**3GPP TSG-RAN2 Meeting #110 electronic *R2-200xxxx***

**Electronic, 01 - 12 June 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **37.340** | **CR** | **-** | **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:*** | Introduction of Conditional PSCell Change for intra-SN without MN involvement | | | | | | | | | |
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| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_enh-Core | | | | |  | ***Date:*** | | | 2020-05-06 |
|  |  | | | |  | |  | | |  |
| ***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 conditional NR PSCell change for intra-SN without MN involvement.  **Agreements**   1. We will prioritize work in SN-initiated PSCell change for conditional PSCell change. 2. Maintain Rel-15 principle that only one PScell is active at a time even with conditional PScell change.   2 For conditional PScell change, A3/A5 execution condition should be supported.  3 For conditional SN change, the source SN configuration can be used as the reference in generation of delta signalling for the candidate SNs.  RAN2#108  **Agreements**  1. CPAC is defined as the UE having network configuration for initiating access to a candidate PSCell, to consider the PSCell as suitable for SN change, based on configured condition(s).  2. Usage of CPAC is decided by the network. The UE evaluates when the condition is valid.  3. Support configuration of one or more candidate cells for CPAC;  4. Allow having multiple triggering conditions (using “and”) for CPAC execution of a single candidate cell. Only single RS type per CPAC candidate is supported. At most two triggering quantities (e.g. RSRP and RSRQ, RSRP and SINR, etc.) can be configured simultaneously.  5. Define an execution condition for conditional PSCell change by the measurement identity which identifies a measurement configuration  6. Cell level quality is used as baseline for Conditional NR PSCell change execution condition;  g. Only single RS type (SSB or CSI-RS) per candidate PSCell is supported for PSCell change.  h. At most two triggering quantities (e.g. RSRP and RSRQ, RSRP and SINR, etc.) can be configured simultaneously.  i. TTT is supported for CPAC execution condition (as per legacy configuration)  7. No additional optimizations with multi-beam operation are introduced to improve RACH performance for conditional PSCell change completion with multi-beam operation.  8. For FR1 and FR2, leave it up to UE implementation to select the candidate PSCell if more than one candidate cell meets the triggering condition. UE may consider beam information in this.  9. UE is not required to continue evaluating the triggering condition of other candidate PSCell(s) during conditional SN execution.  10 Both the execution condition and the configuration for the candidate PSCell (as a container) can be included in the RRCReconfiguration message generated by the SN for intra-SN conditional PSCell change initiated by the SN (without MN involvement).  11 SRB1 can be used in all cases. SRB3 may be used to transmit conditional PScell change configuration to the UE for intra-SN change without MN involvement.  12 limit to intra-SN change without MN involvement (i.e. no MN reconfiguration or decision needed but SRB1 can be used) in Rel-16.  RAN2#109  **Agreements (3.3.2020)**  1) Similar to CHO, the following applies to CPC-intra-SN configuration  - Reuse the RRCReconfiguration/RRCConnectionReconfiguration procedure to signal CPC-intra-SN configuration to UE.  - The MN is not allowed to alter any content of the configuration from the SN which is carried in an RRC container.  - Multiple candidate PSCells can be sent in either one or multiple RRC messages.  - Use add/mod list + release list to configure multiple candidate PSCells.  - CPC-intra-SN execution condition and/or candidate PSCell configuration can be updated by the SN (i.e. by modifying the existing CPC-intra-SN configuration).  2) Once the CPC-intra-SN procedure is executed successfully, the UE releases all CPC-intra-SN configurations stored on the UE side.  3) Upon the successful completion of conventional PSCell change procedure, the UE releases all CPC-intra –SN configurations.  4) The SCG failure information procedure can be used for CPC-intra-SN procedure failure (due to RLF, T304-like timer expiry or compliance check failure).  6) If SRB3 is not configured, the UE first informs the MN that the message has been received. Then the UE needs to provide the CPC complete message to the SN via the MN upon CPC execution.  7) CPC reuses the IE defined for CHO. The field name of the IE could be changed to reflect that the IE is used for both CHO and CPC.  **Agreements (3.3.2020)**  S1\_1: While executing CPC procedure, the UE continues to receive RRC reconfiguration from the MN. However, the UE should finalise the ongoing CPC execution before processing the RRC message received from the MN (same as in the conventional PSCell change). i.e. legacy behaviour and no specific UE requirement.  S1\_2: As in legacy PSCell change, the UE sends RRCReconfigurationComplete to the MN at execution of CPC when no SRB3 is configured and the MN informs the SN. i.e the complete message to MN includes an embedded complete message to the SN.  S1\_3: The UE sends RRCReconfigurationComplete to the MN at configuration of CPC when no SRB3 is configured and the MN informs the SN. i.e. the complete message to the MN includes an embedded complete message to the SN.  S1\_4. Upon RLF on PCell during the execution of Conditional PSCell change for intra-SN change without MN involvement, the UE supports the Rel-16 MR-DC procedures, i.e. performs connection re-establishment procedure without any fast MCG link recovery.  S1\_5: Support of CHO and CPC-intra-SN configuration simultaneously is not considered in Rel-16. Leave it up to the network solution to ensure there is no simultaneous CHO and CPC configuration.  S2\_6: Reconfirm the use of SCG failure information upon declaring SCG failure in the procedure of the conditional PSCell change.  S2\_7. When the conditional PSCell configuration received over SRB3 is invalid, UE initiates SCG failure information procedure to report to the MN about the SN change failure due to invalid configuration (legacy procedure).  S2\_9. Like CHO, UE shall follow the below procedures for handling the T310 and T304 timers during conditional PSCell addition/change procedure for EN-DC, NGEN-DC, NR-DC cases:  • UE shall not stop MN T310 or SN T310 and shall not start T304 when it receives configuration of a CPC-intra-SN  • The timer T310 (SN only in case of SN Change) is stopped and timer T304-like is started when the UE begins execution of a CPC-intra-SN.  S3\_11. UE checks the validity of conditional PSCell change execution criteria configuration immediately on receiving the conditional PSCell change RRC Reconfiguration message, either embedded in the MN RRC message over SRB1 or received over SRB3 (same as CHO).  S3\_12. Introduce no specification changes regarding compliance checking of embedded Reconfiguration message containing configuration of conditional PSCell candidate (same as for CHO).  S2\_8. If UE cannot comply with the embedded PSCell configuration for intra-SN Change, UE performs connection re-establishment procedure or actions upon going to RRC\_IDLE (legacy procedure).  RAN2 #109bis  **Agreements**  1 The UE does not inform the MN when CPC execution condition is fulfilled and the UE starts executing CPC, when CPC configuration is provided over SRB3.  2 A threshold parameter is not introduced to determine PCell quality for execution of CPC.  3 Upon transmission of SCG failure information to the network, the UE stops evaluating the CPC execution criteria according to the current CPC configuration until a response is received from the network.  4 Whether the UE continue measurements for candidate PSCells configured for execution condition upon CPC failure is left to the UE implementation.  5 The content of FailureReportSCG for CPC procedure failure should include failureType, measResultFreqList and measuResultSCG-Failure. These parameters are set according to the exiting SCGFailureInformation procedure. (same as legacy)  7 Use ULInformationTransferMRDC instead of RRCReconfigurationComplete message to inform the network of CPC execution when no SRB3 is configured and the MN informs the SN, i.e. ULInformationTransferMRDC message to MN includes an embedded RRCReconfigurationComplete message to the SN. This applies to both NR MN and LTE MN. (change of previous agreement).  **Agreements**  1 If CPC configuration is not released by network, the UE autonomously releases the stored CPC configuration upon the SCG release.  2 measID and reportConfig associated with CPC config, and measObject(s) only associated to CPC shall be autonomously removed by UE when SCG is released.  4 Support of CPC configuration (CPC condition + CPC reconfiguration) in legacy HO command or CPC configuration in CPC configuration should not be considered in Rel-16. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | To capture the conditional PSCell change agreements.  **Impact analysis**  Impacted architecture options:  Impacted 5G architecture:NR-DC, (NG)EN-DC  Impacted functionality:  Conditional PSCell change for intra-SN without MN involvement  Inter-operability:  If the Network is implemented according to the CR and the UE is not, the UE will not support the conditional PSCell cahnge for intra-SN without MN invovlement.  If the UE is implemented according to the CR and the Network is not, the NW will not support the conditional PSCell change for intra-SN without MN involvement. | | | | | | | | |
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| ***Consequences if not approved:*** | | Not support the conditional PSCell change for intra-SN without MN involvement | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.1 3.2 10.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1] and TS 36.300 [2].

