**3GPP TSG-RAN WG2 Meeting #125 R2-23xxxxx**

**Athens, Greece, 26th February – 1st March, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **37.340** | **CR** |  | **rev** |  | **Current version:** | **18.0.0** |  |
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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:*** | Miscellaneous corrections for NR further mobility enhancements in TS 37.340 | | | | | | | | | |
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| ***Source to WG:*** | ZTE Corporation (Rapporteur), Sanechips | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_Mob\_enh2-Core | | | | |  | ***Date:*** | | | 2024-02-16 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | To address some miscellaneous clarification and editorial changes:   1. The current definition of subsequent CPAC may cause the ambiguity that the subsequent CPAC includes only the following/subsequent CPC/CPA execution after a PSCell addition/change, PCell change or SCG release, but not including the initial CPA/CPC execution after receiving the subsequent CPAC configuration. 2. The description of intra-SN subsequent CPAC without MN involvement execution completion is missing in the section 10.10.2 for RRC Transfer procedure. 3. Some editorial clarification/changes are required in Figure 10.20-1 and 10.20-2, to align with the procedural text. 4. The current text on MN initiated SN modification procedure during subsequent CPAC procedure in section 10.20 is unclear and may cause some ambiguity. 5. Remove “and when RRC full configuration is not used” in section 10.20, to avoid the ambiguity that RRC full configuration may be used for subsequent CPAC. 6. Some editorial changes needs to be fixed. | | | | | | | | |
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| ***Summary of change:*** | | 1. Update the definition of subsequent CPAC in section 3.1 and 10.20. 2. Add the description of intra-SN subsequent CPAC without MN involvement execution completion in the section 10.10.2. 3. Fix some editorial changes in Figure 10.20-1 and 10.20-2. 4. Improve the procedural text on MN initiated SN modification procedure during subsequent CPAC procedure in section 10.20. 5. Remove “and when RRC full configuration is not used” in section 10.20. 6. Fix some editorial changes in section 10.20.   **Impact Analysis**  Impacted 5G architecture options:  NR-DC  Impacted functionality:  Subsequent CPAC  Inter-operability:  1. If the network is implemented according to the CR and the UE is not, there is no inter-operability issue.  2. If the UE is implemented according to the CR and the network is not, there is no inter-operability issue. | | | | | | | | |
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| ***Consequences if not approved:*** | | There are still some ambiguity and editorial errors in the specification. | | | | | | | | |
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| ***Clauses affected:*** | | 3.1, 10.10.2, 10.20 | | | | | | | | |
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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:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*Start of Change*

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-DU's or IAB-donor-DU's next hop neighbour IAB-node.

**Conditional PSCell Addition:** a PSCell addition procedure that is executed only when PSCell addition execution condition is met.

**Conditional PSCell Change:** a PSCell change procedure that is executed only when PSCell change execution condition is 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 in an E-UTRAN cell group, or up to four RLC bearers in case of CA packet duplication in a NR cell group) 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] and ProSe Communication (including ProSe UE-to-Network Relay and non-Relay communication) as defined in TS 23.304 [24], between two or more nearby UEs, using NR technology but not traversing any network node.

**NR sidelink discovery**: AS functionality enabling ProSe non-Relay Discovery and ProSe UE-to-Network Relay discovery for Proximity based Services as defined in TS 23.304 [24] between two or more nearby UEs, using NR technology but not traversing any network node.

**Parent node:** IAB-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.

**Ranging/Sidelink Positioning:** AS functionality enabling ranging-based services and sidelink positioning as defined in TS 23.586 [25].

**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 in an E-UTRAN cell group, or up to four RLC bearers in case of CA packet duplication in a NR cell group) 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.

**SRB5:** in NR-DC, a direct SRB between the SN and the UE dedicated for sending application layer measurement report information.

**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.

**Subsequent Conditional PSCell Addition or Change (subsequent CPAC):** a conditional PSCell addition or change procedure that is executed based on pre-configured subsequent CPAC configuration of candidate PSCell(s) without reconfiguration and re-initiation of CPC/CPA after a PSCell addition, a PSCell change, a PCell change or an SCG release.

