**3GPP TSG-RAN WG2 Meeting #118-e R2-22xxxxx**

**Online, May 9th – May 20th, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.300** | **CR** | **XXXX** | **rev** | **1** | **Current version:** | **17.0.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Corrections on MBS | | | | | | | | | |
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| ***Source to WG:*** | ZTE | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_MBS-Core | | | | |  | ***Date:*** | | | 2022-05-23 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | ***F*** |  | | | | | ***Release:*** | | | *Rel-17* |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | 1. It was agreed by RAN3 that the determination point of PTP amd PTM switch should be DU.So for split MRB, the split point should be below PDCP layer in Figure 16.10.3-1; 2. MBS QFI SN is 32 bits. PDCP COUNT instead of PDCP SN should be equal to MBS QFI SN in Section 16.10.5.1; 3. The latest version of TS38.300 V17.0.0 does not include Rel-17 NR MBS stage 2 description of physical layer functionalities; 4. Description to MR-DC support for MBS is not clear; 5. Consistency could be improved, among WG specs (RAN2/RAN3/SA2), on wording/terminology choices, e.g., it should be “PDU Session” rather than “Unicast Session”, and PTP/PTM usage in MTCH transmission, using gNB instead of NG-RAN node, as only MBS only applies to gNB as WID (RP-201038) indicates; 6. Editorial error exists. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. For split MRB, the split point is changed to below PDCP layer in Figure 16.10.3-1; 2. PDCP SN is changed to PDCP COUNT in Section 16.10.5.1; 3. The added descriptions for physical layer functionalities are divided into two parts. One is for multicast and the other is for broadcast. For multicast, common frequency resource configuration for multicast transmission, DCI formats for multicast scheduling, and HARQ-ACK feedback are introduced. For broadcast, common frequency resource configuration for broadcast transmission and DCI format for broadcast scheduling are introduced. (R2-2206473/R1-2205336); 4. MR-DC support for MBS is clarified in section 16.10.2; 5. Consistency improvements, e.g., “Unicast Session” in Figure 16.10.3-1 changed to “PDU Session”, and PTP/PTM usage in MTCH transmission in section 8.1, using gNB instead of NG-RAN node in section 16.10.5.3, etc; 6. Editorial changes. | | | | | | | | |
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| ***Consequences if not approved:*** | | 1. Misleading on split point for PTM and PTP switch; 2. PDCP COUNT set to MBS QFI SN with different sizes; 3. Rel-17 NR MBS stage 2 description of physical layer functionalities is missing if the text proposal is not approved; 4. Description to MR-DC support for MBS is not clear; 5. Misunderstanding might exist due to the in-consistency on terminology/wording choices; 6. Editorial error exists.   **Impact analysis**  **Impacted 5G architecture options:**  SA, NE-DC, NR-DC  **Impacted functionality:**  MBS multicast, broadcast  **Inter-operability:**  There is no inter-operability issue | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.3.1, 8.1, 16.10 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

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| FIRST CHANGE |

7 RRC

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7.3 System Information Handling

7.3.1 Overview

System Information (SI) consists of a MIB and a number of SIBs, which are divided into Minimum SI and Other SI:

- **Minimum SI** comprises basic information required for initial access and information for acquiring any other SI. Minimum SI consists of:

- *MIB* contains cell barred status information and essential physical layer information of the cell required to receive further system information, e.g. CORESET#0 configuration. *MIB* is periodically broadcast on BCH.

- *SIB1* defines the scheduling of other system information blocks and contains information required for initial access. SIB1 is also referred to as Remaining Minimum SI (RMSI) and is periodically broadcast on DL-SCH or sent in a dedicated manner on DL-SCH to UEs in RRC\_CONNECTED.

