**3GPP TSG-RAN WG2 Meeting #109 electronicR2-200xxxx**

**E-Meeting, 24th Feb. – 6th Mar. 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.321** | **CR** | **0687** | **rev** | **-** | **Current version:** | **15.8.0** |  |
|  | | | | | | | | |
| *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:*** | Running CR for NR mobility enhancement | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | vivo | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_enh-Core | | | | |  | ***Date:*** | | | 2020-02-15 |
|  |  | | | |  | |  | | |  |
| ***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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | To capture agreements for NR mobility enhancement into MAC specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduction of NR mobility enhancement.  This CR captures the MAC aspects of feMob and it is based on the RAN2 agreements made so far. | | | | | | | | |
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| ***Consequences if not approved:*** | | NR moiblity enhancement is missing in MAC. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.2, 4.2.2, 5.1.6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

Start of change

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

BSR Buffer Status Report

BWP Bandwidth Part

CE Control Element

CG Cell Group

CSI Channel State Information

CSI-IM CSI Intereference Measurement

CSI-RS CSI Reference Signal

CS-RNTI Configured Scheduling RNTI

DAPS Dual Active Protocol Stack

INT-RNTI Interruption RNTI

LCG Logical Channel Group

LCP Logical Channel Prioritization

MCG Master Cell Group

NUL Normal Uplink

NZP CSI-RS Non-Zero Power CSI-RS

PHR Power Headroom Report

PTAG Primary Timing Advance Group

QCL Quasi-colocation

RS Reference Signal

SCG Secondary Cell Group

SFI-RNTI Slot Format Indication RNTI

SI System Information

SpCell Special Cell

SP Semi-Persistent

SP-CSI-RNTI Semi-Persistent CSI RNTI

SPS Semi-Persistent Scheduling

SR Scheduling Request

SS Synchronization Signals

SSB Synchronization Signal Block

STAG Secondary Timing Advance Group

SUL Supplementary Uplink

TAG Timing Advance Group

TCI Transmission Configuration Indicator

TPC-SRS-RNTI Transmit Power Control-Sounding Reference Symbols-RNTI

ZP CSI-RS Zero Power CSI-RS

Next change

### 4.2.2 MAC Entities

The MAC entity of the UE handles 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).

When the UE is configured with SCG, two MAC entities are configured to the UE: one for the MCG and one for the SCG.

When the UE is configured with DAPS handover, two MAC entities are used by the UE: one for the source cell (source MAC entity) and one for the target cell (target MAC entity).

The functions of the different MAC entities in the UE operate independently unless otherwise specified. The timers and parameters used in each MAC entity are configured independently unless otherwise specified. 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 unless otherwise specified.

If the MAC entity is configured with one or more SCells, there are multiple DL-SCH and there may be multiple UL-SCH as well as multiple 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.

If the MAC entity is not configured with any SCell, there is one DL-SCH, one UL-SCH, and one RACH per MAC entity.

Figure 4.2.2-1 illustrates one possible structure of the MAC entity when SCG is not configured and for each MAC entity during DAPS handover.

Editor’s Note: FFS which functions will be supported by the source and target MAC entity in DAPS HO.

Figure 4.2.2-1: MAC structure overview

Figure 4.2.2-2 illustrates one possible structure for the MAC entities when MCG and SCG are configured.



Figure 4.2.2-2: MAC structure overview with two MAC entities

Next change

### 5.1.6 Completion of the Random Access procedure

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

1> discard explicitly signalled contention-free Random Access Resources except contention-free Random Access Resources for beam failure recovery request, if any;

1> flush the HARQ buffer used for transmission of the MAC PDU in the Msg3 buffer;

1> If the Random Access Procedure towards target cell for DAPS handover is successfully completed;

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

Editor’s Note: FFS if Msg.B for 2-step RACH works the same.

End of change

Annex – RAN2 agreements

### RAN2#107 meeting:

Agreements

Reconfirm the following understanding on DAPS

1 For DAPS DL transmission/reception operation:

• The source eNB and the target eNB perform header compression, ciphering and add PDCP header separately;

• UE performs deciphering and header decompression for the DL PDCP SDUs received from the source eNB and target eNB separately; stores those PDCP SDUs in the common PDCP reception buffer and performs PDCP reordering; and then delivers the PDCP SDUs to upper layers in ascending order.