**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.

*Next Change*

10.10.2 MR-DC with 5GC

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 SN measurement report, failure information report, SN UE assistance information, intra-SN CPC execution completion or intra-SN subsequent CPAC without MN involvement execution completion from the UE to the SN. If UE is IAB-MT, providing NR IAB other information from the IAB-MT to the SN when the IAB-donor is the SN;

- providing MCG failure information from the UE to the MN via the SN and an RRC reconfiguration, or release, or an inter-RAT handover command from the MN to the UE via the SN;

- providing F1-C traffic from an IAB-node to the MN via the SN, or F1-C traffic from the MN to an IAB-node via the SN.

Additional details of the RRC transfer procedure are defined in TS 38.423 [5].

**Split SRB:**

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**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.

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**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, failure information report, SN UE assistance information, intra-SN CPC execution completion, intra-SN subsequent CPAC without MN involvement execution completion or IAB other information:**

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**Figure 10.10.2-3: RRC Transfer procedure for SN measurement report, failure information report, SN UE assistance information, intra-SN CPC execution completion, intra-SN subsequent CPAC without MN involvement execution completion or IAB other information**

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, SN UE assistance information, intra-SN CPC execution completion, intra-SN subsequent CPAC without MN involvement execution completion or IAB other information from the UE:

1. When the UE sends an SN measurement report, failure information report, SN UE assistance information, intra-SN CPC execution completion, intra-SN subsequent CPAC without MN involvement execution completion or IAB other information it sends it to the MN in a container called *ULInformationTransferMRDC* message 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, SN UE assistance information, intra-SN CPC execution completion, intra-SN subsequent CPAC without MN involvement execution completion or IAB other information as an octet string.

**MCG failure information and RRC Reconfiguration / RRC Release / inter-RAT handover command over SRB3:**

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**Figure 10.10.2-4: RRC Transfer procedure for MCG failure information**

Figure 10.10.2-4 shows an example signaling flow for RRC Transfer in case of the forwarding of the MCG failure information from the UE:

1. When the UE sends *MCGFailureInformation* message over SRB3, it sends it to the SN in a container called *ULInformationTransferMRDC* message as specified in TS 38.331 [4].

2. The SN initiates the RRC Transfer procedure, in which it transfers the received *MCGFailureInformation* message as an octet string.

3. The MN initiates the RRC Transfer procedure, in which it transfers the *RRCConnectionReconfiguration* message, or *RRCReconfiguration* message, or *RRCConnectionRelease* message, or *RRCRelease* message, or *MobilityFromNRCommand* message, or *MobilityFromEUTRACommand* message as an octet string.

4. The SN sends the received RRC message to the UE in a container called *DLInformationTransferMRDC* message, as specified in TS 38.331 [4].

**F1-C traffic transfer:**

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**Figure 10.10.2-5: Scenario 2: F1-C Traffic Transfer procedure between IAB-MT and MN (F1-terminating node) in NR-DC**

1. The IAB-MT sends a F1-AP message encapsulated in SCTP/IP or F1-C related (SCTP/)IP packet to the SN (non-F1-terminating IAB-donor) via split SRB2 in a container within *ULInformationTransfer* message encapsulated in a PDCP PDU as specified in TS 38.331 [4].

2. The SN initiates the RRC Transfer procedure, in which it transfers the received PDCP PDU (*ULInformationTransfer* message) including F1-AP message.

3. When the MN (F1-terminating IAB-donor) sends a F1-AP message encapsulated in SCTP/IP or F1-C related (SCTP/)IP packet, it starts the procedure by initiating the RRC Transfer procedure, if split SRB2 is determined to be used and usage of SCG path is determined. The MN sends the F1-AP message to the SN in a container within *DLInformationTransfer* message encapsulated in a PDCP PDU specified in TS 38.331 [4].

4. The SN forwards the encapsulated *DLInformationTransfer* message in a PDCP PDU as specified in TS 38.331 [4] to IAB-MT.

*Next Change*

10.20 Subsequent Conditional PSCell Addition or Change

A Subsequent Conditional PSCell Addition or Change (subsequent CPAC) is defined as a conditional PSCell addition or change procedure that is executed based on pre-configured subsequent CPAC configuration of candidate PSCell(s) without reconfiguration and re-initiation of CPC/CPA after a PSCell addition, a PSCell change, a PCell change or an SCG release. The UE keeps the configured subsequent CPAC configuration (unless the network indicates to release it) and evaluates the execution conditions of candidate PSCells after completion of a PSCell addition, a PSCell change, a PCell change or an SCG release. Intra-SN subsequent CPAC initiated by the SN, inter-SN subsequent CPAC initiated by either MN or SN are supported.

