**3GPP TSG RAN meeting #89e RP-20xxxx**

**Electronic Meeting, September 14 - 18, 2020**

## Status Report to TSG

**Agenda item:** 9.8.8

|  |  |
| --- | --- |
| **WI / SI Name** | NR Multicast and Broadcast Services |
| included in this status report | Study Item: No | Core part: Yes | Performance part:No | Testing part:No |
| **Acronym** | NR\_MBS |
| **Unique ID** | 860048 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-201038 |
| **Target Completion Date****(indicate if changed)** | Study Item: N/A | Core part: N/A | Performance part: N/A | Testing part: N/A |
| **Overall Completion level** | Study Item: N/A | Core part: 10% | Performance Part: N/A | Testing part: N/A |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |
| --- | --- |
| **Leading WG** | TSG RAN WG2 |
| **Rapporteur** | **Name** | Zhenzhen CAO |
| **Company** | Huawei |
| **Email** | caozhenzhen@huawei.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | Yes |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.
 One time unit (TU) corresponds to ~ 2 hours in the meeting.
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

Due to COVID-19 pandemic, this WI has been rescheduled and started only from Q3/2020 which is 6 months delay compared to the original schedule agreed in RP- RP-193248. For the new schedule, TUs need to be allocated for WG meetings in Q4/2020 and onwards.

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

 NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

RAN1#102-E agreements

Agreements:

* For RRC\_CONNECTED UEs, HARQ-ACK feedback is supported for multicast and no additional evaluation is needed to justify this.
	+ FFS: The detailed HARQ-ACK feedback solutions, e.g., ACK/NACK based, NACK-only based.
	+ FFS: HARQ-ACK feedback can be optionally disabled and/or enabled.

Agreements:

* For RRC\_CONNECTED UEs, at least support group-common PDCCH with CRC scrambled by a common RNTI to schedule a group-common PDSCH, where the scrambling of the group-common PDSCH is based on the same common RNTI.
	+ o   FFS: whether to support UE-specific PDCCH to schedule a PDSCH for MBS.

Agreements:

* For RRC\_CONNECTED UEs, define/configure common frequency resource for group-common PDSCH.
	+ FFS: whether to reuse the BWP framework or not
	+ FFS: the relation between the common frequency resource and UE dedicated BWP, e.g., the common frequency resource is a MBS specific BWP, or the common frequency resource is confined within UE’s dedicated BWP, etc.
	+ FFS: whether more than one common frequency resource can be configured per UE

Agreements:

* For RRC\_CONNECTED UEs, at least support FDM between unicast PDSCH and group-common PDSCH in a slot based on UE capability.
	+ FFS: TDM or SDM in a slot.

Agreements:

* For RRC\_CONNECTED UEs, at least support slot-level repetition for group-common PDSCH.
	+ FFS: whether enhancement is needed

Agreements:

* For RRC\_CONNECTED UEs, existing CSI feedback can be used for multicast transmission.
	+ FFS: whether enhancement is needed

#### 2.1.2 Remaining Open issues

* Group scheduling mechanism for MBS in RRC\_CONNECTED state, including enhancements to enable simultaneous operation with unicast reception
* Reliability improvement mechanisms for MBS in RRC\_CONNECTED state
* Required changes for MBS in RRC\_IDLE/ RRC\_INACTIVE states

## 2.2 RAN2

#### 2.2.1 Agreements

RAN2#111-E agreements

* Focus initially on NR SA, TBD to what extent other scenarios NR DC, NE DC can be supported.
* Confirm Will support PTM transmission in a cell.
* Confirm that We will, for multicast services introduce support for PTP and PTM transmission of shared traffic delivered by 5GC, at least for connected mode (this is not intended to exclude other cases)
* For a UE, gNB dynamically decides whether to deliver multicast data by PTM or PTP (Shared delivery)
* FFS which layer(s) handles reliability (in general), inorder delivery / duplicate handling, and it is FFS how it works at PTM PTP switch.
* Focus on MBS-MBS scenario initially (i.e. shared delivery), including both PTM and PTP (if applicable). Other scenarios later, TBD.
* Requirements for lossless mobility are TBD. Assume for now that R2 will anyway discuss service continuity functionality for low or no data loss.
* R2 assumes that for Rel-17 NR multicast Mobility in Connected mode, handover (including variants) is the baseline, TBD exactly which variants.
* R2 expect that there may be HARQ with feedback (for PTM) and this is specified by R1.

