 38.473] Multicast and Broadcast F1AP functions (Ericsson)
12. [R3-222080](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222080.zip) (TP for 38.473) F1AP Correction for MBS Group Paging (Nokia, Nokia Shanghai Bell)
13. [R3-222081](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222061.zip) (TP for 38.473) F1AP full UE associated Signalling solution for Multicast (Nokia, Nokia Shanghai Bell)
14. [R3-222112](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222112.zip) Discussion on bearer management over F1/E1 for multicast (LG Electronics)
15. [R3-222162](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222162.zip) (TPs to TS 38.401 38.470, 38.460 BL CRs) Bearer management over F1 and E1 for Broadcast (Huawei, Nokia, Nokia Shanghai Bell, CBN, China Unicom, China Telecom, CMCC)
16. [R3-222163](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222163.zip) (TPs to TS 38.401, 470, 460 BL CRs) Bearer Management for Multicast (Huawei, Lenovo, Motorola Mobility, CBN, CMCC)
17. [R3-222164](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222164.zip) (TP to 38.473 BL CR) Bearer Management for Multicast (Huawei, Lenovo, Motorola Mobility, CBN, CMCC)
18. [R3-222165](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222165.zip) (TP to TS 38.425 BL CR) Flow Control for MBS (Huawei, CBN, China Unicom, China Telecom)
19. [R3-222253](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222253.zip) (TP for TS 38.425) Discussion on flow control for MBS (CMCC)
20. [R3-222277](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222277.zip) F1-U tunnel for MRB retransmission (Qualcomm Incorporated)
21. [R3-222291](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222291.zip) (TP for TS38.425): Discussion on open issues in F1 for multicast (Samsung)
22. [R3-222322](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222322.zip) Bearer management for NR MBS with TP to BL CR for TS 38.425 BL CR (ZTE)
23. [R3-222024](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_115-e/Docs/R3-222024.zip) Discussion on remaining issues on F1-U (CATT)