The following principles apply to subsequent CPAC:

- For MN initiated subsequent CPAC, the MN initially triggers the candidate cell preparation of subsequent CPAC procedure and generates the execution conditions for the initial execution of subsequent CPAC (e.g. CPA or CPC).

- For SN initiated subsequent CPAC, the source SN initially triggers the candidate cell preparation of subsequent CPAC procedure and generates the execution conditions for the initial execution of subsequent CPAC.

- For both MN and SN initiated inter-SN subsequent CPAC, the candidate SN generates the execution conditions for the following execution of subsequent CPAC when the candidate SN prepares the candidate SCG configuration(s) for candidate PSCell(s). For SN initiated intra-SN subsequent CPAC, the source SN generates the execution conditions for the following execution of subsequent CPAC when the source SN prepares the candidate SCG configuration(s) for candidate PSCell(s).

- The subsequent CPAC configuration contains candidate SCG configuration(s) of candidate PSCell(s), execution conditions, and may contain the MCG configuration (to be applied when subsequent CPAC execution is triggered), the reference configuration and the security update configuration.

- The subsequent CPAC configuration for CPA or inter-SN CPC candidate PSCell(s) is provided in MN format. The subsequent CPAC configuration for intra-SN CPC candidate PSCell(s) is provided in MN format or SN format. It's up to the source SN to decide which format to be used for intra-SN subsequent CPAC.

- For one UE, the subsequent CPAC configuration for all candidate PSCells (including inter-SN and/or intra-SN) is provided in the same format, i.e., either MN format, or SN format. If the configured candidate PSCell(s) includes at least one inter-SN CPC candidate PSCell, the subsequent CPAC configuration can only be provided in MN format. If only intra-SN CPC candidate PSCell(s) is configured, the subsequent CPAC configuration can be provided in either MN format or SN format.

- Each candidate PSCell configuration is provided as a delta configuration on top of a reference configuration or a complete configuration. Only one reference configuration is supported.

- The MN generates the MCG part of the reference configuration (if any), while the SN generates the SCG part of the reference configuration. The MN can request an SCG reference configuration from any one of the involved SNs.

- The network explicitly configures a subsequent CPAC configuration for the current serving PSCell if the network wants to use that PSCell as a candidate PSCell for subsequent CPAC.

- The network always explicitly releases the subsequent CPAC configuration for candidate PSCells after an inter-MN PCell change.

- Upon the release of SCG, the UE releases the stored subsequent CPAC configuration in SN format. Upon the release of SCG, the UE releases or maintains the stored subsequent CPAC configuration in MN format according to the network indication.

- The same candidate PSCell configuration can be used for CPA execution and CPC execution, but with different execution conditions of the candidate PSCell.

- The subsequent CPAC configuration with CPA execution condition(s) maintained after SCG release can be used for the subsequent CPA execution.

- Upon inter-SN subsequent CPAC execution, the UE uses the first unused sk-Counter value for S-KgNB generation, based on the per-SN pre-configured sk-Counter value list.

- Upon PCell change, PSCell change or SCG release, if the subsequent CPAC configuration is maintained, the UE also maintains the unused sk-Counter values.

**MN initiated subsequent CPAC**

The subsequent CPAC procedure is initiated by the MN for inter-SN subsequent CPAC configuration and inter-SN subsequent CPAC execution.



**Figure 10.20-1: Inter-SN subsequent CPAC - MN initiated**

Figure 10.20-1 shows an example signalling flow for the inter-SN subsequent CPAC initiated by the MN:

