**3GPP TSG-****RAN2 Meeting #110 electronic R2-2006338**

**1st – 12th June, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **37.340** | **CR** | **0209** | **rev** | **-** | **Current version:** | **16.1.0** |  |
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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:*** | Support of asynchronous NR-DC | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | ZTE Corporation (Rapporteur), Ericsson, LG Electronics Inc., vivo | | | | | | | | | |
| ***Source to TSG:*** | RAN2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | LTE\_NR\_DC\_CA\_enh-Core | | | | |  | ***Date:*** | | | 2020-06-11 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***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:*** | | 1. The current specification indicates that NR-DC always assumes slot-level synchronization between PCell and PSCell. However Rel-16 also supports asynchronous NR-DC. 2. Capture the following RAN2 agreements at RAN2#109bis-e meeting:  * Inter-RAT handover during the fast MCG link recovery procedure is supported * During fast MCG recovery, it is up to network implementation to guarantee that the RRC-related messages are delivered to the UE by the SN before the release of its control plane resources * All handover scenarios according to Table B-1 of TS 37.340 that have a DC option in the column “from” are supported in fast MCG recovery | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. It is clarified that NR-DC may require synchronization between PCell and PSCell or not depending on the UE's capabilities.  * Inclusion of *MobilityFromNRCommand* and *MobilityFromEUTRACommand* messages in sections 7.5 and 7.7 to support inter-RAT HO during the fast MCG link recovery procedure. * Addition of a note in section 7.7 to clarify that it is up to network implementation to guarantee that the RRC-related messages are delivered to the UE by the SN before the release of its control plane resources * Addition of a note in Annex B to clarify that all handover scenarios according to Table B-1 of TS 37.340 that have a DC option in the column “from” are supported in fast MCG failure recovery | | | | | | | | |
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| ***Consequences if not approved:*** | | 1. The specification remains incorrect regarding the support of asynchronous NR-DC. 2. HO is not supported upon fast MCG link failure recovery including Intra-RAT HO and some inter-RAT HO cases | | | | | | | | |
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| ***Clauses affected:*** | | 5, 7.5, 7.7, Annex B | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 CHANGES

# 5 Layer 1 related aspects

In MR-DC, two or more Component Carriers (CCs) may be aggregated over two cell groups. A UE may simultaneously receive or transmit on multiple CCs depending on its capabilities. The maximum number of configured CCs for a UE is 32 for DL and UL. Depending on UE's capabilities, up to 31 CCs can be configured for an E-UTRA cell group when the NR cell group is configured. For the NR cell group, the maximum number of configured CCs for a UE is 16 for DL and 16 for UL.

A gNB may configure the same Physical Cell ID (PCI) to more than one NR cell it serves. To avoid PCI confusion for MR-DC, NR PCIs should be allocated in a way that an NR cell is uniquely identifiable by a PCell identifier. This PCell is in the coverage area of an NR cell included in the MR-DC operation. In addition, NR PCIs should only be re-used in NR cells on the same SSB frequency sufficiently distant from each other. X2-C/Xn-C signalling supports disambiguation of NR PCIs by including the CGI of the PCell in respective X2AP/XnAP messages (e.g. SGNB ADDITION REQUEST/S-NODE ADDITION REQUEST) and by providing neighbour cell relationship via non-UE associated signaling (e.g. via the Xn Setup procedure or the NG-RAN node Configuration Update procedure).

NR-DC supports the case of no synchronization between PCell and PSCell. However, some UEs may support NR-DC only if slot-level synchronization between PCell and PSCell is ensured.

NEXT CHANGES

## 7.5 SRB3

SRB3 is supported in EN-DC, NGEN-DC and NR-DC, but not in NE-DC.

The decision to establish SRB3 is taken by the SN, which provides the SRB3 configuration using an SN RRC message. SRB3 establishment and release can be done at Secondary Node Addition and Secondary Node Change. SRB3 reconfiguration can be done at Secondary Node Modification procedure.

SRB3 may be used to send *SN RRC Reconfiguration*, *SN RRC Reconfiguration Complete*, *SN Measurement Report*, and *SN Failure Information* messages (i.e., in case of failure for an SCG RLC bearer), only in procedures where the MN is not involved. *SN RRC Reconfiguration Complete* messages are mapped to the same SRB as the message initiating the procedure. *SN Measurement Report* messages are mapped to SRB3, if configured, regardless of whether the configuration is received directly from the SN or via the MN. No MN RRC messages are mapped to SRB3.

If split SRB1 is not configured, SRB3 may be used by the UE to transmit to the MN an encapsulated *MCG Failure Information* message in the *ULInformationTransferMRDC* message and receive in response an encapsulated *RRC reconfiguration* message, *MobilityFromNRCommand* message, *MobilityFromEUTRACommand* messageor *RRC release* message in the *DLInformationTransferMRDC* message.

SRB3 is modelled as one of the SRBs defined in TS 38.331 [4] and uses the NR-DCCH logical channel type. RRC PDUs on SRB3 are ciphered and integrity protected using NR PDCP, with security keys derived from S-KgNB. The SN selects ciphering and integrity protection algorithms for the SRB3 and provides them to the MN within the SCG Configuration for transmission to the UE.