#### 2.2.2 Remaining Open issues

* L2 architecture for MBS
* Dynamic switch of MBS between PTP/PTM with service continuity
* Solutions for mobility with service continuity.
* Solutions of MBS for UEs in RRC\_IDLE/ RRC\_INACTIVE states

## 2.3 RAN3

#### 2.3.1 Agreements

RAN3#109-e agreements

There are 67 papers [1]-[67] submitted for this Work item, 11 email discussions were handled during the e-Meeting, with a list of agreements and working assumptions achieved.

**About RAN Architecture**

Agreements:

* Use existing NG-RAN architecture to support NR MBS.
* No MCE entity/node in RAN architecture.
* No SYNC protocol for this release.
* gNB makes the decision on using PTP or PTM over the radio.
* First focus on standalone (i.e. non-MR-DC) scenarios.
* Counting procedures for multicast are not introduced in Rel-17

Working Assumptions:

* For 5GC shared MBS traffic delivery of user data to a gNB, we shall use shared NG-U transport, regardless of delivery method over the radio.
* use “PTP” and “PTM” over the radio: definitions of “PTP” and “PTM” in RAN3 are pending until basic RAN1/2 decisions are made.

**About MBS Session**

Agreements:

* An MBS session is denoted by an MBS session identifier unique within the PLMN.
* MBS Session Resources: the term to denote NG-RAN resources for control and delivery of MBS user data, to be used on NG, Xn, F1 and E1.
* We Define MBS session resource in analogy with PDU session resource, e.g. including radio part, CP part, NG-UP part, MBS context in RAN.
* MBS session resource establishment is requested by 5GC (similarly to the PDU session establishment for unicast).
* RAN may request MBS session resource UP establishment, e.g. in handover (FFS). The signaling procedure (e.g. nested in handover signaling or new procedure, whether a single procedure is used or not) is FFS.
* For multicast, the gNB determines the area in which MBS user data needs to be provided by knowledge of the UEs that have joined the MBS Session.
* For multicast, the area in which MBS user data needs to be provided may be further limited by the multicast service area; input from SA2 expected.
* For multicast, the area in which the MBS user data needs to be provided is deduced from UE Context data.

Working Assumptions：

* One or more QoS flows may be used within a single MBS session.
* Each MB QoS flow belongs to one MBS Session.
* Each MB QoS flow is associated with a QoS profile.
* NR MBS supports both GBR and non-GBR QoS.
* One Shared NG-U tunnel is used per MBS session.
* For multicast, same QoS requirements are applicable regardless of whether PtP or PtM is selected by NG-RAN. [Input from SA2 is needed]

**About Service Continuity**

Agreements:

* Prioritize work on support of mobility scenarios of UEs moving from a cell with established MBS session resource to another cell with established or to be established MBS session resource.
* For the prioritized scenario, intra-CU mobility and Xn/NG based inter-gNB mobility will be considered.
* Xn Handover Request and the NG Handover Request message should contain MBS context information for the UE
* The F1AP UE context should contain MBS context information.
* The MBS configuration decided at target gNB is sent to the UE via the source gNB (details e.g. RRC container etc. pending RAN2 progress).

Working Assumptions：

* The UE Context to be transferred to the target gNB contains information about the MBS Session(s) the UE joined. Details are FFS.
* In RRC\_CONNECTED state, the MBS multicast tree is updated between the gNB and the MB-UPF at least for the first UE joining an MBS multicast session at a gNB. Similarly, the MBS multicast tree is updated between the target gNB and the MB-UPF at least for the first UE requesting an MBS multicast session and accepted into the target gNB.

#### 2.3.2 Remaining Open issues

* PTP/PTM decision in case of disaggregated gNB.
* Session management over NG interface.
* Bearer management over F1 interface.
* Service continuity- signaling procedures.
* Service continuity- minimizing data loss.