**Child node**: IAB-node-DU's next hop neighbour node; the child node is also an IAB-node.

**Conditional PSCell Change:** a PSCell change procedure that is executed only when PSCell execution condition(s) are met.

**En-gNB:** node providing NR user plane and control plane protocol terminations towards the UE, and acting as Secondary Node in EN-DC.

**Fast MCG link recovery:** in MR-DC, an RRC procedure where the UE sends an MCG Failure Information message to the MN via the SCG upon the detection of a radio link failure on the MCG.

**IAB-donor:** gNB that provides network access to UEs via a network of backhaul and access links.

**IAB-MT:** IAB-node function that terminates the Uu interface to the parent node using the procedures and behaviours specified for UEs unless stated otherwise.

**IAB-node:** RAN node that supports NR access links to UEs and NR backhaul links to parent nodes and child nodes. The IAB-node does not support backhauling via E-UTRA.

**Master Cell Group**: in MR-DC, a group of serving cells associated with the Master Node, comprising of the SpCell (PCell) and optionally one or more SCells.

**Master node**: in MR-DC, the radio access node that provides the control plane connection to the core network. It may be a Master eNB (in EN-DC), a Master ng-eNB (in NGEN-DC) or a Master gNB (in NR-DC and NE-DC).

**MCG bearer**: in MR-DC, a radio bearer with an RLC bearer (or two RLC bearers, in case of CA packet duplication) only in the MCG.

**MN terminated bearer:** in MR-DC, a radio bearer for which PDCP is located in the MN.

**MCG SRB**: in MR-DC, a direct SRB between the MN and the UE.

**Multi-Radio Dual Connectivity:** Dual Connectivity between E-UTRA and NR nodes, or between two NR nodes.

**Ng-eNB**: as defined in TS 38.300 [3].

**NR sidelink communication**: AS functionality enabling at least V2X Communication as defined in TS 23.287 [18], between two or more nearby UEs, using NR technology but not traversing any network node.

