**3GPP TSG-RAN WG2 Meeting #110-e R2-2005761**

**Electronic, 1st Jun. – 12th Jun. 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.321** | **CR** | **1474** | **rev** | **1** | **Current version:** | **16.0.0** |  |
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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:*** | CR on 36.321 for even further mobility enhancement in E-UTRAN | | | | | | | | | |
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| ***Source to WG:*** | vivo | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | LTE\_feMob-Core | | | | |  | ***Date:*** | | | 2020-05-22 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | In RAN2#109bis-e meeting, the following conclusions are made:   1. All the functions in Figure 4.2.2-1 will be supported by the source and target MAC entity in DAPS HO. 2. LTE DAPS+ LTE RACH-less is not allowed. 3. Forbid data transmission of non-DAPS DRBs in MSG3 for CBRA. 4. Do not support PHR reporting in another node   In RAN2#110-e meeting, the following conclusions are made:   1. Intent of the first and second changes in R2-2005612 is correct: *In section 5.1.6 and 5.4.3.1.3, it needs to clarify that target MAC entity only performs the operations (i.e., to indicate the successful completion of the Random Access Procedure and to forbid data transmission of non-DAPS DRBs in MSG3 for CBRA).* Discuss in the MAC CR email discussion how to capture this. 2. Consider whether “target MAC entity” is a good way to indicate and use it consistently. | | | | | | | | |
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| ***Summary of change:*** | | 1. Remove the Editor’s Note in section 4.2.1 for FFS which functions will be supported by the source and target MAC entity in DAPS HO. 2. In 4.2.1, clarify the terminology for source/target MAC entity. 3. Remove the Editor’s Note in section 5.1.6 for DAPS+Rach-less. 4. In 5.1.6, clarify that target MAC entity indicates the successful completion of the Random Access Procedure. 5. In 5.4.3.1, add the clarification to forbid data transmission of non-DAPS DRBs in MSG3 for CBRA. 6. In 6.1.3.6b, add clarification about UE does not support DC PHR reporting in another node | | | | | | | | |
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| ***Consequences if not approved:*** | | The latest conclusions for FeMobility have not been catpured in the specificiation. | | | | | | | | |
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| ***Clauses affected:*** | | 4.2.1, 5.1.6, 5.4.3.1, 6.1.3.6b | | | | | | | | |
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|  | | **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:*** | | The draft CR was agreed in principle in RAN2#109bis-e meeting. | | | | | | | | |

Start of change

### 4.2.1 MAC Entities

E-UTRA defines two MAC entities; one in the UE and one in the E-UTRAN. These MAC entities handle the following transport channels:

- Broadcast Channel (BCH);

- Downlink Shared Channel(s) (DL-SCH);

- Paging Channel (PCH);

- Uplink Shared Channel(s) (UL-SCH);

- Random Access Channel(s) (RACH);

- Multicast Channel(s) (MCH);

- Sidelink Broadcast Channel (SL-BCH);

- Sidelink Discovery Channel (SL-DCH);

- Sidelink Shared Channel (SL-SCH).

The exact functions performed by the MAC entities are different in the UE from those performed in the E-UTRAN.

The RN includes both types of MAC entities; one type for communication with UEs and one type for communication with the E-UTRAN.

In Dual Connectivity, two MAC entities are configured in the UE: one for the MCG and one for the SCG. In DAPS handover, two MAC entities are configured in the UE: one MAC entity for the source cell (source MAC entity) and one MAC entity for the target cell (target MAC entity). Each MAC entity is configured by RRC with a serving cell supporting PUCCH transmission and contention based Random Access. In this specification, the term SpCell refers to such cell, whereas the term SCell refers to other serving cells. The term SpCell either refers to the PCell of the MCG or the PSCell of the SCG depending on if the MAC entity is associated to the MCG or the SCG, respectively. A Timing Advance Group containing the SpCell of a MAC entity is referred to as pTAG, whereas the term sTAG refers to other TAGs.

The functions of the different MAC entities in the UE operate independently if not otherwise indicated. The timers and paramenters used in each MAC entity are configured independently if not otherwise indicated. The Serving Cells, C-RNTI, radio bearers, logical channels, upper and lower layer entities, LCGs, and HARQ entities considered by each MAC entity refer to those mapped to that MAC entity if not otherwise indicated.