## 2.4 RAN4

#### 2.4.1 Agreements

#### 2.4.2 Remaining Open issues

## 2.5 RAN5

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

In SA2#140E meeting, an LS to SA, RAN, RAN2 and RAN3 has been approved in *S2-2006044*, with the following agreements:

- SA2 will develop means to provide QoS requirements for an MBS Session to RAN nodes.

- 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.

- SA2 agreed that the UE shall be able to receive on-going data of a multicast MBS session while in CM-CONNECTED state.

- Based on SA plenary decisions, Key Issue #5 ("Support of Broadcast TV Video and Radio communication services") is out of scope of Rel-17.

#### 3.1.2 Remaining Open issues with cross-TSG impacts

Some questions in *S2-2006044* should be answered and taken into account by TSG RAN and RAN WGs.

1. There are different proposals how to handle the CM-IDLE/CM-CONNECTED state transitions:
	1. UE within a multicast MBS session shall stay in CM-CONNECTED state,
	2. UE can receive data of a multicast MBS session also while in CM-IDLE state.
	3. UEs can transition into CM-IDLE while no multicast MBS data are transmitted.
	4. Some solutions propose that 5G CN may trigger notification to CM-IDLE and/or CM-CONNECTED mode UEs (e.g. paging CM-IDLE mode UEs) for establishing transmission resources for an multicast MBS session when data of an multicast MBS session are ready to be delivered.
	5. Some solutions propose that the multicast MBS session can be deactivated by the network while no multicast MBS data are transmitted to save power.
	6. Some solutions propose that the network can activate the multicast MBS session and trigger notification to UEs when multicast MBS data are transmitted again.

SA2 would appreciate RAN2 and RAN3 feedback on the above and comments, if any.

1. Some Xn/N2 handover solutions in the SA2 study are documented in the TR.
	1. Some solutions consider to have temporary MBS data forwarding from S-RAN to the T-RAN, to address potential data loss or duplication in case of a UE moving to a T-RAN supporting 5MBS.
	2. Some solutions have left forwarding FFS and would appreciate RAN feedback on possibilities for forwarding at Xn/N2 handovers with considerations of minimization of data loss, data duplication and complexity.
	3. Some solutions introduce HO for local MBS service that can only transmit data in a certain area, which has impact on RAN for service area restriction.

SA2 would appreciate RAN2 and RAN3 feedback and considerations on these solutions and topics.

1. SA2 is debating whether broadcast (i.e. without the network’s awareness about UEs receiving broadcast contents and for other use cases than the ones excluded already for Rel-17) should be further down-scoped in Rel-17 for remaining broadcast requirement in the SID. Some companies have provided solutions on broadcast (which are documented in the TR). SA2 would like to ask SA, RAN, RAN2 and RAN3 for feedback on broadcast support in Rel-17.
2. Some solution suggests the 5GC sends MBS assistance information to RAN for PTP/PTM delivery method decision and switching.

SA2 would appreciate RAN2 and RAN3 feedback on the above and comments, if any.

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

NOTE: This can be e.g. a list of all related Tdocs in the affected WGs since last TSG, references to LSs, produced TRs/TSs, the work/study item description or status reports of previous TSGs.