- **Other SI** encompasses all SIBs not broadcast in the Minimum SI. Those SIBs can either be periodically broadcast on DL-SCH, broadcast on-demand on DL-SCH (i.e. upon request from UEs in RRC\_IDLE, RRC\_INACTIVE, or RRC\_CONNECTED), or sent in a dedicated manner on DL-SCH to UEs in RRC\_CONNECTED (i.e., upon request, if configured by the network, from UEs in RRC\_CONNECTED or when the UE has an active BWP with no common search space configured or when the UE configured with inter cell beam management is receiving DL-SCH from a TRP with PCI different from serving cell's PCI). Other SI consists of:

- *SIB2* contains cell re-selection information, mainly related to the serving cell;

- *SIB3* contains information about the serving frequency and intra-frequency neighbouring cells relevant for cell re-selection (including cell re-selection parameters common for a frequency as well as cell specific re-selection parameters);

- *SIB4* contains information about other NR frequencies and inter-frequency neighbouring cells relevant for cell re-selection (including cell re-selection parameters common for a frequency as well as cell specific re-selection parameters), which can also be used for NR idle/inactive measurements;

- *SIB5* contains information about E-UTRA frequencies and E-UTRA neighbouring cells relevant for cell re-selection (including cell re-selection parameters common for a frequency as well as cell specific re-selection parameters);

- *SIB6* contains an ETWS primary notification;

- *SIB7* contains an ETWS secondary notification;

- *SIB8* contains a CMAS warning notification;

- *SIB9* contains information related to GPS time and Coordinated Universal Time (UTC);

- *SIB10* contains the Human-Readable Network Names (HRNN) of the NPNs listed in SIB1;

- *SIB11* contains information related to idle/inactive measurements;

- *SIB15* contains information related to disaster roaming;

- *SIB17* contains information related to TRS configuration for UEs in RRC\_IDLE/RRC\_INACTIVE;

- *SIBpos* contains positioning assistance data as defined in TS 37.355 [43] and TS 38.331 [12];

- *SIB18* contains information related to the Group IDs for Network selection (GINs) associated with SNPNs listed in SIB1.

For sidelink, Other SI also includes:

- *SIB12* contains information related to NR sidelink communication;

- *SIB13* contains information related to *SystemInformationBlockType21* for V2X sidelink communication as specified in TS 36.331 clause 5.2.2.28 [29];

- *SIB14* contains information related to *SystemInformationBlockType26* for V2X sidelink communication as specified in TS 36.331 clause 5.2.2.33 [29].

For non-terrestrial network, Other SI also includes:

- *SIB19* contains NTN-specific parameters for serving cell and/or neighbour cells as defined in TS 38.331 [12].

For MBS broadcast, Other SI also includes:

- *SIB20* contains MCCH configuration;

- *SIB21* contains information related to service continuity for MBS broadcast reception.

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| NEXT CHANGE |

8 NG Identities

8.1 UE Identities

In this clause, the identities used by NR connected to 5GC are listed. For scheduling at cell level, the following identities are used:

- C-RNTI: unique UE identification used as an identifier of the RRC Connection and for scheduling;

- CI-RNTI: identification of cancellation in the uplink;

- CS-RNTI: unique UE identification used for Semi-Persistent Scheduling in the downlink or configured grant in the uplink;

- INT-RNTI: identification of pre-emption in the downlink;

- MCS-C-RNTI: unique UE identification used for indicating an alternative MCS table for PDSCH and PUSCH;

- P-RNTI: identification of Paging and System Information change notification in the downlink;

- SI-RNTI: identification of Broadcast and System Information in the downlink;

- SP-CSI-RNTI: unique UE identification used for semi-persistent CSI reporting on PUSCH.

For power and slot format control, the following identities are used:

- SFI-RNTI: identification of slot format;

- TPC-PUCCH-RNTI: unique UE identification to control the power of PUCCH;

- TPC-PUSCH-RNTI: unique UE identification to control the power of PUSCH;

- TPC-SRS-RNTI: unique UE identification to control the power of SRS.

During the random access procedure, the following identities are also used:

- RA-RNTI: identification of the Random Access Response in the downlink;

- Temporary C-RNTI: UE identification temporarily used for scheduling during the random access procedure;

- Random value for contention resolution: UE identification temporarily used for contention resolution purposes during the random access procedure.

For NR connected to 5GC, the following UE identities are used at NG-RAN level:

- I-RNTI: used to identify the UE context in RRC\_INACTIVE.