**Parent node:** IAB-node-MT's next hop neighbour node; the parent node can be IAB-node or IAB-donor-DU.

**PCell**: SpCell of a master cell group.

**PSCell**: SpCell of a secondary cell group.

**RLC bearer:** RLC and MAC logical channel configuration of a radio bearer in one cell group.

**Secondary Cell Group**: in MR-DC, a group of serving cells associated with the Secondary Node, comprising of the SpCell (PSCell) and optionally one or more SCells.

**Secondary node**: in MR-DC, the radio access node, with no control plane connection to the core network, providing additional resources to the UE. It may be an en-gNB (in EN-DC), a Secondary ng-eNB (in NE-DC) or a Secondary gNB (in NR-DC and NGEN-DC).

**SCG bearer**: in MR-DC, a radio bearer with an RLC bearer (or two RLC bearers, in case of CA packet duplication) only in the SCG.

**SN terminated bearer:** in MR-DC, a radio bearer for which PDCP is located in the SN.

**SpCell**: primary cell of a master or secondary cell group.

**SRB3**: in EN-DC, NGEN-DC and NR-DC, a direct SRB between the SN and the UE.

**Split bearer:** in MR-DC, a radio bearer with RLC bearers both in MCG and SCG.

**Split PDU Session (or PDU Session split):** a PDU Session whose QoS Flows are served by more than one SDAP entities in the NG-RAN.

**Split SRB**: in MR-DC, a SRB between the MN and the UE with RLC bearers both in MCG and SCG.

**User plane resource configuration:** in MR-DC with 5GC, encompasses radio network resources and radio access resources related to either one or more PDU sessions, one or more QoS flows, one or more DRBs, or any combination thereof.

**V2X sidelink communication**: AS functionality enabling V2X Communication as defined in TS 23.285 [19], between nearby UEs, using E-UTRA technology but not traversing any network node.

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] and TS 36.300 [2].

CPC Conditional PSCell Change

CLI Cross Link Interference

DC Intra-E-UTRA Dual Connectivity

DCP DCI with CRC scrambled by PS-RNTI

EN-DC E-UTRA-NR Dual Connectivity

IAB Integrated Access and Backhaul

MCG Master Cell Group

MN Master Node

MR-DC Multi-Radio Dual Connectivity

NE-DC NR-E-UTRA Dual Connectivity

NGEN-DC NG-RAN E-UTRA-NR Dual Connectivity

NR-DC NR-NR Dual Connectivity

SCG Secondary Cell Group

SMTC SS/PBCH block Measurement Timing Configuration

SN Secondary Node

V2X Vehicle-to-Everything

*NEXT CHANGE*

## 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 the execution of CPC, if radio link failure is detected for MCG, 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 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 or *RRC release* message to the UE, using the SCG leg of split SRB1 or SRB3. Upon receiving an *RRC reconfiguration* 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.

The following SCG failure cases are supported:

- SCG RLF;

- SN change failure;

- For EN-DC, NGEN-DC and NR-DC, SCG configuration failure or CPC 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;

- CPC execution failure;

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

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.

In case of CPC, upon transmission of the *SCG Failure Information* message to the MN, the UE stops evaluating the CPC execution condition ~~configuration~~. The UE is not required to continue measurements for candidate PSCell(s) for execution condition upon transmission of the SCG Failure Information message to the MN.

*NEXT CHANGE*

10.1 General

Similar procedures as defined under clause 10.1.2.8 (Dual Connectivity operation) in TS 36.300 [2] apply for MR-DC.

*NEXT CHANGE*

10.3 Secondary Node Modification (MN/SN initiated)

10.3.1 EN-DC

The Secondary Node Modification procedure may be initiated either by the MN or by the SN and be used to modify, establish or release bearer contexts, to transfer bearer contexts to and from the SN or to modify other properties of the UE context within the same SN. It may also be used to transfer an NR RRC message from the SN to the UE via the MN and the response from the UE via MN to the SN (e.g. when SRB3 is not used). In case of CPC, this procedure is used to configure or modify CPC configuration within the same SN.The Secondary Node modification procedure does not necessarily need to involve signalling towards the UE.

**MN initiated SN Modification**

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**Figure 10.3.1-1: SN Modification procedure - MN initiated**

The MN uses the procedure to initiate configuration changes of the SCG within the same SN, e.g. the addition, modification or release of SCG bearer(s) and the SCG RLC bearer of split bearer(s), as well as configuration changes for SN terminated MCG bearers. Bearer termination point change is realized by adding the new bearer configuration and releasing the old bearer configuration within a single MN initiated SN Modification procedure for the respective E-RAB. The MN uses this procedure to perform handover within the same MN while keeping the SN. The MN also uses the procedure to query the current SCG configuration, e.g. when delta configuration is applied in an MN initiated SN change. The MN also uses the procedure to provide the S-RLF related information to the SN. The MN may not use the procedure to initiate the addition, modification or release of SCG SCells. The SN may reject the request, except if it concerns the release of SN terminated bearer(s) or the SCG RLC bearer of MN terminated bearer(s), or if it is used to perform handover within the same MN while keeping the SN. Figure 10.3.1-1 shows an example signalling flow for an MN initiated SN Modification procedure.