If the MAC entity is configured with one or more SCells, there are multiple DL-SCH and there may be multiple UL-SCH and RACH per MAC entity; one DL-SCH, one UL-SCH, and one RACH on the SpCell, one DL-SCH, zero or one UL-SCH and zero or one RACH for each SCell.

The physical layer may perform a listen-before-talk procedure, according to which transmissions are not performed if the channel is identified as being occupied or the physical layer may monitor for PUSCH trigger, as specified in TS 36.213 [2], according to which transmissions are not performed if PUSCH trigger B is not received. In both cases a MAC entity considers the transmission to have been performed anyway, unless stated otherwise.

Figure 4.2.1-1 illustrates one possible structure for the UE side MAC entity when SCG is not configured and for each MAC entity during DAPS handover, and it should not restrict implementation.

Next change

### 5.1.6 Completion of the Random Access procedure

At completion of the Random Access procedure, the MAC entity shall:

- discard explicitly signalled *ra-PreambleIndex* and *ra-PRACH-MaskIndex*, if any;

- flush the HARQ buffer used for transmission of the MAC PDU in the Msg3 buffer.

Upon successful completion of the Random Access procedure initiated for DAPS handover, the target MAC entity shall:

- indicate the successful completion of the Random Access Procedure to the upper layers.

In addition, the RN shall resume the suspended RN subframe configuration, if any.

Next change

#### 5.4.3.1 Logical channel prioritization

The Logical Channel Prioritization procedure is applied when a new transmission is performed.

RRC controls the scheduling of uplink data by signalling for each logical channel: *priority* where an increasing *priority* value indicates a lower priority level, *prioritisedBitRate* which sets the Prioritized Bit Rate (PBR), *bucketSizeDuration* which sets the Bucket Size Duration (BSD), and optionally *allowedTTI-Lengths* which sets the allowed TTI lengths. For NB-IoT, *prioritisedBitRate*, *bucketSizeDuration* and the corresponding steps of the Logical Channel Prioritisation procedure (i.e., Step 1 and Step 2 below) are not applicable.

The MAC entity shall maintain a variable Bj for each logical channel j. Bj shall be initialized to zero when the related logical channel is established, and incremented by the product PBR × TTI duration for each TTI, where PBR is Prioritized Bit Rate of logical channel j. However, the value of Bj can never exceed the bucket size and if the value of Bj is larger than the bucket size of logical channel j, it shall be set to the bucket size. The bucket size of a logical channel is equal to PBR × BSD, where PBR and BSD are configured by upper layers.

Before the successful completion of the contention based Random Access procedure initiated for DAPS handover, the target MAC entity shall not select the logical channel(s) corresponding to non-DAPS DRB(s) for the uplink grant received in a Random Access Response.

The MAC entity shall perform the following Logical Channel Prioritization procedure when a new transmission is performed on an UL grant with a certain TTI length:

- The MAC entity shall allocate resources to the logical channels that are allowed to transmit using the TTI length of the grant, in the following steps:

- Step 1: All the allowed logical channels with Bj > 0 are allocated resources in a decreasing priority order. If the PBR of a logical channel is set to "infinity", the MAC entity shall allocate resources for all the data that is available for transmission on the logical channel before meeting the PBR of the lower priority logical channel(s);

- Step 2: the MAC entity shall decrement Bj by the total size of MAC SDUs served to logical channel j in Step 1;

NOTE 1: The value of Bj can be negative.

- Step 3: if any resources remain, all the allowed logical channels are served in a strict decreasing priority order (regardless of the value of Bj) until either the data for that logical channel or the UL grant is exhausted, whichever comes first. Logical channels configured with equal priority should be served equally.

- The UE shall also follow the rules below during the scheduling procedures above:

- the UE should not segment an RLC SDU (or partially transmitted SDU or retransmitted RLC PDU) if the whole SDU (or partially transmitted SDU or retransmitted RLC PDU) fits into the remaining resources of the associated MAC entity;

- if the UE segments an RLC SDU from the logical channel, it shall maximize the size of the segment to fill the grant of the associated MAC entity as much as possible;

- the UE should maximise the transmission of data.

- if the MAC entity is given an UL grant size that is equal to or larger than 4 bytes while having data available for transmission, the MAC entity shall not transmit only padding BSR and/or padding (unless the UL grant size is less than 7 bytes and an AMD PDU segment needs to be transmitted);

- for transmissions on serving cells operating according to Frame Structure Type 3, the MAC entity shall only consider logical channels for which *laa-UL-Allowed* has been configured;

- if a logical channel has been configured with *lch-CellRestriction* and if PDCP duplication is activated, for this logical channel the MAC entity shall not consider the cells indicated by *lch-CellRestriction* to be restricted for transmission.