For UE power saving purpose during DRX, the following identity is used:

- PS-RNTI: used to determine if the UE needs to monitor PDCCH on the next occurrence of the connected mode DRX on-duration.

For IAB the following identity is used:

- AI-RNTI: identification of the DCI carrying availability indication for soft symbols of an IAB-DU.

For MBS, the following identities are used:

- G-RNTI: Identifies dynamically scheduled PTM transmissions of MTCH(s);

- G-CS-RNTI: Identifies configured scheduled PTM transmissions of MTCH(s);

- MCCH-RNTI: Identifies transmissions of MCCH and MCCH change notification.

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| NEXT CHANGE |

16 Verticals Support

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## 16.10 Multicast and Broadcast Services

### 16.10.1 General

NR system enables resource efficient delivery of multicast/broadcast services (MBS).

For broadcast communication service, the same service and the same specific content data are provided simultaneously to all UEs in a geographical area (i.e., all UEs in the broadcast service area are authorized to receive the data). A broadcast communication service is delivered to the UEs using a broadcast session. A UE can receive a broadcast communication service in RRC\_IDLE, RRC\_INACTIVE and RRC\_CONNECTED state.

For multicast communication service, the same service and the same specific content data are provided simultaneously to a dedicated set of UEs (i.e., not all UEs in the multicast service area are authorized to receive the data). A multicast communication service is delivered to the UEs using a multicast session. A UE can receive a multicast communication service in RRC\_CONNECTED state with mechanisms such as PTP and/or PTM delivery, as defined in clause 16.10.5.4. HARQ feedback/retransmission can be applied to both PTP and PTM transmission.

### 16.10.2 Network Architecture

The overall NG-RAN architecture specified in clause 4 applies for NR MBS.

Multicast MBS can be supported in MCG side in NE-DC and NR-DC scenarios, i.e., MN terminated MCG bearer kind of MRB. The configuration of MBS on SCG is not supported for the UE.

#### 16.10.2.1 QoS Model

The following QoS model applies to both multicast and broadcast [45]:

- An MBS Session Resource may be associated with one or more MBS QoS flows;

- Each MBS QoS flow is associated with a QoS profile.

### 16.10.3 Protocol Architecture

Figure 16.10.3-1 and 16.10.3-2 depict the downlink Layer 2 architecture for multicast session and broadcast session respectively, where MBS protocol stack comprises the same layer 2 sublayers as described in clause 6 with the following differences:

- SDAP sublayer provides only the following functionalities:

- Mapping between an MBS QoS flow and an MRB;

- Transfer of user plane data.

- PDCP sublayer provides only the following functionalities:

- Transfer of user plane data;

- Maintenance of PDCP SNs;

- Header compression and decompression using the ROHC protocol or EHC protocol;

- Reordering and in-order delivery;

- Duplicate discarding.

- For a multicast session, gNB provides one or more of the following multicast MRB configuration(s) to the UE via dedicated RRC signalling:

- 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 RLC-UM entity for PTP transmission and the other DL only RLC-UM entity for PTM transmission;

- 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;

- Multicast MRB with two RLC entities, one RLC-AM entity for PTP transmission and the other DL only RLC-UM entity for PTM transmission.

- For a multicast session, gNB may change the MRB type using RRC signalling.



Figure 16.10.3-1: Downlink Layer 2 Architecture for Multicast Session

- For broadcast session, gNB provides the following broadcast MRB configuration to the UE using broadcast RRC signalling:

- Broadcast MRB with one DL only RLC-UM entity for PTM transmission.



Figure 16.10.3-2: Downlink Layer 2 Architecture for Broadcast Session

### 16.10.4 Group Scheduling

The following logical channels are used for MBS delivery:

- MTCH: A point-to-multipoint downlink channel for transmitting MBS data of either multicast session or broadcast session from the network to the UE;

- DTCH: A point-to-point channel defined in clause 6.2.2 for transmitting MBS data of a multicast session from the network to the UE;

- MCCH: A point-to-multipoint downlink channel used for transmitting MBS broadcast control information associated to one or several MTCH(s) from the network to the UE.

The following connections between logical channels and transport channels for group transmission exist:

- MCCH can be mapped to DL-SCH;

- MTCH can be mapped to DL-SCH.