1. The MN sends the *SgNB Modification Request* message, which may contain bearer context related or other UE context related information, data forwarding address information (if applicable) and the requested SCG configuration information, including the UE capability coordination result to be used as basis for the reconfiguration by the SN. In case a security key update in the SN is required, a new *SgNB Security Key* is included. In case of SCG RLC re-establishment for E-RABs configured with an MN terminated bearer with an SCG RLC bearer for which no bearer type change is performed, the MN provides a new UL GTP tunnel endpoint to the SN. The SN shall continue sending UL PDCP PDUs to the MN with the previous UL GTP tunnel endpoint until it re-establishes the RLC and use the new UL GTP tunnel endpoint after re-establishment. In case of PDCP re-establishment for E-RABs configured with an SN terminated bearer with an MCG RLC bearer for which no bearer type change is performed, the MN provides a new DL GTP tunnel endpoint to the SN. The SN shall continue sending DL PDCP PDUs to the MN with the previous DL GTP tunnel endpoint until it performs PDCP re-establishment and use the new DL GTP tunnel endpoint starting with the PDCP re-establishment.

2. The SN responds with the *SgNB Modification Request Acknowledge* message, which may contain SCG radio resource configuration information within a NR RRC configuration message and data forwarding address information (if applicable). In case of a security key update (with or without PSCell change), for E-RABs configured with the MN terminated bearer option that require X2-U resources between the MN and the SN, for which no bearer type change is performed, the SN provides a new DL GTP tunnel endpoint to the MN. The MN shall continue sending DL PDCP PDUs to the SN with the previous DL GTP tunnel endpoint until it performs PDCP re-establishment or PDCP data recovery, and use the new DL GTP tunnel endpoint starting with the PDCP re-establishment or data recovery. In case of a security key update (with or without PSCell change), for E-RABs configured with the SN terminated bearer option that require X2-U resources between the MN and the SN, for which no bearer type change is performed, the SN provides a new UL GTP tunnel endpoint to the MN. The MN shall continue sending UL PDCP PDUs to the SN with the previous UL GTP tunnel endpoint until it re-establishes the RLC and use the new UL GTP tunnel endpoint after re-establishment.

3-5. The MN initiates the RRC connection reconfiguration procedure, including the NR RRC configuration message. The UE applies the new configuration, synchronizes to the MN (if instructed, in case of intra-MN handover) and replies with *RRCConnectionReconfigurationComplete*, including a NR RRC response message, if needed. In case the UE is unable to comply with (part of) the configuration included in the *RRCConnectionReconfiguration* message, it performs the reconfiguration failure procedure.

6. Upon successful completion of the reconfiguration, the success of the procedure is indicated in the *SgNB Reconfiguration Complete* message.

7. If instructed, the UE performs synchronisation towards the PSCell of the SN as described in SgNB addition procedure. Otherwise, the UE may perform UL transmission after having applied the new configuration.

8. If PDCP termination point is changed for bearers using RLC AM, and when RRC full configuration is not used, the SN Status Transfer takes place between the MN and the SN (Figure 10.3.1-1 depicts the case where a bearer context is transferred from the MN to the SN).

NOTE 0: The SN may not be aware that a SN terminated bearer requested to be released is reconfigured to a MN terminated bearer. The SN Status for the released SN terminated bearers with RLC AM may also be transferred to the MN.

9. If applicable, data forwarding between MN and the SN takes place (Figure 10.3.1-1 depicts the case where a bearer context is transferred from the MN to the SN).

10. The SN sends the *Secondary RAT Data Usage Report* message to the MN and includes the data volumes delivered to and received from the UE over the NR radio for the E-RABs to be released and for the E-RABs for which the S1 UL GTP Tunnel endpoint was requested to be modified.

NOTE 1: The order the SN sends the *Secondary RAT Data Usage Report* message and performs data forwarding with MN is not defined. The SN may send the report when the transmission of the related bearer is stopped.

11. If applicable, a path update is performed.

**SN initiated SN Modification with MN involvement**

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**Figure 10.3.1-2: SN Modification procedure - SN initiated with MN involvement**

The SN uses the procedure to perform configuration changes of the SCG within the same SN, e.g. to trigger the release of SCG bearer(s) and the SCG RLC bearer of split bearer(s) (upon which the MN may release the bearer or maintain current bearer type or reconfigure it to an MCG bearer, either MN terminated or SN terminated), and to trigger PSCell change (e.g. when a new security key is required or when the MN needs to perform PDCP data recovery). The MN cannot reject the release request of SCG bearer and the SCG RLC bearer of a split bearer. Figure 10.3.1-2 shows an example signalling flow for an SN initiated SgNB Modification procedure, with MN involvement.

1. The SN sends the *SgNB Modification Required* message including a NR RRC configuration message, which may contain bearer context related, other UE context related information and the new SCG radio resource configuration. For bearer release or modification, a corresponding E-RAB list is included in the *SgNB Modification Required* message. In case of change of security key, the *PDCP Change* *Indication* indicates that a S-KgNB update is required. In case the MN needs to perform PDCP data recovery, the *PDCP Change* *Indication* indicates that PDCP data recovery is required.

The SN can decide whether the change of security key is required.

2/3. The MN initiated SN Modification procedure may be triggered by the *SN Modification Required* message (e.g. to provide information such as data forwarding addresses, new SN security key, measurement gap, etc...)

NOTE 2: If only SN security key is provided in step 2, the MN does not need to wait for the reception of step 3 to initiate the RRC connection reconfiguration procedure.

4. The MN sends the *RRCConnectionReconfiguration* message including a NR RRC configuration messageto the UE including the new SCG radio resource configuration.

5. The UE applies the new configuration and sends the *RRCConnectionReconfigurationComplete* message, including an encoded NR RRC response message, if needed. In case the UE is unable to comply with (part of) the configuration included in the *RRCConnectionReconfiguration* message, it performs the reconfiguration failure procedure.