1/2/3/4. The MN initiates the inter-SN subsequent CPAC by requesting the candidate SN(s) to allocate resources for the UE by means of the SN Addition procedure, indicating that the request is for subsequent CPAC. The MN also provides the candidate cells recommended by MN via the latest measurement results for the candidate SN(s) to choose and configure the SCG cell(s), provides the upper limit for the number of PSCells that can be prepared by each candidate SN, and provides a list of KSN and associated sk-Counter values for each candidate SN. In the SN Addition procedure, the MN also includes information of other candidate SN(s), and for each candidate SN, a list of cells recommended by the MN via the latest measurement results for the candidate SN to select the PSCell(s) for the following execution of subsequent CPAC. Within the list of cells as indicated within the measurement results indicated by the MN, the candidate SN decides the list of PSCell(s) to prepare (considering the maximum number indicated by the MN) and, for each prepared PSCell, the candidate SN decides other SCG SCells and provides the new corresponding SCG radio resource configuration to the MN in an NR *RRCReconfiguration*\*\* message contained in the *SN Addition Request Acknowledge* message with the prepared PSCell ID(s). For each prepared PSCell, the candidate SN also decides the list of PSCell(s) and associated execution conditions proposed for the following execution of subsequent CPAC. If data forwarding is needed, the candidate SN provides data forwarding addresses to the MN. The candidate SN may also propose data forwarding to the MN or other candidate SN(s) for subsequent CPAC. The candidate SN includes the indication of the complete or delta RRC configuration with respect to the SCG reference configuration. For the prepared PSCell(s) and the proposed PSCell(s) for the following execution of subsequent CPAC, the candidate SN can either accept or reject each of the candidate cells listed within the measurement results indicated by the MN, i.e. it cannot configure any alternative candidates.

The MN may select one of the candidate SN(s) and requests providing the SCG reference configuration as part of the SN Addition procedure. Once obtained, the MN provides the SCG reference configuration to other candidate SN(s).

NOTE 1: If the UE was configured with SN-1 in Dual Connectivity operation (i.e. SN-1 is the source SN), then the MN starts the subsequent CPAC operation with SN-1 via the MN-initiated SN Modification procedure instead of the SN Addition procedure.

NOTE 2: If the UE was configured with SN-1 in Dual Connectivity operation (i.e. SN-1 is the source SN), then the MN may trigger the MN-initiated SN Modification procedure to SN-1 to retrieve the current SCG configuration or request a SCG reference configuration for the subsequent CPAC, and to allow provision of data forwarding related information before step 1.

NOTE 3: If applicable, the MN stores the data forwarding addresses and data forwarding proposals provided from all the candidate SN(s).

5. For SN terminated bearers using MCG resources, the MN provides Xn-U DL TNL address information in the *Xn-U Address Indication* message to the candidate SN(s).

6/7. If the lists of prepared PSCells received from the candidate SN(s) in steps 2 and 4 are different than the list of proposed PSCells by a candidate SN for the following execution of subsequent CPAC, e.g., when not all proposed PSCells were accepted by the candidate SN(s), the MN may initiate the SN Modification procedure towards that candidate SN to inform it about the candidate PSCells accepted by each candidate SN. If requested, that candidate SN sends an SN Modification Request Acknowledge message and if needed, provides the updated candidate SCG configuration(s) and/or the execution conditions for the following execution of subsequent CPAC to the MN.

8. The MN sends to the UE an *RRCReconfiguration* messageincluding the subsequent CPAC configuration, i.e. a list of *RRCReconfiguration\** messagesand associated execution conditions for the subsequent CPAC, in which each *RRCReconfiguration\** messagecontains the SCG configuration in the *RRCReconfiguration\*\** messagereceived from one of the candidate SN(s) in steps 2 and 4, and possibly an MCG configuration. Besides, the *RRCReconfiguration* message can also include an updated source MCG configuration, e.g., to configure the required conditional measurements. The *RRCReconfiguration* message also includes a security update configuration and may also include a reference configuration.

9. The UE applies the *RRCReconfiguration* message received in step 8, stores the subsequent CPAC configurationand replies to the MN with an *RRCReconfigurationComplete* message. In case the UE is unable to comply with (part of) the configuration included in the *RRCReconfiguration* message, it performs the reconfiguration failure procedure.

11. The UE starts evaluating the execution conditions. If the execution conditionof one candidate PSCell is satisfied, the UE applies *RRCReconfiguration\** message corresponding to the selected candidate PSCell, and sends an MN *RRCReconfigurationComplete\** message, including an *RRCReconfigurationComplete\*\** message for the selected candidate PSCell, and information enabling the MN to identify the SN of the selected candidate PSCell. The *RRCReconfigurationComplete\** message may also include the sk-Counter value associated with the selected candidate PSCell if a new sk-Counter value is selected.