The following depicts the usage of RNTI for group transmission:

- A UE can receive different services using same or different G-RNTIs/G-CS-RNTIs.

The maximum number of HARQ processes for a UE are shared by unicast, multicast and broadcast scheduling and no dedicated HARQ process is defined for broadcast.

### 16.10.5 Multicast Handling

#### 16.10.5.1 Session Management

There are two delivery modes as specified in TS 23.247 [45]:

- 5GC Shared MBS traffic delivery;

- 5GC Individual MBS traffic delivery.

As specified in TS 23.247 [45], if the gNB supports MBS, the network shall use the 5GC Shared MBS traffic delivery in which case an MBS Session Resource context for a multicast session is setup in the gNB when the first UE joins the multicast session.

For MBS shared delivery mode, shared NG-U resources are used to provide MBS user data to the gNB. The gNB node initiates the Distribution Setup procedure towards the 5GC, to allocate shared NG-U resources for a multicast session. In case multiple MBS session areas are associated with the MBS session for location dependent MBS services, multiple NG-U shared resources are established for the same multicast session per MBS Area Session ID served by the gNB.

A shared NG-U resource applies one of the following transport options:

- unicast transport;

- multicast transport.

For 5GC Shared MBS traffic delivery an MBS Session Resource comprises one or several MRBs. If minimisation of data loss is applied for a given MRB, synchronisation of allocation of PDCP COUNTs is applied by either or a combination of the following methods:

- derivation of the PDCP COUNTs by means of a DL MBS QFI Sequence Number provided on NG-U;

- deployment of a Shared NG-U Termination at NG-RAN, shared among gNBs, which comprises a common entity for assignment of PDCP SNs.

Synchronisation in terms of MBS QoS flow to MRB mapping among gNBs is achieved by means of network implementation.

If PDCP COUNTs are derived from a DL MBS QFI Sequence Number provided on NG-U and only one QoS Flow is mapped to an MRB, the gNB shall set the PDCP COUNT of PDCP PDU to the value of the DL MBS QFI Sequence Number provided with the received packet over NG-U. If PDCP COUNTs are derived from a DL MBS QFI Sequence Number provided on NG-U and multiple QoS Flows are mapped to an MRB, the gNB may derive the PDCP COUNT of the PDCP PDU from the sum of the DL MBS QFI Sequence Numbers of the QoS Flows mapped to this MRB.

NOTE: Synchronisation of PDCP COUNTs in case user data for MBS QoS flows mapped to the same MRB arrive over NG-U at different gNBs in different order or in case of loss of data over NG-U, and related handling of minimisation of data loss is left to implementation.

#### 16.10.5.2 Configuration

A UE can receive data of MBS multicast session only in RRC\_CONNECTED state. If the UE which joined a multicast session is in RRC\_CONNECTED state and when the multicast session starts, the gNB sends *RRCReconfiguration* message with relevant MBS configuration for the multicast session to the UE.

When there is (temporarily) no data to be sent to the UEs for a multicast session, the gNB may move the UE to RRC IDLE/INACTIVE state. gNBs supporting MBS use a group notification mechanism to notify the UEs in RRC IDLE/INACTIVE state when a multicast session has been activated by the CN or the gNB has multicast session data to deliver. Upon reception of the group notification, the UEs reconnect to the network. The group notification is addressed with P-RNTI on PDCCH, and the paging channels are monitored by the UE as described in clause 9.2.5. Paging message for group notification contains MBS session ID which is utilized to page all UEs in RRC IDLE and RRC INACTIVE states that joined the associated MBS multicast session, i.e., UEs are not paged individually. The UE stops monitoring for group notifications related to a specific multicast session once the UE leaves this multicast session.

If the UE in RRC IDLE state that joined an MBS multicast session is camping on gNB not supporting MBS, the UE may be notified about multicast session activation or data availability by CN-initiated paging where CN pages each UE individually, as described in clause 9.2.5. If the UE in RRC INACTIVE state that joined MBS multicast session is camping on gNB not supporting MBS, the UE may be notified about data availability individually by RAN-initiated paging, as described in clause 9.2.5.