6. Upon successful completion of the reconfiguration, the success of the procedure is indicated in the *SgNB Modification Confirm* message containing the encoded NR RRC response message, if received from the UE.

7. If instructed, the UE performs synchronisation towards the PSCell of the SN as described in SN addition procedure. Otherwise, the UE may perform UL transmission after having applied the new configuration.

8. If PDCP termination point is changed for bearers using RLC AM, and when RRC full configuration is not used, the SN Status Transfer takes place between the MN and the SN (Figure 10.3.1-2 depicts the case where a bearer context is transferred from the SN to the MN).

NOTE 2a: The SN may not be aware that a SN terminated bearer requesting to release is reconfigured to a MN terminated bearer. The SN Status for the released SN terminated bearers with RLC AM may also be transferred to the MN.

9. If applicable, data forwarding between MN and the SN takes place (Figure 10.3.1-2 depicts the case where a bearer context is transferred from the SN to the MN).

10. The SN sends the *Secondary RAT Data Usage Report* message to the MN and includes the data volumes delivered to and received from the UE over the NR radio for the E-RABs to be released.

NOTE 3: The order the SN sends the *Secondary RAT Data Usage Report* message and performs data forwarding with MN is not defined. The SN may send the report when the transmission of the related bearer is stopped.

11. If applicable, a path update is performed.

**SN initiated SN Modification without MN involvement**

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**Figure 10.3.1-3: SN modification - SN initiated without MN involvement**

The SN initiated modification without MN involved procedure is used to modify the configuration within SN in case no coordination with MN is required, including the addition/modification/release of SCG SCell and PSCell change (e.g. when the security key does not need to be changed and the MN does not need to be involved in PDCP recovery). The SN may initiate the procedure to configure or modify CPC configuration within the same SN. Figure 10.3.1-3 shows an example signalling flow for SN initiated SN modification procedure, without MN involvement. The SN can decide whether the Random Access procedure is required.

1. The SN sends the *RRCReconfiguration* message to the UE through SRB3. The UE applies the new configuration. In case the UE is unable to comply with (part of) the configuration included in the *RRCReconfiguration* message, it performs the reconfiguration failure procedure.

2. If instructed, the UE performs synchronisation towards the PSCell of the SN.

3. The UE replies with the *RRCReconfigurationComplete* message.

3a. In case of CPC, the UE maintains connection with source PSCell after receiving CPC configuration, and starts evaluating the CPC execution conditions for candidate PSCell(s). If at least one CPC candidate PSCell satisfies the corresponding CPC execution condition, the UE detaches from the source PSCell, applies the stored corresponding configuration for the selected candidate PSCell and synchronises to that candidate PSCell. The UE completes the CPC execution procedure by sending an *RRCReconfigurationComplete* message to the new PSCell if the SRB3 is configured.

**Transfer of an NR RRC message to/from the UE (when SRB3 is not used)**

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**Figure 10.3.1-4: Transfer of an NR RRC message to/from the UE**

The SN initiates the procedure when it needs to transfer an NR RRC message to the UE and SRB3 is not used.

1. The SN initiates the procedure by sending the SgNB Modification Required to the MN.

2. The MN forwards the NR RRC message to the UE in the *RRCConnectionReconfiguration* message.

3. The UE applies the new configuration and replies with the *RRCConnectionReconfigurationComplete* message.

3a. If CPC is configured in the *RRCConnectionReconfiguration,* the UE maintains the connection with source PSCell after receiving the CPC configuration, and starts evaluating the CPC execution conditions for candidate PSCell(s). If at least one CPC candidate PSCell satisfies the corresponding CPC execution condition, the UE detaches from the source PSCell, applies the stored corresponding configuration for the selected candidate PSCell and synchronises to that candidate PSCell. The UE completes the CPC execution procedure by sending, to the MN, a *ULInformationTransferMRDC* message which includes an embedded *RRCReconfigurationComplete* message to the new PSCell.

4. The MN forwards the NR RRC response message, if received from the UE, to the SN in the *SgNB Modification Confirm* message.

5. If instructed, the UE performs synchronisation towards the PSCell of the SN as described in SgNB Addition procedure. Otherwise the UE may perform UL transmission after having applied the new configuration.

10.3.2 MR-DC with 5GC

The SN Modification procedure may be initiated either by the MN or by the SN and be used to modify the current user plane resource configuration (e.g. related to PDU session, QoS flow or DRB) or to modify other properties of the UE context within the same SN. It may also be used to transfer an RRC message from the SN to the UE via the MN and the response from the UE via MN to the SN (e.g. when SRB3 is not used). In NGEN-DC and NR-DC, the RRC message is an NR message (i.e., *RRCReconfiguration*) whereas in NE-DC it is an E-UTRA message (i.e., *RRCConnectionReconfiguration*). In case of CPC, this procedure is used to configure or modify CPC configuration within the same SN. The CPC configuration cannot be used to configure target PSCell in NE-DC.

The SN modification procedure does not necessarily need to involve signalling towards the UE.