**RAN1#102-E contributions:**

1. R1-2006232 NR MBS work plan CMCC, Huawei, HiSilicon
2. [R1-2007001](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2007001.zip) FL summary on NR Multicast and Broadcast Services Moderator (CMCC)
3. R1-2007089 Summary#1 on NR Multicast and Broadcast Services Moderator (CMCC)
4. R1-2007235 Summary#2 on NR Multicast and Broadcast Services Moderator (CMCC)
5. R1-2007341 Summary#3 on NR Multicast and Broadcast Services Moderator (CMCC)
6. [R1-2005249](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005249.zip) Resource configuration and group scheduling for RRC\_CONNECTED UEs Huawei, HiSilicon
7. [R1-2005406](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005406.zip) Discussion on mechanisms to support group scheduling for RRC\_CONNECTED UEs vivo
8. [R1-2005436](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005436.zip) Mechanisms to Support Group Scheduling for RRC\_CONNECTED UEs ZTE
9. [R1-2005531](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005531.zip) Group Scheduling Mechanisms to Support 5G Multicast / Broadcast Services for RRC\_CONNECTED Ues Nokia, Nokia Shanghai Bell
10. [R1-2005589](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005589.zip) Considerations on MBMS group scheduling for RRC\_CONNECTED UEs Sony
11. [R1-2005693](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005693.zip) Discussion on group scheduling mechanism for RRC\_CONNECTED UEs in MBS CATT
12. [R1-2005898](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005898.zip) Group Scheduling for NR-MBS Intel Corporation
13. [R1-2006013](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006013.zip) Group scheduling for NR Multicast and Broadcast Services OPPO
14. [R1-2006173](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006173.zip) On Mechanisms to support group scheduling for RRC\_CONNECTED UEs Samsung
15. [R1-2006233](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006233.zip) Discussion on group scheduling mechanisms in NR MBS CMCC
16. [R1-2006320](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006320.zip) Support of group scheduling for RRC\_CONNECTED UEs LG Electronics
17. [R1-2006631](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006631.zip) On group scheduling mechanism for NR multicast and broadcast Convida Wireless
18. [R1-2006830](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006830.zip) Views on group scheduling for Multicast RRC\_CONNECTED UEs Qualcomm Incorporated
19. [R1-2006918](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006918.zip) Mechanism for group scheduling of RRC\_CONNECTED UEs in NR Ericsson
20. [R1-2005250](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005250.zip) Mechanisms to improve reliablity for RRC\_CONNECTED UEs Huawei, HiSilicon
21. [R1-2005407](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005407.zip) Discussion on mechanisms to improve reliability for RRC\_CONNECTED UEs vivo
22. [R1-2005437](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005437.zip) Mechanisms to Improve Reliability for RRC\_CONNECTED UEs ZTE
23. [R1-2005532](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005532.zip) Mechanisms for 5G Multicast / Broadcast Reliability Improvements for RRC\_CONNECTED Ues Nokia, Nokia Shanghai Bell
24. [R1-2005590](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005590.zip) Considerations on MBMS reliability for RRC\_CONNECTED UEs Sony
25. [R1-2005694](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005694.zip) Discussion on reliability improvement mechanism for RRC\_CONNECTED UEs in MBS CATT
26. [R1-2005899](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005899.zip) Mechanisms to Improve Reliability for NR-MBS Intel Corporation
27. [R1-2006014](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006014.zip) UL feedback for RRC-CONNECTED UEs in MBMS OPPO
28. [R1-2006174](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006174.zip) On Mechanisms to improve reliability for RRC\_CONNECTED Ues Samsung
29. [R1-2006234](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006234.zip) Discussion on reliability improvement in NR MBS CMCC
30. [R1-2006321](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006321.zip) Mechanisms to improve reliability of Broadcast/Multicast service LG Electronics
31. [R1-2006632](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006632.zip) On reliability enhancement for NR multicast and broadcast Convida Wireless
32. [R1-2006831](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006831.zip) Views on UE feedback for Multicast RRC\_CONNECTED UEs Qualcomm Incorporated
33. [R1-2006863](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006863.zip) HARQ-based time-interleaving for NR Multicast/Broadcast BBC
34. [R1-2006919](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006919.zip) Mechanisms to improve reliability for RRC\_CONNECTED UEs receiving PTM transmission Ericsson
35. [R1-2005272](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005272.zip) Discussion on multicast support for IDLE/INACTIVE UEs Huawei, HiSilicon
36. [R1-2005408](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005408.zip) Discussion on basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs vivo
37. [R1-2005438](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005438.zip) Basic Functions for Broadcast or Multicast for RRC\_IDLE or RRC\_INACTIVE UEs ZTE
38. [R1-2005533](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005533.zip) Basic Functions for Broadcast / Multicast for RRC\_IDLE / RRC\_INACTIVE Ues Nokia, Nokia Shanghai Bell
39. [R1-2005695](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005695.zip) Discussion on basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs CATT
40. [R1-2006015](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006015.zip) Discussion on enhancements for IDLE and INACTIVE state UEs OPPO
41. [R1-2006175](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006175.zip) On Basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs Samsung
42. [R1-2006235](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006235.zip) Discussion on NR MBS in RRC\_IDLE RRC\_INACTIVE states CMCC
43. [R1-2006322](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006322.zip) Basic function for broadcast/multicast LG Electronics
44. [R1-2006832](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006832.zip) Views on group scheduling for Multicast RRC\_IDLE/INACTIVE UEs Qualcomm Incorporated
45. [R1-2006920](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006920.zip) Basic functions for broadcast/multicast for RRC\_IDLE/RRC\_INACTIVE UEs Ericsson
46. [R1-2005439](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005439.zip) Preliminary Simulation Results of Rel-17 MBS ZTE
47. [R1-2005534](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2005534.zip) Simulation assumptions and evaluation scenarios for 5G Multicast Services Nokia, Nokia Shanghai Bell
48. [R1-2006016](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006016.zip) PUCCH resource allocation for UL feedback in MBMS OPPO
49. [R1-2006236](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006236.zip) On R17 NR MBS WI CMCC
50. [R1-2006410](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006410.zip) Performance evaluation of HARQ for NR multicast Huawei, HiSilicon
51. [R1-2006658](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006658.zip) Other issues for Rel-17 MBS vivo
52. [R1-2006861](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006861.zip) MIMO support in NR Multicast/Broadcast BBC
53. [R1-2006921](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2006921.zip) Assumptions for Performance Evaluations of NR-MBS Ericsson