12. The MN informs the SN of the selected candidate PSCell (i.e. the selected candidate SN) that the UE has completed the reconfiguration procedure successfully via *SN Reconfiguration Complete* message, including the *RRCReconfigurationComplete\*\** message. If the sk-Counter value is received by the *RRCReconfigurationComplete\** message, the MN also indicates the received sk-Counter value to the SN.

13. The UE performs synchronisation towards the PSCell indicated in the *RRCReconfiguration\** message applied in step 11. The order the UE sends the MN *RRCReconfigurationComplete\** message and performs the Random Access procedure towards the SCG is not defined. The successful RA procedure towards the SCG is not required for a successful completion of the RRC Reconfiguration procedure.

14. If PDCP termination point is changed to the SN for bearers using RLC AM, the MN sends the *SN Status Transfer* message.

15. For SN terminated bearers or QoS flows moved from the MN, dependent on the characteristics of the respective bearer or QoS flow, the MN may take actions to minimise service interruption due to activation of MR-DC (Data forwarding).

16. If data forwarding is needed, the MN may send the *Xn-U Address Indication* message to the selected candidate SN. The SN may decide to perform, if applicable, early data forwarding for SN-terminated bearers, together with the sending of an *Early Status Transfer* message to the MN.

NOTE 4: Separate Xn-U Address Indication procedures may be initiated to provide different forwarding addresses of the prepared subsequent CPAC. In this case, it is up to the MN and the candidate SN implementations to make sure that the *Early Status Transfer* message(s) from the selected candidate SN, if any, is forwarded to the right other candidate SN.

18. The UE starts evaluating the execution conditions. If the execution conditionof one candidate PSCell is satisfied, the UE applies *RRCReconfiguration\** message corresponding to the selected candidate PSCell, and sends an MN *RRCReconfigurationComplete\** message, including an *RRCReconfigurationComplete\*\** message for the selected candidate PSCell, and information enabling the MN to identify the SN of the selected candidate PSCell. The *RRCReconfigurationComplete\** message may also include a sk-Counter value associated with the selected candidate PSCell if a new sk-Counter value is selected.

19. The MN informs the SN of the selected candidate PSCell that the UE has completed the reconfiguration procedure successfully via *SN Reconfiguration Complete* message, including the *RRCReconfigurationComplete\*\** message. If the sk-Counter value is received by the *RRCReconfigurationComplete\** message, the MN also indicates the received sk-Counter value to the SN.

20. The UE performs synchronisation towards the PSCell indicated in the *RRCReconfiguration\** message applied in step 18. The order the UE sends the MN *RRCReconfigurationComplete\** message and performs the Random Access procedure towards the SCG is not defined. The successful RA procedure towards the SCG is not required for a successful completion of the RRC Reconfiguration procedure.

21/22/23. The MN triggers the MN initiated SN Modification procedure to inform the last serving SN to stop providing user data to the UE, to switch to the prepared state, and if applicable, to allow provisioning of new data forwarding addresses. If applicable, the MN triggers the Xn-U Address Indication procedure to inform the last serving SN the address of the SN of the selected candidate PSCell, to start late data forwarding.

24/25. If PDCP termination point is changed for bearers using RLC AM, the SN sends the *SN Status Transfer* message to MN, which the MN sends then to the SN of the selected candidate PSCell, if needed.

26. If applicable, data forwarding from the last serving SN takes place. It may be initiated as early as the the last serving SN receives the early data forwarding address in step 17.

27. If data forwarding is needed, the MN may send the *Xn-U Address Indication* message to the selected candidate SN. The SN may decide to perform, if applicable, early data forwarding for SN-terminated bearers, together with the sending of an *Early Status Transfer* message to the MN.

NOTE 5: Separate Xn-U Address Indication procedures may be initiated to provide different forwarding addresses of the prepared subsequent CPAC. In this case, it is up to the MN and candidate SN implementations to make sure that the *Early Status Transfer* message(s) from the selected candidate SN, if any, is forwarded to the right other candidate SN.

**SN initiated subsequent CPAC**

The subsequent CPAC procedure is initiated by the SN for inter-SN subsequent CPAC configuration and inter-SN subsequent CPAC execution.