**MN initiated SN Modification**

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**Figure 10.3.2-1: SN Modification procedure - MN initiated**

The MN uses the procedure to initiate configuration changes of the SCG within the same SN, including addition, modification or release of the user plane resource configuration. The MN uses this procedure to perform handover within the same MN while keeping the SN, when the SN needs to be involved (i.e. in NGEN-DC). The MN also uses the procedure to query the current SCG configuration, e.g. when delta configuration is applied in an MN initiated SN change. The MN also uses the procedure to provide the S-RLF related information to the SN or to provide additional available DRB IDs to be used for SN terminated bearers. The MN may not use the procedure to initiate the addition, modification or release of SCG SCells. The SN may reject the request, except if it concerns the release of the user plane resource configuration, or if it is used to perform handover within the same MN while keeping the SN. Figure 10.3.2-1 shows an example signalling flow for an MN initiated SN Modification procedure.

1. The MN sends the *SN Modification Request* message, which may contain user plane resource configuration related or other UE context related information, PDU session level Network Slice info and the requested SCG configuration information, including the UE capabilities coordination result to be used as basis for the reconfiguration by the SN. In case a security key update in the SN is required, a new *SN Security Key* is included.

2. The SN responds with the *SN Modification Request Acknowledge* message, which may contain new SCG radio configuration information within an SN RRC reconfiguration message*,* and data forwarding address information (if applicable).

NOTE 1: For MN terminated NR SCG bearers to be setup for which PDCP duplication with CA is configured the MN allocates 2 separate Xn-U bearers

For SN terminated NR MCG bearers to be setup for which PDCP duplication with CA is configured the SN allocates 2 separate Xn-U bearers.

2a. When applicable, the MN provides data forwarding address information to the SN. For SN terminated bearers using MCG resources, the MN provides Xn-U DL TNL address information in the *Xn-U Address Indication* message.

3/4. The MN initiates the RRC reconfiguration procedure, including an *SN RRC reconfiguration* message. The UE applies the new configuration, synchronizes to the MN (if instructed, in case of intra-MN handover) and replies with *MN RRC reconfiguration complete* message,including an SN RRC response message, if needed. In case the UE is unable to comply with (part of) the configuration included in the *MN RRC reconfiguration* message, it performs the reconfiguration failure procedure.

5. Upon successful completion of the reconfiguration, the success of the procedure is indicated in the *SN Reconfiguration Complete* message.

6. If instructed, the UE performs synchronisation towards the PSCell of the SN as described in SN addition procedure. Otherwise, the UE may perform UL transmission after having applied the new configuration.

7. If PDCP termination point is changed for bearers using RLC AM, and when RRC full configuration is not used, the SN Status Transfer takes place between the MN and the SN (Figure 10.3.2-1 depicts the case where a bearer context is transferred from the MN to the SN).

8. If applicable, data forwarding between MN and the SN takes place (Figure 10.3.2-1 depicts the case where a user plane resource configuration related context is transferred from the MN to the SN).

9. The SN sends the *Secondary RAT Data Usage Report* message to the MN and includes the data volumes delivered to and received from the UE as described in clause 10.11.2.

NOTE 2: The order the SN sends the *Secondary RAT Data Usage Report* message and performs data forwarding with MN is not defined. The SN may send the report when the transmission of the related QoS flow is stopped.

10. If applicable, a PDU Session path update procedure is performed.

**SN initiated SN Modification with MN involvement**

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**Figure 10.3.2-2: SN Modification procedure - SN initiated with MN involvement**

The SN uses the procedure to perform configuration changes of the SCG within the same SN, e.g. to trigger the modification/release of the user plane resource configuration and to trigger PSCell changes (e.g. when a new security key is required or when the MN needs to perform PDCP data recovery). The MN cannot reject the release request of PDU session/QoS flows. The SN also uses the procedure to request the MN to provide more DRB IDs to be used for SN terminated bearers or to return DRB IDs used for SN terminated bearers that are not needed any longer. Figure 10.3.2-2 shows an example signalling flow for SN initiated SN Modification procedure.

1. The SN sends the *SN Modification Required* message including an SN RRC reconfiguration message, which may contain user plane resource configuration related context, other UE context related information and the new radio resource configuration of SCG. In case of change of security key, the *PDCP Change* *Indication* indicates that an SN security key update is required. In case the MN needs to perform PDCP data recovery, the *PDCP Change* *Indication* indicates that PDCP data recovery is required.

The SN can decide whether the change of security key is required.

2/3. The MN initiated SN Modification procedure may be triggered by *SN Modification Required* message, e.g. when an SN security key change needs to be applied.

NOTE 3: For SN terminated NR MCG bearers to be setup for which PDCP duplication with CA is configured the SN allocates 2 separate Xn-U bearers.

4. The MN sends the *MN RRC reconfiguration* message to the UE including the SN RRC reconfiguration message with the new SCG radio resource configuration.

5. The UE applies the new configuration and sends the *MN RRC reconfiguration complete* message, including an SN RRC response message, if needed. In case the UE is unable to comply with (part of) the configuration included in the *MN RRC reconfiguration* message, it performs the reconfiguration failure procedure.

6. Upon successful completion of the reconfiguration, the success of the procedure is indicated in the *SN Modification Confirm* message including the SN RRC response message, if received from the UE.

7. If instructed, the UE performs synchronisation towards the PSCell configured by the SN as described in SN Addition procedure. Otherwise, the UE may perform UL transmission directly after having applied the new configuration.

8. If PDCP termination point is changed for bearers using RLC AM, and when RRC full configuration is not used, the SN Status Transfer takes place between the MN and the SN (Figure 10.3.2-2 depicts the case where a bearer context is transferred from the SN to the MN).