- for NB-IoT UEs, BL UEs or UEs in enhanced coverage, if *edt-SmallTBS-Enabled* is set to *TRUE* for the corresponding PRACH resource, the UE shall choose a TB size among the set of possible TB sizes as described in clauses 8.6.2 and 16.3.3 of TS 36.213 [2]

The MAC entity shall not transmit data for a logical channel corresponding to a radio bearer that is suspended (the conditions for when a radio bearer is considered suspended are defined in TS 36.331 [8]).

If the MAC PDU includes only the MAC CE for padding BSR or periodic BSR with zero MAC SDUs and there is no aperiodic CSI requested for this TTI, as specified in TS 36.213 [2], the MAC entity shall not generate a MAC PDU for the HARQ entity in the following cases:

- in case the MAC entity is configured with *skipUplinkTxDynamic* and the grant indicated to the HARQ entity was addressed to a C-RNTI; or

- in case the MAC entity is configured with *skipUplinkTxSPS* and the grant indicated to the HARQ entity is a configured uplink grant activated by the MAC entity's Semi-Persistent Scheduling C-RNTI or by the MAC entity's UL Semi-Persistent Scheduling V-RNTI; or

- in case the grant indicated to the HARQ entity is a configured uplink grant activated by the MAC entity's AUL C-RNTI; or

- in case the grant indicated to the HARQ entity is a preconfigured uplink grant.

For the Logical Channel Prioritization procedure, the MAC entity shall take into account the following relative priority in decreasing order:

- MAC control element for C-RNTI or data from UL-CCCH;

- MAC control element for DPR;

- MAC control element for SPS confirmation;

- MAC control element for AUL confirmation;

- MAC control element for BSR, with exception of BSR included for padding;

- MAC control element for PHR, Extended PHR, or Dual Connectivity PHR;

- MAC control element for Sidelink BSR, with exception of Sidelink BSR included for padding;

- MAC control element for DCQR and AS RAI, with exception of when DCQR is to be included in Msg3;

- data from any Logical Channel, except data from UL-CCCH;

- MAC control element for DCQR and AS RAI, when DCQR is to be included in Msg3;

- MAC control element for Recommended bit rate query;

- MAC control element for BSR included for padding;

- MAC control element for Sidelink BSR included for padding.

When AS RAI has been triggered, DCQR and AS RAI MAC control element shall have higher priority than data from any Logical Channel, except data from UL-CCCH, only if after logical channel prioritization including AS RAI in the resulting MAC PDU does not require segmenting RLC SDU. Otherwise data from any Logical Channel shall have higher priority than DCQR and AS RAI MAC control element.

NOTE 2: When the MAC entity is requested to transmit multiple MAC PDUs in one TTI, steps 1 to 3 and the associated rules may be applied either to each grant independently or to the sum of the capacities of the grants. Also the order in which the grants are processed is left up to UE implementation. It is up to the UE implementation to decide in which MAC PDU a MAC control element is included when MAC entity is requested to transmit multiple MAC PDUs in one TTI. When the UE is requested to generate MAC PDU(s) in two MAC entities in one TTI, it is up to UE implementation in which order the grants are processed.