**RAN2#111-e contributions:**

1. R2-2006569 Radio Bearer based Multicast PTM and PTP mode switching TCL Communication Ltd.
2. R2-2006574 Overview on NR MBS Architecture MediaTek Inc.
3. R2-2006575 UE Reception Model of NR MBS Radio Bearer and its Dynamic PTM/PTP switch MediaTek Inc.
4. R2-2006576 Reliability Improvement for NR MBS Reception MediaTek Inc.
5. R2-2006593 Discussion on Requirement and Architecture of MBS CATT
6. R2-2006594 Discussion on Dynamic PTM and PTP Switch with Service Continuity CATT
7. R2-2006595 Discussion on Mobility with Service Continuity in RRC\_CONNECTED CATT
8. R2-2006596 Discussion on the Reliability of Broadcast/Multicast Service CATT
9. R2-2006597 Consideration on Idle and Inactive mode UEs CATT
10. R2-2006793 NR Multicast Radio Bearer Architecture aspects Qualcomm Inc
11. R2-2006794 NR Multicast dynamic PTM PTP switch with service continuity Qualcomm Inc
12. R2-2006795 NR Multicast services and configuration for UEs in different RRC states Qualcomm Inc
13. R2-2006796 NR Multicast mobility enhancements with service continuity Qualcomm Inc
14. R2-2006801 Discussion on MBS reception of idle or inactive mode UE OPPO
15. R2-2006802 Discussion on mobility with MBS Service continuity OPPO
16. R2-2006803 Dynamic PTM and PTP switching with service continuity OPPO
17. R2-2006804 General considerations for MBS in RRC\_CONNECTED OPPO
18. R2-2006827 Scenarios and Requirements for Mobility with Service Continuity MediaTek Inc.
19. R2-2006952 Consideration of L2 protocol impact by MBS Intel Corporation
20. R2-2006982 Dynamic change between PTM and PTP transmission in gNB Nokia, Nokia Shanghai Bell
21. R2-2006983 Scope and solution approach for NR MBS Nokia, Nokia Shanghai Bell
22. R2-2006984 Service Continuity for Connected mode UE NEC
23. R2-2007014 Some consideration for IDLE mode and IN\_ACTIVE mode UE NEC
24. R2-2007015 Simultaneous transmission of multicast/unicast NEC
25. R2-2007024 Rel-17 NR MBS workplan Huawei, CMCC, HiSilicon
26. R2-2007025 Stage 2 aspects for NR MBS Huawei, HiSilicon
27. R2-2007026 Dynamic switch between PTP and PTM for MBS bearer Huawei, HiSilicon
28. R2-2007027 Service continuity during mobility for MBS Huawei, HiSilicon
29. R2-2007028 Reliability enhancement and dynamic control of transmission area for NR MBS Huawei, HiSilicon
30. R2-2007029 IDLE/INACTIVE UE support for NR MBS Huawei, HiSilicon
31. R2-2007033 Overview of NR MBS vivo
32. R2-2007034 Dynamic PTM PTP switch for RRC Connected UE vivo
33. R2-2007035 MBS Service Continuity for RRC Connected UE vivo
34. R2-2007036 Discussion on dynamic control of transmission area for MBS vivo
35. R2-2007037 Discussion on Idle and Inactive mode UEs vivo
36. R2-2007053 Consideration on switching between PTP and PTM Spreadtrum Communications
37. R2-2007054 Discussion on Mobility with Service continuity for connected UE Spreadtrum Communications