#### 16.10.5.3 Service Continuity

##### 16.10.5.3.1 General

Mobility builds on existing functionality including functions described in clause 9.2.

##### 16.10.5.3.2 Handover between Multicast supporting cells

Mobility procedures for multicast reception allow the UE to continue receiving multicast service(s) via PTM or PTP in a new cell after handover.

During handover preparation phase, the source gNB transfers to the target gNB in the UE context information about the MBS sessions the UE has joined. To support provision of local multicast service with location dependent content, for each active multicast session, service area information per Area Session ID may be provided to the target gNB.

The source gNB may propose data forwarding for some MRBs to minimize data loss and may exchange the corresponding MRB PDCP Sequence Number with the target NG-RAN during the handover preparation:

- The lossless handover for multicast service is supported for the handover between MBS supporting cells if the UE is configured with PTP RLC AM entity in target cell MRB of a UE, regardless of whether the UE is configured with PTP RLC AM entity in the source cell or not.

- In order to support lossless handover for multicast service, the network has to ensure DL PDCP SN synchronization and continuity between the source cell and the target cell. Furthermore, data forwarding from the source gNB to the target gNB and/or PDCP status report provided by a UE for an MRB for multicast session can be used during lossless handover.

For each Multicast session with ongoing user data transmission for which no MBS Session Resources exist at the target gNB, the target gNB triggers the setup of MBS user plane resources towards the 5GC using the NGAP Distribution Setup procedure. If unicast transport is used, the target gNB provides the DL tunnel endpoint to be used to the MB-SMF. If multicast transport is used it receives the IP multicast source address from the MB-SMF.

During handover execution, the MBS configuration decided at target gNB is sent to the UE via the source gNB within an RRC container as specified in TS 38.331 [12]. When the UE connects to the target gNB, the target gNB sends an indication that it is an MBS-supporting node to the SMF in the Path Switch Request message (Xn handover) or Handover Request Acknowledge message (NG handover).

Upon successful handover completion, the source gNB may trigger the release of the MBS user plane resources towards the 5GC using the NGAP Distribution Release procedure for any multicast session for which there is no remaining joined UE in the gNB.

##### 16.10.5.3.3 Handover between Multicast supporting cell and Multicast non-supporting cell

During an active MBS multicast session, at mobility from an MBS-supporting gNB to an MBS non-supporting gNB, the target gNB sets up PDU Session Resources mapped to the multicast MBS Session. The 5GC infers from the absence of an "MBS-support" indication in the Path Switch Request message (Xn handover) or Handover Request Acknowledge message (NG handover) that MBS data packets delivery has to be switched to 5GC individual MBS traffic delivery as specified in TS 23.247 [45]. If data forwarding is applied, the source gNB infers from the handover preparation response message that the target gNB does not support MBS and changes the QFI(s) in the forwarded packets to the associated PDU Session QFI(s) if respective mapping information is available. The source gNB may be aware that the target gNB is non-MBS supporting already before Handover Preparation.

For mobility from MBS non-supporting gNB to MBS-supporting gNB, the existing Xn/NG handover procedures apply. The 5GC infers from the presence of the "MBS-support" indicator in the Path Switch Request message (Xn handover) or in the Handover Request Acknowledge message (NG handover) that MBS data packets delivery can be switched from 5GC MBS individual traffic delivery to 5GC shared traffic delivery. After handover, the SMF triggers switching MBS data packets delivery form individual to shared traffic delivery by providing MBS Session IDs joined by the UE to the gNB by means of the PDU Session Resource Modification procedure. Minimization of data loss and duplication avoidance may be applied by means of identical MBS QFI SNs received over both, the shared NG-U and the unicast NG-U tunnels.

Mobility from a multicast supporting cell to a multicast non-supporting cell can be achieved by switching the MRB to a DRB in the source gNB before a handover.

NOTE: A UE may be handed over to a target gNB not-supporting MBS without prior reconfiguration from MRB to the DRB in the source gNB. In this case, the AS configuration may not be comprehended by the target gNB causing full configuration.