9. If applicable, data forwarding between MN and the SN takes place (Figure 10.3.2-2 depicts the case where a user plane resource configuration related context is transferred from the SN to the MN).

10. The SN sends the *Secondary RAT Data Usage Report* message to the MN and includes the data volumes delivered to and received from the UE as described in clause 10.11.2.

NOTE 4: The order the SN sends the *Secondary RAT Data Usage Report* message and performs data forwarding with MN is not defined. The SN may send the report when the transmission of the related QoS flow is stopped.

11. If applicable, a PDU Session path update procedure is performed.

**SN initiated SN Modification without MN involvement**

This procedure is not supported for NE-DC.

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**Figure 10.3.2-3: SN Modification – SN initiated without MN involvement**

The SN initiated SN modification procedure without MN involvement is used to modify the configuration within SN in case no coordination with MN is required, including the addition/modification/release of SCG SCell and PSCell change (e.g. when the security key does not need to be changed and the MN does not need to be involved in PDCP recovery). The SN may initiate the procedure to configure or modify CPC configuration within the same SN. Figure 10.3.2-3 shows an example signalling flow for SN initiated SN modification procedure without MN involvement. The SN can decide whether the Random Access procedure is required.

1. The SN sends the *SN RRC reconfiguration* message to the UE through SRB3.

2. The UE applies the new configuration and replies with the *SN RRC reconfiguration complete* message. In case the UE is unable to comply with (part of) the configuration included in the *SN RRC reconfiguration* message, it performs the reconfiguration failure procedure.

3. If instructed, the UE performs synchronisation towards the PSCell of the SN as described in SN Addition procedure. Otherwise the UE may perform UL transmission after having applied the new configuration.

3a. In case of CPC, the UE maintains connection with source PSCell after receiving CPC configuration, and starts evaluating the CPC execution conditions for the candidate PSCell(s). If at least one CPC candidate PSCell satisfies the corresponding CPC execution condition, the UE detaches from the source PSCell, applies the stored corresponding configuration for that selected candidate PSCell and synchronises to that candidate PSCell. The UE completes the CPC execution procedure by sending an *RRCReconfigurationComplete* message to the new PSCell.

**Transfer of an NR RRC message to/from the UE (when SRB3 is not used)**

This procedure is supported for all the MR-DC options.

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**Figure 10.3.2-4: Transfer of an NR RRC message to/from the UE**

The SN initiates the procedure when it needs to transfer an NR RRC message to the UE and SRB3 is not used.

1. The SN initiates the procedure by sending the *SN Modification Required* to the MN including the SN RRC reconfiguration message.

2. The MN forwards the SN RRC reconfiguration message to the UE including it in the *RRC reconfiguration* message.

3. The UE applies the new configuration and replies with the *RRC reconfiguration complete* message by including the SN RRC reconfiguration complete message.

3a. If CPC is configured in the *RRCReconfiguration,* the UE maintains connection with source PSCell after receiving CPC configuration, and starts evaluating the CPC execution conditions for the candidate PSCell(s). If at least one CPC candidate PSCell satisfies the corresponding CPC execution condition, the UE detaches from the source PSCell, applies the stored corresponding configuration for the selected candidate PSCell and synchronises to that candidate PSCell. The UE completes the CPC execution procedure by sending, to the MN, a *ULInformationTransferMRDC* message which includes an embedded *RRCReconfigurationComplete* message to the new PSCell.

4. The MN forwards the SN RRC response message, if received from the UE, to the SN by including it in the *SN Modification Confirm* message.

5. If instructed, the UE performs synchronisation towards the PSCell of the SN as described in SN Addition procedure. Otherwise the UE may perform UL transmission after having applied the new configuration.

*NEXT CHANGE*

## 10.6 PSCell change

In MR-DC, a PSCell change does not always require a security key change.

If a security key change is required, this is performed through a synchronous SCG reconfiguration procedure towards the UE involving random access on PSCell and a security key change, during which the MAC entity configured for SCG is reset and RLC configured for SCG is re-established regardless of the bearer type(s) established on SCG. For SN terminated bearers, PDCP is re-established. In all MR-DC options, to perform this procedure within the same SN, the SN Modification procedure as described in clause 10.3 is used, setting the *PDCP Change Indication* to indicate that a S-KgNB (for EN-DC, NGEN-DC and NR-DC) or S-KeNB (for NE-DC) update is required when the procedure is initiated by the SN or including the *SgNB Security Key* / *SN Security Key* when the procedure is initiated by the MN. In all MR-DC options, to perform a PSCell change between different SN nodes, the SN Change procedure as described in clause 10.5 is used.

If a security key change is not required (only possible in EN-DC, NGEN-DC and NR-DC), this is performed through a synchronous SCG reconfiguration procedure without security key change towards the UE involving random access on PSCell, during which the MAC entity configured for SCG is reset and RLC configured for SCG is re-established regardless of the bearer type(s) established on SCG. For bearers using RLC AM mode PDCP data recovery applies, for bearers using RLC UM no action is performed in PDCP while for SRBs PDCP discards all stored SDUs and PDUs. Unless MN terminated SCG or split bearers are configured, this does not require MN involvement. In this case, if location information was requested for the UE, the SN informs the MN about the PSCell change (as part of location information) using the SN initiated SN modification procedure independently from the reconfiguration of the UE. In case of MN terminated SCG or split bearers, the SN initiated SN Modification procedure as described in clause 10.3 is used, setting the *PDCP Change Indication* to indicate that a PDCP data recovery is required.