Next change

#### 6.1.3.6b Dual Connectivity Power Headroom Report MAC Control Element

The Dual Connectivity Power Headroom Report (PHR) MAC control element is identified by a MAC PDU subheader with LCID as specified in table 6.2.1-2 and this MAC control element is also used for PHR reporting during DAPS handover . It has a variable size and is defined in Figure 6.1.3.6b-1 and Figure 6.1.3.6b-2. One octet with Ci fields is used for indicating the presence of PH per serving cell other than PCell, when the highest *SCellIndex* of SCell with configured uplink is less than 8, otherwise four octets are used. In case EN-DC, NE-DC or NGEN-DC is configured, four octets with Ci fields is always used. In case of DAPS handover, PH reporting is not applicable for for SCell(s) and omits other cell PH reporting for PCell (i.e., source cell MAC entity PHR reporting omits PH report for target PCell and vice versa). When Type 2 PH is reported for the PCell, the octet containing the Type 2 PH field is included first after the octet(s) indicating the presence of PH per cell (PSCell and all SCells of all MAC entities) and followed by an octet containing the associated PCMAX,c field (if reported). Then after that, when Type 2 PH is reported for the PSCell, the octet containing the Type 2 PH field is included followed by an octet containing the associated PCMAX,c field (if reported). Then follows an octet with the Type 1 PH field and an octet with the associated PCMAX,c field (if reported), for the PCell. If *SRS-ConfigAdd-r16* is configured for the PCell then follows an octet with the Type 3 PH field and an octet with the associated PCMAX,c field (if reported), for the PCell. And then follows in ascending order based on the *ServCellIndex*, as specified in TS 36.331 [8], an octet with the Type x PH field, wherein x is either 1 or 3 according to TS 36.213 [2] and TS 38.213 [18] and an octet with the associated PCMAX,c field (if reported), for all serving cells of all MAC entities indicated in the bitmap. In case of EN-DC and NGEN-DC, for serving cells in the other MAC entity in which the UE does not support dynamic power sharing or dynamic power sharing is not applicable (clause 4.2.7.9, TS 38.306 [22]), the UE may omit the octets containing Power Headroom field and PCMAX,c field for those serving cells. In case of NE-DC, for serving cells in the other MAC entity in which the UE does not support dynamic power sharing or dynamic power sharing is not applicable, the UE may omit the octets containing Power Headroom field and PCMAX,f,c field for those serving cells except for the PCell in the other MAC entity and the reported values of Power Headroom and PCMAX,f,c for the PCell are up to UE implementation.

The Dual Connectivity PHR MAC Control Element is defined as follows:

- Ci: this field indicates the presence of a PH field for the serving cell of any MAC entity, except the PCell, with *ServCellIndex* (for EN-DC, NE-DC or NGEN-DC case) or *SCellIndex* i as specified in TS 36.331 [8]. The Ci field set to "1" indicates that a PH field for the serving cell with *ServCellIndex* (for EN-DC, NE-DC or NGEN-DC case) or *SCellIndex* i is reported. The Ci field set to "0" indicates that a PH field for the serving cell with *ServCellIndex* (for EN-DC, NE-DC or NGEN-DC case) or *SCellIndex* i is not reported;

- R: reserved bit, set to "0";

- V: this field indicates if the PH value is based on a real transmission or a reference format. For Type 1 PH, V=0 indicates real transmission on PUSCH and V=1 indicates that a PUSCH reference format is used. For Type 2 PH, V=0 indicates real transmission on PUCCH and V=1 indicates that a PUCCH reference format is used. For Type 3 PH, V=0 indicates real transmission on SRS and V=1 indicates that an SRS reference format is used. Furthermore, for Type 1 ,Type 2 and Type 3 PH, V=0 indicates the presence of the octet containing the associated PCMAX,c field, and V=1 indicates that the octet containing the associated PCMAX,c field is omitted. Whether the reported PH value for an activated NR Serving Cell is based on real transmission or a reference format is determined based on UL transmissions that have been scheduled or configured until 4 ms prior to the TTI in which this PHR MAC CE is transmitted;

- Power Headroom (PH): this field indicates the power headroom level. The length of the field is 6 bits. The reported PH and the corresponding power headroom levels are shown in Table 6.1.3.6-1 (the corresponding measured values in dB for the E-UTRA Serving Cell are specified in clause 9.1.8.4 of TS 36.133 [9] while the corresponding measured values in dB for the NR Serving Cell are specified in TS 38.133 [19]);

- P: this field indicates whether power backoff due to power management is applied (as allowed by P-MPRc, see TS 36.101 [10] and TS 38.101-3 [21]). The MAC entity shall set P=1 if the corresponding PCMAX,c field would have had a different value if no power backoff due to power management had been applied;

- PCMAX,c: if present, this field indicates the PCMAX,c or , as specified in TS 36.213 [2] for the E-UTRA Serving Cell and the PCMAX,f,c or P̃CMAX,f,c, as specified in TS 38.213 [18]) for the NR Serving Cell used for calculation of the preceding PH field. The reported PCMAX,c and the corresponding nominal UE transmit power levels are shown in Table 6.1.3.6a-1 (the corresponding measured values in dBm for the E-UTRA Serving Cell can be found in TS 36.133 [9] while the corresponding measured values in dBm for the NR Serving Cell can be found in TS 38.133 [19]).



Figure 6.1.3.6b-1: Dual Connectivity PHR MAC Control Element



Figure 6.1.3.6b-2: Dual Connectivity PHR MAC Control Element supporting 32 serving cells with configured uplink

End of change