##### 16.10.5.3.4 MRB reconfiguration

The gNB may use *RRCReconfiguration* message to configure or reconfigure a multicast MRB, e.g., add/release/modify the MRB's RLC entities as described in clause 16.10.3. In order to minimize the data loss due to MRB reconfiguration, gNB may configure UE to send a PDCP status report during reconfiguration which results in MRB type change.

#### 16.10.5.4 Reception of MBS Multicast data

For multicast service, gNB may deliver Multicast MBS data packets using the following methods:

- PTP Transmission: gNB individually delivers separate copies of MBS data packets to each UEs independently, i.e., gNB uses UE-specific PDCCH with CRC scrambled by UE-specific RNTI (e.g., C-RNTI) to schedule UE-specific PDSCH which is scrambled with the same UE-specific RNTI.

- PTM Transmission: gNB delivers a single copy of MBS data packets to a set of UEs, e.g., gNB uses group-common PDCCH with CRC scrambled by group-common RNTI to schedule group-common PDSCH which is scrambled with the same group-common RNTI.

If a UE is configured with both PTM and PTP transmissions, a gNB dynamically decides whether to deliver multicast data by PTM leg and/or PTP leg for a given UE based on the protocol stack defined in clause16.10.3, based on information such as MBS Session QoS requirements, number of joined UEs, UE individual feedback on reception quality, and other criteria. The same QoS requirements apply regardless of the decision.

#### 16.10.5.5 Support of CA

UE can receive MBS multicast data either from a PCell or a single SCell at a time.

#### 16.10.5.6 DRX

The following DRX configuration for PTM/PTP transmission are possible:

- For PTM transmission, a multicast DRX pattern is configured on a per G-RNTI/G-CS-RNTI basis which is independent of UE-specific DRX for unicast transmission;

- For PTP transmission, the UE-specific DRX pattern for unicast is reused, i.e., the UE specific DRX pattern is used for both unicast services and the PTP transmission of MBS. For PTP transmission for PTM retransmission, the UE monitors PDCCH scrambled by C-RNTI/CS-RNTI only during unicast DRX's Active time.

#### 16.10.5.7 Physical Layer

A common frequency resource configured by SRB is defined for multicast scheduling as an ‘MBS frequency region’ with a number of contiguous PRBs confined within and with the same numerology as the DL BWP, but which may have specific characteristics (e.g. PDCCH, PDSCH and SPS configurations).

Two HARQ-ACK reporting modes are defined for MBS:

* For the first HARQ-ACK reporting mode, the UE generates HARQ-ACK information with ACK value when a UE correctly decodes a transport block or detects a DCI format indicating an SPS PDSCH release; otherwise, the UE generates HARQ-ACK information with NACK value.
* For the second HARQ-ACK reporting mode, the UE does not transmit a PUCCH that would include only HARQ-ACK information with ACK values.

HARQ-ACK feedback for multicast can be enabled or disabled by higher layer configuration per G-RNTI or per G-CS-RNTI and/or indication in the DCI scheduling multicast.

### 16.10.6 Broadcast Handling

#### 16.10.6.1 Session Management

For delivery of location dependent contents of a broadcast session, Area session ID is included in the NGAP broadcast session resource setup procedure associated with MBS service area information and per Area Session ID NG-U tunnels are established.

#### 16.10.6.2 Configuration

The UE can receive the MBS configuration for broadcast session (e.g., parameters needed for MTCH reception) via MCCH in RRC\_IDLE, RRC\_INACTIVE and RRC\_CONNECTED state. The parameters needed for the reception of MCCH are provided via System Information.

The following principles govern the MCCH structure:

- MCCH provides the list of all broadcast services with ongoing sessions transmitted on MTCH(s) and the associated information for broadcast session including: MBS session ID, associated G-RNTI scheduling information and information about neighbouring cells providing certain service on MTCH(s). MCCH content is transmitted within periodically occurring time domain windows, referred to as MCCH transmission window defined by MCCH repetition period, MCCH window duration and radio frame/slot offset;

- MCCH uses a modification period and MCCH contents are only allowed to be modified at each modification period boundary; A notification mechanism is used to announce the change of MCCH contents due to broadcast session start, modification or stop and due to neighbouring cell information modification;

- When the UE receives a MCCH change notification, it acquires the updated MCCH in the same MCCH modification period where the change notification is sent.