38. R2-2007055 MBS for Idle and Inactive mode UE Spreadtrum Communications
39. R2-2007124 RAN2 Study on the NR MBMS Apple
40. R2-2007134 Discussion on delivery mode switch with service continuity in NR multicast KT Corp.
41. R2-2007177 NR multicast architecture and SC-PTM Sony
42. R2-2007178 NR multicast in connected mode Sony
43. R2-2007248 Counting scheme for dynamically switching PTM and PTP ITRI
44. R2-2007262 NR Multicast in Idle and Inactive mode Ericsson
45. R2-2007412 Initial considerations of NR Multicast CMCC
46. R2-2007413 Discussion on dynamic delivery mode switch CMCC
47. R2-2007414 Discussion on MBS mobility with service continuity CMCC
48. R2-2007415 Discussion on MBS dynamic area control and reliability enhancements CMCC
49. R2-2007416 Discussion on MBS supported UEs in RRC\_IDLE and RRC\_INACTIVE states CMCC
50. R2-2007442 Scope and Architecture analysis of NR MBS ZTE, Sanechips
51. R2-2007443 Delivery mode switching for NR MBS ZTE, Sanechips
52. R2-2007444 Discussion about basic mobility support in NR MBS ZTE, Sanechips
53. R2-2007445 Miscellaneous issues in NR MBS ZTE, Sanechips
54. R2-2007446 MBS for UE in RRC\_INACTIVE/RRC\_IDLE State ZTE, Sanechips
55. R2-2007466 Protocols and Dynamic Switching for 5G MBS PTP and PTM Lenovo, Motorola Mobility
56. R2-2007467 PDCP Count Value Alignment to support of Loss-less handover for 5G MBS Lenovo, Motorola Mobility
57. R2-2007550 Discuss NR MBS architecture and protocol stack Futurewei
58. R2-2007551 Discuss dynamic change of MBS delivery method Futurewei
59. R2-2007552 Support MBS service continuity with mobility Futurewei
60. R2-2007628 Mobility for NR MBS Ericsson
61. R2-2007631 Protocol structure and bearer modelling for NR MBS Ericsson
62. R2-2007633 Mechanisms to improve reliability for UEs in RRC\_CONNECTED Ericsson
63. R2-2007636 General framework for MBS Intel Corporation
64. R2-2007637 Dynamic switch between PTM and PTP for service continuity Intel Corporation
65. R2-2007639 Overview of NR MBS work item Ericsson
66. R2-2007672 On Stage-2 aspects and overview of NR MBS Samsung
67. R2-2007673 RRC IDLE/ INACTIVE aspects of NR MBS Samsung
68. R2-2007774 Initial consideration of NR MBS Kyocera
69. R2-2007896 Group Based MBS Notification for Idle/Inactive mode UEs MediaTek Inc.
70. R2-2007991 MBS service continuity LG Electronics Inc.
71. R2-2007992 Dynamic bearer type change LG Electronics Inc.
72. R2-2007993 Consideration on BWP and beam in NR multicast LG Electronics Inc.
73. R2-2008031 Discussion on user-plane structure for NR multicast LG Electronics Inc.
74. R2-2008032 Discussion on reliability improvement and UL feedback in NR multicast LG Electronics Inc.
75. R2-2008052 NR MBS solution for UE in RRC\_IDLE or RRC\_INACTIVE state CHENGDU TD TECH LTD.
76. R2-2008061 MBS Mobility for Connected Mode UEs Samsung
77. R2-2008062 Reliability Enhancement for MBS Samsung
78. R2-2008063 Transfer Type Change with Service Continuity Samsung