NOTE: A NR SCG RRC message sent via E-UTRA MCG SRB is protected by E-UTRA MCG SRB security (NR security is not used in this case).

SRB3 is of higher scheduling priority than all DRBs. The default scheduling priorities of split SRB1 and SRB3 are the same.

There is no requirement on the UE to perform any reordering of RRC messages between SRB1 and SRB3.

When SCG is released, SRB3 is released.

NEXT CHANGES

## 7.7 SCG/MCG failure handling

RLF is declared separately for the MCG and for the SCG.

If radio link failure is detected for MCG, and fast MCG link recovery is configured, the UE triggers fast MCG link recovery. Otherwise, the UE initiates the RRC connection re-establishment procedure.

During fast MCG link recovery, the UE suspends MCG transmissions for all radio bearers and reports the failure with *MCG Failure Information* message to the MN via the SCG, using the SCG leg of split SRB1 or SRB3.

The UE includes in the *MCG Failure Information* message the measurement results available according to current measurement configuration of both the MN and the SN. Once the fast MCG link recovery is triggered, the UE maintains the current measurement configurations from both the MN and the SN, and continues measurements based on configuration from the MN and the SN, if possible. The UE initiates the RRC connection re-establishment procedure if it does not receive an *RRC reconfiguration* message, *MobilityFromNRCommand* message, *MobilityFromEUTRACommand* message or *RRC release* message within a certain time after fast MCG link recovery was initiated.

Upon reception of the MCG Failure Indication, the MN can send *RRC reconfiguration* message, *MobilityFromNRCommand* message, *MobilityFromEUTRACommand* messageor *RRC release* message to the UE, using the SCG leg of split SRB1 or SRB3. Upon receiving an *RRC reconfiguration* message, *MobilityFromNRCommand* message or *MobilityFromEUTRACommand* message, the UE resumes MCG transmissions for all radio bearers. Upon receiving an *RRC release* message, the UE releases all the radio bearers and configurations.

NOTE1: It is up to network implementation to guarantee that the RRC-related messages are delivered to the UE by the SN before the release of its control plane resources.

The following SCG failure cases are supported:

- SCG RLF;

- SN change failure;

- For EN-DC, NGEN-DC and NR-DC, SCG configuration failure (only for messages on SRB3);

- For EN-DC, NGEN-DC and NR-DC, SCG RRC integrity check failure (on SRB3);

- For EN-DC, NGEN-DC and NR-DC, consistent UL LBT failure on PSCell.

Upon SCG failure, if MCG transmissions of radio bearers are not suspended, the UE suspends SCG transmissions for all radio bearers and reports the SCG Failure Information to the MN, instead of triggering re-establishment. If SCG failure is detected while MCG transmissions for all radio bearers are suspended, the UE initiates the RRC connection re-establishment procedure.

In all SCG failure cases, the UE maintains the current measurement configurations from both the MN and the SN and the UE continues measurements based on configuration from the MN and the SN if possible. The SN measurements configured to be routed via the MN will continue to be reported after the SCG failure.

NOTE: UE may not continue measurements based on configuration from the SN after SCG failure in certain cases (e.g. UE cannot maintain the timing of PSCell).

The UE includes in the *SCG Failure Information* message the measurement results available according to current measurement configuration of both the MN and the SN. The MN handles the *SCG Failure Information* message and may decide to keep, change, or release the SN/SCG. In all the cases, the measurement results according to the SN configuration and the SCG failure type may be forwarded to the old SN and/or to the new SN.

NEXT CHANGES

Annex B (informative):  
Supported MR-DC Handover Scenarios

Table B-1 summarizes the supported handover scenarios involving MR-DC configurations.

**Table B-1: Supported MR-DC handover scenarios.**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **To (column)  HO from (row)** | **E-UTRA with EPC** | **E-UTRA with 5GC** | **NR** | **GERAN or UTRAN** | **EN-DC** | **NGEN-DC** | **NE-DC** | **NR-DC** |
| **E-UTRA with EPC** | YES | YES | YES | YES | YES | NO | NO | NO |
| **E-UTRA with 5GC** | YES | YES | YES | NO | NO | YES | NO | NO |
| **NR** | YES | YES | YES | NOTE | YES | NO | YES | YES |
| **GERAN or UTRAN** | YES | NO | NO | YES | NO | NO | NO | NO |
| **EN-DC** | YES | YES | YES | YES | YES | NO | NO | NO |
| **NGEN-DC** | YES | YES | YES | NO | NO | YES | NO | NO |
| **NE-DC** | YES | YES | YES | NOTE | NO | NO | YES | NO |
| **NR-DC** | YES | YES | YES | NOTE | NO | NO | NO | YES |

NOTE1: Only SRVCC handover of IMS voice bearer to UTRAN is supported.

NOTE2: All handover scenarios according to Table B-1 that have a DC option in the column “from” are supported during fast MCG failure recovery.

END OF CHANGES