#### 16.10.6.3 Support of CA

UE can receive MBS broadcast data and MCCH either from a PCell or a single SCell at a time. Meanwhile, dedicated RRC signalling is used for providing SIB20 of the SCell i.e., while in RRC\_CONNECTED state, UEs need not to acquire broadcast SIB20 directly from the SCells.

NOTE: The broadcast reception from non-serving cell may be supported by UE implementation without capability signalling.

#### 16.10.6.4 DRX

One PTM DRX configuration can be configured by gNB to a UE for one or multiple G-RNTIs via MCCH.

#### 16.10.6.5 Service Continuity

Mobility principles builds on existing functionality including functions described in clause 9.2.

NR MBS supports MBS frequency layer prioritization for MBS broadcast sessions. The gNBs may be configured with the MBS FSA ID(s) supported by each of their cell. The gNBs may exchange this information with their neighbours within Xn Setup messages and subsequent Xn Configuration Update messages to help for frequency layer prioritization.

##### 16.10.6.5.1 Service Continuity in RRC\_IDLE or RRC\_INACTIVE

Mobility procedures for MBS reception allow the UE to start or continue receiving MBS service(s) when changing cells. The gNB may indicate in the MCCH the list of neighbour cells providing the same MBS broadcast service which as provided in the serving cell. This allows the UE, e.g., to request unicast reception of the service before moving to a cell not providing the MBS broadcast service(s) using PTM transmission. To avoid the need to read MBS broadcast related system information and potentially MCCH on neighbour frequencies, the UE is made aware of which frequency is providing which MBS broadcast services via PTM, through the combination of the following MBS related information:

- User Service Description (USD), as defined in TS 23.346 [46];

- SIB21, as defined in clause 7.3.1.

In RRC\_IDLE and RRC\_INACTIVE, the UE applies the normal cell reselection rules with the following modifications:

- the UE which is receiving or interested to receive MBS broadcast service(s) via PTM and can only receive these MBS broadcast service(s) via PTM while camping on the frequency providing these MBS broadcast service(s) is allowed to make this frequency highest priority when the conditions described in TS 38.304 [10] are met;

- when the MBS broadcast service(s) which the UE is interested in are no longer available (after the end of the session) or the UE is no longer interested in receiving the service(s), the UE no longer prioritises the frequency providing these MBS broadcast service(s).

##### 16.10.6.5.2 Service Continuity in RRC\_CONNECTED

To ensure service continuity of MBS broadcast, the UE in RRC\_CONNECTED state may send MBS Interest Indication to the gNB, consisting of the following information:

- List of MBS frequencies UE is interested to receive, sorted in decreasing order of interest;

- Priority between the reception of all listed MBS frequencies and the reception of any unicast bearer;

- List of MBS broadcast services the UE is interested to receive, in case SIB20 is scheduled by the UE's PCell.

MBS Interest Indication information reporting can be implicitly enabled/disabled by the presence of SIB21.

The gNB may use this information, together with the information about the UE's capabilities (e.g, supported band combinations), when providing an RRC configuration and/or downlink assignments to the UE, to allow the UE to receive the MBS services the UE is interested in. MBS Interest Indication information can be exchanged between source gNB and target gNB during handover.

#### 16.10.6.6 Physical Layer

MBS broadcast can be received by UEs in RRC\_CONNECTED/RRC\_INACTIVE/RRC\_IDLE states.

A common frequency resource configured by SIB is defined for broadcast scheduling as an ‘MBS frequency region’ with a number of contiguous PRBs with a bandwidth equal to or larger than CORESET0, with the same numerology asCORESET0, but which have specific characteristics (e.g. PDCCH and PDSCH configurations).

The maximum number of MIMO layers is one for MBS broadcast scheduling. RB-level rate matching, and RE-level rate matching around LTE-CRS configured by higher layer signaling are supported for MCCH and MTCH, and slot-level repetition is supported for MTCH.

HARQ-ACK feedback is not supported for MBS broadcast.

Only dynamic scheduling is supported for MBS broadcast.

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| END OF CHANGES |