**RAN3#109-e contributions:**

1. R3-204648 Discussion on the NG-RAN architecture enhancement for MBS ZTE
2. R3-204649 Discussion on the split gNB architecture enhancement for MBS ZTE
3. R3-204650 [Draft] LS on NR Multicast and Broadcast Services ZTE
4. R3-204688 Work Plan for Rel-17 NR Multicast and Broadcast Services Huawei, CMCC
5. R3-204689 NG-RAN Architecture to support NR MBS Huawei
6. R3-204690 Service continuity Scenarios during mobility for MBS Huawei, LGU+
7. R3-204691 Service continuity CP and UP aspects during mobility Huawei, LGU+
8. R3-204692 Dynamic switch between PTP and PTM Huawei
9. R3-204693 Dynamic Control of the MBS Transmission Area Huawei
10. R3-204702 5G MBS RAN Architecture Qualcomm Incorporated
11. R3-204703 QoS/bearer model and session management Qualcomm Incorporated
12. R3-204704 MBS Service continuity Qualcomm Incorporated
13. R3-204705 Dynamic PTM and PTP switching Qualcomm Incorporated
14. R3-204744 MBS architecture discussion Intel Corporation
15. R3-204841 5MBS Scope and Structuring of RAN3 work Nokia, Nokia Shanghai Bell
16. R3-204843 Enhancements to NG-RAN architecture for 5MBS Nokia, Nokia Shanghai Bell
17. R3-204844 5MBS Control Plane impact of mobility with service continuity Nokia, Nokia Shanghai Bell
18. R3-204845 5MBS User Plane impact of mobility with service continuity Nokia, Nokia Shanghai Bell
19. R3-204846 Key Principles for PtP-PtM Switching Nokia, Nokia Shanghai Bell
20. R3-204885 Overview of NR MBS vivo
21. R3-204886 Counting the MBS interest vivo
22. R3-204887 Mobility support for the switching between PTP and PTM vivo
23. R3-204920 Overview on NG RAN to support NR Multicast and Broadcast Services Lenovo, Motorola Mobility
24. R3-204921 Mode Decision and Dynamic Switching between PTM and PTP Lenovo, Motorola Mobility
25. R3-204922 Support of Loss-less handover for 5G MBS Lenovo, Motorola Mobility
26. R3-204923 5G MBS Transmission Mode and Area Control Lenovo, Motorola Mobility
27. R3-205032 On NG-RAN Architecture for 5G MBS Ericsson
28. R3-205033 Support of Basic Mobility with Service Continuity Ericsson
29. R3-205034 On NG-RAN support for dynamic change between PTP and PTM with service continuity Ericsson
30. R3-205035 Dynamic Control of Broadcast/Multicast Transmission Area Ericsson
31. R3-205036 On mobility to and from non-supporting NG-RAN nodes Ericsson
32. R3-205120 Discussion on service continuity between MBS-capable cells CATT
33. R3-205121 Discussion on Uu mode selection in disaggregated gNBs CATT
34. R3-205141 Discussion on MBS session management CATT
35. R3-205203 [TP for BL CR for 38.401] Overall NG-RAN architecture for NR MBS Ericsson
36. R3-205242 Consideration on basic mobility in NR MBS ZTE
37. R3-205243 Consideration on service continuty of basic mobility in NR MBS ZTE
38. R3-205244 Discussion about the procedure of delivery mode switching ZTE
39. R3-205245 Discussion about the bearer configuration for dlivery mode switching ZTE
40. R3-205246 Discussion on multicast/broadcast transmission area ZTE
41. R3-205247 Dynamic transmission area control in CU/DU split scenario ZTE
42. R3-205248 Consideration on the control information in NR MBS ZTE
43. R3-205253 Switching between multicast and unicast in RAN LG Electronics
44. R3-205351 Consideration on Mobility with Service Continuity LG Electronics
45. R3-205364 NG-RAN Architecture Discussion for MBS CATT
46. R3-205365 Consideration on MBSFN Transmission Area CATT
47. R3-205366 Consideration on Transmission Area for SC-PTM CATT
48. R3-205367 Consideration on F1 MBS Transport Mode CATT
49. R3-205396 Necessary Enhancements to NG-RAN Architecture Samsung
50. R3-205397 Addition of MBS feature Samsung
51. R3-205398 Dynamic Change Between PTP and PTM with Service Continuity Samsung
52. R3-205424 Consideration on Dynamic Control of the Broadcast/Multicast Transmission Area LG Electronics
53. R3-205443 MBS mobility with service continuity CMCC
54. R3-205444 Requirements and NG-RAN architecture to support MBS CMCC
55. R3-205495 CB: # 14\_MBS\_General - Summary of email discussion Huawei - moderator
56. R3-205496 CB: # 15\_MBS\_Architecture - Summary of email discussion Huawei - moderator
57. R3-205497 CB: # 16\_MBS\_Bearers\_SessionMgmt - Summary of email discussion Qualcomm - moderator
58. R3-205498 CB: # 17\_MBS\_Mobility\_SvcCont - Summary of email discussion Ericsson - moderator
59. R3-205499 CB: # 18\_MBS\_Mobility\_SvcCont\_CPUP - Summary of email discussion Nokia - moderator
60. R3-205500 CB: # 19\_MBS\_PTP-PTM\_DynChange - Summary of email discussion Samsung - moderator
61. R3-205506 CB: # 39\_MBS\_UP\_count - Summary of email discussion Lenovo - Moderator
62. R3-205641 Introduction of 5MBS Nokia, Nokia Shanghai Bell
63. R3-205684 Introduction of NR MBS Huawei
64. R3-205685 CB: # 20\_MBS\_DynTXareaCtrl - Summary of email discussion Ericsson - moderator
65. R3-205686 CB: # 22\_MBS\_Counting - Summary of email discussion Vivo - moderator
66. R3-205687 CB: # 23\_MBS\_Mobility2NonSupporting - Summary of email discussion Ericsson - moderator
67. R3-205688 CB: # 21\_MBS\_CtrlInfo - Summary of email discussion ZTE - moderator