**Figure 10.20-2: Inter-SN subsequent CPAC - SN initiated**

Figure 10.20-2 shows an example signalling flow for the inter-SN subsequent CPAC initiated by the source SN:

1. The source SN (i.e. SN-1) initiates the inter-SN subsequent CPAC procedure by sending the *SN Change Required* message, which contains a subsequent CPAC initiation indication. The message also contains candidate node ID(s) and may include an SCG reference configuration (to support delta configuration), and contains the measurements results which may include cells that are not subsequent CPAC candidates. The message also includes a list of proposed PSCell candidates recommended by the source SN, including execution conditions for the initial evaluation, the upper limit for the number of PSCells that can be prepared by each candidate SN, and may also include the SCG measurement configurations for subsequent CPAC (e.g. measurement ID(s) to be used for subsequent CPAC).

2/3/4/5. The MN requests each candidate SN(s) to allocate resources for the UE by means of the SN Addition procedure(s), indicating the request is for subsequent CPAC, and the measurements results which may include cells that are not subsequent CPAC candidates received from the source SN to the candidate SN, and indicating a list of proposed PSCell candidates to the candidate SN(s) received from the source SN, but not including execution conditions. The MN also includes information of other candidate SN(s), and for each candidate SN, a list of proposed PSCell candidates recommended by the source SN for the candidate SN to select the PSCell(s) for the following execution of subsequent CPAC. The MN also provides the upper limit for the number of PSCells that can be prepared by each candidate SN and provides a list of KSN and associated sk-Counter values for each candidate SN. Within the list of PSCells suggested by the source SN, the candidate SN decides the list of PSCell(s) to prepare (considering the maximum number indicated by the MN) and, for each prepared PSCell, the candidate SN decides other SCG SCells and provides the new corresponding SCG radio resource configuration to the MN in an NR *RRCReconfiguration*\*\* message contained in the *SN Addition Request Acknowledge* message with the prepared PSCell ID(s). For each prepared PSCell, the candidate SN also decides the list of PSCell(s) and associated execution conditions proposed for the following execution of subsequent CPAC. If data forwarding is needed, the candidate SN provides data forwarding addresses to the MN. The candidate SN may also propose data forwarding to the MN or other candidate SN(s) for subsequent CPAC. The candidate SN includes the indication of the complete or delta RRC configuration with respect to the SCG reference configuration. For the prepared PSCell(s) and the proposed PSCell(s) for the following execution of subsequent CPAC, the candidate SN can either accept or reject each of the candidate cells suggested by the source SN, i.e. it cannot configure any alternative candidates.

The MN may select one of the candidate SN(s) and requests providing the reference SCG configuration as part of the SN Addition procedure. Once obtained, the MN provides the reference configuration to other candidate SN(s).

NOTE 6: The MN may trigger the MN-initiated SN Modification procedure (to the source SN) to request a reference configuration for the subsequent CPAC before step 2.

NOTE 7: If applicable, the MN stores the data forwarding addresses and data forwarding proposals provided from all the candidate SN(s) and the source SN.

6. For SN terminated bearers using MCG resources, the MN provides Xn-U DL TNL address information in the *Xn-U Address Indication* message to the candidate SN(s).

7/8. If the lists of prepared PSCells received from the candidate SN(s) in steps 3 and 5 are different than the list of proposed PSCells recommended by a SN (e.g., source SN or candidate SN), e.g., when not all proposed PSCells were accepted by the candidate SN(s), the MN may initiate the SN Modification procedure towards that SN to inform it about the candidate PSCells accepted by each candidate SN. If requested, that SN sends an SN Modification Request Acknowledge message and if needed, provides the updated SCG configuration(s) and/or the execution conditions for the prepared PSCell(s) to the MN.

9. The MN sends to the UE an *RRCReconfiguration* messageincluding the subsequent CPAC configuration, i.e. a list of *RRCReconfiguration\** messagesand associated execution conditions for the subsequent CPAC, in which each *RRCReconfiguration\** messagecontains the SCG configuration in the *RRCReconfiguration\*\** messagereceived from one of the candidate SN(s) in steps 3 and 5, and possibly an MCG configuration. Besides, the *RRCReconfiguration* message can also include an updated MCG configuration, as well as the NR *RRCReconfiguration\*\**\* message generated by the source SN, e.g., to configure the required conditional measurements. The *RRCReconfiguration* message also includes a security update configuration and may also include a reference configuration.

10. The UE applies the *RRCReconfiguration* message received in step 9, stores the subsequent CPAC configurationand replies to the MN with an *RRCReconfigurationComplete* message, which can include an NR *RRCReconfigurationComplete\*\*\** message. In case the UE is unable to comply with (part of) the configuration included in the *RRCReconfiguration* message, it performs the reconfiguration failure procedure.