10.6.1 Conditional PSCell Change

A Conditional PSCell Change (CPC) is defined as a PSCell change that is executed by the UE when execution condition(s) is met. The UE starts evaluating the execution condition(s) upon receiving the CPC configuration, and stops evaluating the execution condition(s) once the execution condition(s) is met. Only intra-SN CPC is supported.

The following principles apply to CPC:

- The CPC configuration contains the configuration of CPC candidate cell(s) and execution condition(s) generated by the SN.

- An execution condition may consist of one or two trigger condition(s) (CPC events A3/A5, as defined in [4]). Only single RS type is supported and at most two different trigger quantities (e.g. RSRP and RSRQ, RSRP and SINR, etc.) can be configured simultaneously for the evalution of CPC execution condition of a single candidate PSCell.

- Before any CPC execution condition is satisfied, upon reception of PSCell change command, the UE executes the PSCell change procedure as described in clause 10.3 and 10.5, regardless of any previously received CPC configuration. Upon the successful completion of PSCell change procedure, the UE releases all stored CPC configurations.

- Once the CPC procedure is executed successfully, the UE releases all stored CPC configurations.

- Upon the release of SCG, the UE releases the stored CPC configurations.

CPC configuration in HO command or CPC configuration is not supported.

*NEXT CHANGE*

## 10.10 RRC Transfer

### 10.10.1 EN-DC

The RRC Transfer procedure is used to deliver an RRC message, encapsulated in a PDCP PDU between the MN and the SN (and vice versa) so that it may be forwarded to/from the UE using split SRB. The RRC transfer procedure is also used for providing a NR measurement report, NR failure information or CPC execution completion from the UE to the SN via the MN. Additional details of the RRC transfer procedure are defined in TS 36.423 [9].

**Split SRB:**



Figure 10.10.1-1: RRC Transfer procedure for the split SRB (DL operation)

Figure 10.10.1-1 shows an example signaling flow for the DL RRC Transfer in case of the split SRB:

1. The MN, when it decides to use the split SRBs, starts the procedure by initiating the RRC Transfer procedure. The MN encapsulates the RRC message in a PDCP-C PDU and ciphers with own keys.

NOTE: The usage of the split SRBs shall be indicated in the Secondary Node Addition procedure or Modification procedure.

2. The SN forwards the RRC message to the UE.

3. The SN may send PDCP delivery acknowledgement of the RRC message forwarded in step 2.



Figure 10.10.1-2: RRC Transfer procedure for the split SRB (UL operation)

Figure 10.10.1-2 shows an example signaling flow for the UL RRC Transfer in case of the split SRB:

1. When the UE provides response to the RRC message, it sends it to the SN.

2. The SN initiates the RRC Transfer procedure, in which it transfers the received PDCP-C PDU with encapsulated RRC message.

**NR measurement report, NR failure information or CPC execution completion:**



Figure 10.10.1-3: RRC Transfer procedure for NR measurement report or NR failure information

Figure 10.10.1-3 shows an example signaling flow for RRC Transfer in case of the forwarding of the NR measurement report, NR failure information or CPC execution completion from the UE:

1. When the UE sends a measurement report,NR failure information or CPC execution completion, it sends it to the MN in a container called *ULInformationTransferMRDC* as specified in TS 36.331 [10].

2. The MN initiates the RRC Transfer procedure, in which it transfers the received NR measurement report,NR failure information or CPC execution completion as an octet string.

### 10.10.2 MR-DC with 5GC

The RRC Transfer procedure is used to exchange RRC messages, encapsulated in a PDCP PDU, between the MN and the UE via the SN (split SRB) and to provide SN measurement reports,failure information report or CPC execution completion from the UE to the SN. Additional details of the RRC transfer procedure are defined in TS 38.423 [5].

**Split SRB:**



Figure 10.10.2-1: RRC Transfer procedure for split SRB (DL operation)

Figure 10.10.2-1 shows an example signaling flow for DL RRC Transfer in case of the split SRB:

1. The MN, when it decides to use the split SRBs, starts the procedure by initiating the RRC Transfer procedure. The MN encapsulates the RRC message in a PDCP PDU and ciphers with own keys.

NOTE: The usage of the split SRBs shall be indicated in the Secondary Node Addition procedure or Modification procedure.

2. The SN forwards the RRC message to the UE.

3. The SN may send PDCP delivery acknowledgement of the RRC message forwarded in step 2.



Figure 10.10.2-2: RRC Transfer procedure for split SRB (UL operation)

Figure 10.10.2-2 shows an example signaling flow for UL RRC Transfer in case of the split SRB:

1. When the UE provides response to the RRC message, it sends it to the SN.

2. The SN initiates the RRC Transfer procedure, in which it transfers the received PDCP PDU with encapsulated RRC message.

**SN measurement report or failure information report:**



Figure 10.10.2-3: RRC Transfer procedure for SN measurement report or failure information report

Figure 10.10.2-3 shows an example signaling flow for RRC Transfer in case of the forwarding of the SN measurement report, failure information report or CPC execution completion from the UE:

1. When the UE sends an SN measurement report,failure information report or CPC execution completion, it sends it to the MN in a container called *ULInformationTransferMRDC* as specified in TS 38.331 [4].

2. The MN initiates the RRC Transfer procedure, in which it transfers the received SN measurement report, failure information or CPC execution completion as an octet string.

*END OF CHANGE*