2 single UL new PUSCH data transmission as baseline and UE switches UL data transmission (new and unacknowledged PDCP SDUs) to target gNB upon reception of the first UL grant for data transmission from the target gNB after RA procedure towards the target gNB is successfully completed.

1. As described in single UL new data transmission solution: For the DL data transmission, the UE continues to provide HARQ ACK/NACK, other CSI kind of feedback, ARQ ACK/NACK to the source eNB before release of the source cell connection.

FFS whether UL HARQ retransmissions continue

FFS whether RoHC feedback is needed

4 We do not restrict UP specifications without clear reason (e.g. BSR, PHR, etc.)

Agreements

1. UE shall be able to send UL PUSCH user plane data to source eNB until the point when the message including RRC Connection Reconfiguration Complete has been successfully transmitted to target eNB.
2. Rel-15 PDCP duplication via DC (from HRLLC WID) is not supported in combination with DAPS during handover.

3 For UL transmission operation during DAPS based HO.

• UE maintains PDCP SN for UL PDCP PDUs in the common SN allocation function throughout the handover procedure;

• Performs header compression and ciphering for the UL PDCP SDUs based on the destination of the PDU (source or target eNB);

• Adds PDCP header and submits the PDCP date PDU to the lower layers associated to the destination of the PDU (source or target eNB);

• FFS on whether security and ROHC are modelled as separate functions or not.

### RAN2#107bis meeting:

**Agreements for LTE and NR**

1 UE switches the UL PDCP data transmission upon successful RACH procedure (Msg2 for CFRA or Msg4 for CBRA).

2 The UE keeps the UL HARQ (re)transmission of the source link after UL data transmission switching to the target eNB.

3 When an uplink grant indicating the HARQ new transmission is received in the source link after UL data switching, the UE is expected to perform the corresponding UL transmission accordingly.

4 During Rel-16 RUDI handover, the UE only supports two links (i.e. the source MCG link and the target MCG link).

**Agreements for LTE**

1. RACHless applicability can be discused after procedure has progressed more.

**Agreements for NR**

1. FFS if Msg.B for 2-step RACH works the same.

**Agreements for NR**

UL new data transmission switching:

13 The indication to switch the UL new data transmission and will be specified in MAC.

14 After UL new data transmission switching, data available for transmission/the PDCP data volume is indicated to the MAC entity associated to the target eNB/gNB. UE starts retransmission of packets from the earliest unacknowedged SDU of source cell.

FFS how this is done in specification.

FFS if something different is needed for LTE than NR

15 After UL new data transmission switching, the size of the PDCP control PDUs containing the ROHC feedback to the source cell is indicated to the MAC entity associated to the source eNB/gNB as data available for transmission/the PDCP data volume.

Agreements

1 RAN2 adopts DAPS HO as the feature name used in all running CRs and LSs.

**Agreements for NR**

1. We do not support TDM pattern.
2. We leave it up to network implementation how to coordinate UL scheduling.
3. For single UL transmission, we will not specify rules how UE handles which link to transmit if UL should be sent to both source and target.

### RAN2#108 meeting:

**Agreements**

1. UE establishes PDCP entity for SRBs associated to the target node upon receiving DAPS HO command. UE does not re-establish PDCP entities for source SRBs during DAPS HO.
2. Once HO command is successfully received, UE can switch the RRC protocol signaling processing towards the target cell to receive any further RRC messages.
3. The UE releases the source SRB resources, security configuration of the source cell and stops DL/UL reception/transmission with source upon receiving explicit release from target node.
4. No changes to RRM during handover due to DAPS HO. (No changes needed to running CR)
5. After receiving HO command (RRCConnectionReconfiguration with mobility control info) from source cell, UE stops system information updates, short messages (for NR), paging, ETWS, CMAS reception for the source cell.
6. The UE re-starts system information updates, paging, short messages (for NR), ETWS, CMAS in source cell once resuming the connection to source successfully when target cell is failed.