 20.04.2020 minor adaptations for RAN #88e

 18.02.2020 minor adaptations for RAN #87e

 14.11.2019 minor adaptations for RAN #86

 18.08.2019 minor adaptations for RAN #85

 12.05.2019 minor adaptations for RAN #84

 27.02.2019 minor adaptations for RAN #83

 21.11.2018 completion levels with colours added (for RAN #82)

v04.81 31.07.2018 simplification of template and addition of cross-TSG aspects (for RAN #81)

v04.80 21.05.2018 minor adaptations for RAN #80

v04.79 26.02.2018 minor adaptations for RAN #79

v04.78 18.11.2017 minor adaptations for RAN #78

v04.77 06.08.2017 minor adaptations for RAN #77

v04.76 15.05.2017 minor adaptations for RAN #76

v04.75 31.01.2017 minor adaptations for RAN #75

v04.74 28.10.2016 minor adaptations for RAN #74

v04.73 01.09.2016 adaptations for RAN #73 (time units in extra Excel table, RAN6 reporting included)

v04.72 26.05.2016 adaptations for RAN #72 (introduction of NR & GERAN TUs)

v04.71 10.02.2016 minor adaptations for RAN #71

v04.70 30.10.2015 minor adaptations for RAN #70

v04.69 12.08.2015 minor adaptations for RAN #69

v04.68 21.05.2015 minor adaptations for RAN #68

v04.67 01.02.2015 minor adaptations for RAN #67

v04.66 16.11.2014 minor adaptations for RAN #66

v04.65 16.08.2014 minor adaptations for RAN #65

v04.64 22.05.2014 minor adaptations for RAN #64

v04.63 24.01.2014 restructuring for RAN #63 to cover Core & Perf. in one doc file

v03.62 11.11.2013 section 1.2.3 adapted for RAN #62

v03 11.08.2013 section 1.2.3 added on time budget

v02 07.05.2010 history added, some spelling corrections

v01 13.11.2009 First version of the template