11/12. If an SN RRC response message is included, the MN informs the source SN with the SN *RRCReconfigurationComplete\*\*\** message via *SN Change Confirm* message. If step 7 and 8 towards the source SN are skipped, the MN will indicate the candidate PSCells accepted by each candidate SN to the source SN in the *SN Change Confirm* message.

The MN sends the *SN Change Confirm* message towards the source SN to indicate that subsequent CPAC is prepared, and in such case the source SN continues providing user data to the UE. If early data forwarding is applied, the MN informs the source SN the data forwarding addresses as received from the candidate SN(s), the source SN, if applicable, together with the Early Status Transfer procedure, starts early data forwarding. The PDCP SDU forwarding may take place during early data forwarding. In case multiple candidate SNs are prepared, the MN includes a list of Target SN ID and list of data forwarding addresses to the source SN.

NOTE 8: The Xn-U Address Indication procedure may further be invoked to indicate to the source SN to stop already initiated early data forwarding for some PDCP SDUs if they are no longer subject to data forwarding due to the modification or cancellation of the prepared conditional PSCell change.

NOTE 9: For the early transmission of MN terminated split/SCG bearers, the MN forwads the PDCP PDU to the candidate SN(s).

13. The UE starts evaluating the execution conditions. If the execution conditionof one candidate PSCell is satisfied, the UE applies *RRCReconfiguration\** message corresponding to the selected candidate PSCell, and sends an MN *RRCReconfigurationComplete\** message, including an *RRCReconfigurationComplete\*\** message for the selected candidate PSCell, and information enabling the MN to identify the SN of the selected candidate PSCell. The *RRCReconfigurationComplete\** message may also include the sk-Counter value associated with the selected candidate PSCell if a new sk-Counter value is selected.

14. The MN informs the SN of the selected candidate PSCell (i.e. the selected candidate SN) that the UE has completed the reconfiguration procedure successfully via *SN Reconfiguration Complete* message, including the *RRCReconfigurationComplete\*\** message. If the sk-Counter value is received by the *RRCReconfigurationComplete\** message, the MN also indicates the received sk-Counter value to the SN.

15. The UE performs synchronisation towards the PSCell indicated in the *RRCReconfiguration\** message applied in step 13. The order the UE sends the MN *RRCReconfigurationComplete\** message and performs the Random Access procedure towards the SCG is not defined. The successful RA procedure towards the SCG is not required for a successful completion of the RRC Reconfiguration procedure.

16/17/18. If the source SN is configured as a candidate SN, the MN triggers the MN initiated SN Modification procedure to inform the source SN to stop providing user data to the UE, to switch to the prepared state, and if applicable, to allow provisioning of new data forwarding addresses. If applicable, the MN triggers the Xn-U Address Indication procedure to inform the source SN the address of the SN of the selected candidate PSCell, to start late data forwarding. If the source SN is not configured as a candidate SN, the MN triggers the MN initiated SN Release procedure to inform the source SN to stop providing user data to the UE, and triggers the Xn-U Address Indication procedure to inform the source SN the address of the SN of the selected candidate PSCell and if applicable, starts late data forwarding.

19/20. If PDCP termination point is changed for bearers using RLC AM, the SN sends the *SN Status Transfer* message to MN, which the MN sends then to the SN of the selected candidate PSCell, if needed.

21. If applicable, data forwarding from the source SN takes place. It may be initiated as early as the the source SN receives the early data forwarding address in step 12.

22. If data forwarding is needed, the MN may send the *Xn-U Address Indication* message to the selected candidate SN. The SN may decide to perform, if applicable, early data forwarding for SN-terminated bearers, together with the sending of an *Early Status Transfer* message to the MN.

NOTE 10: Separate Xn-U Address Indication procedures may be initiated to provide different forwarding addresses of the prepared subsequent CPAC. In this case, it is up to the MN and the candidate SN implementations to make sure that the *Early Status Transfer* message(s) from the selected candidate SN, if any, is forwarded to the right other candidate SN.

24. In subsequent evaluation and execution phase, i.e., for the following execution of subsequent CPAC, the similar steps as steps 13~23 are performed.

*End of Change*