**3GPP TSG- Meeting #**

**Changsha, China, 15. -**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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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 |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Clarification of the bearer menagement in case of CHO with SCG | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
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| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
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| ***Reason for change:*** | | RAN3 agreed and defined that in case of CHO and multiple Addition requests coming to the same (candidate) SN from multiple target MNs, the (candidate) SN may decide to allocate the same tunnel endpoints. At RAN3 #122 meeting, it was further clarified that it is the target S-CU-CP to decide if new tunnels (bearers) are to be set up at the S-CU-UP. This decision, however, was not captured anywhere: the TS 37.340 does not discuss CP-UP signalling, while the TS 38.401 does not discuss CHO with SCG.  In addition, a clarification is proposed to link the late data forwarding with the selected target node(s) – currently it is not linked. | | | | | | | | |
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| ***Summary of change:*** | | It is proposed to further clarify the information about the allocating or not of the tunnel endpoints with a statement that it means setting up or not new bearers.  This approach does not discuss CP-UP communication or refers to CP or UP, but by declaring that it is related to setting up a bearer helps find the responsible node in TS 38.401 (bearer setup is initiated from the CP).  It is also added that data forwarding starts to the accessed target side (MN or SN).  Impact assessment towards the previous version of the specification (same release):  The impact can be considered isolated because the change only clarifies usage of the procedure. | | | | | | | | |
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| ***Consequences if not approved:*** | | The implementation of the CU-UP communication in the discussed scenario is left up to the deduction and prone to misunderstandings. | | | | | | | | |
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| ***Clauses affected:*** | | 10.19.1, 10.19.1 | | | | | | | | |
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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:*** | |  | | | | | | | | |

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| **First change, ommited text not changed** |

## 10.19 Conditional Handover with Secondary Node

### 10.19.1 EN-DC

The Conditional Handover with Secondary Node procedure is used for configuration and execution of CHO with SN. This procedure includes the cases where the SN is kept, changed or added. If the SN is kept, the UE context at the SN is kept. If the SN is changed, the UE context at the source SN is moved to the target SN.



Figure 10.19.1-1: Conditional Handover with Secondary Node procedure

Figure 10.19.1-1 shows an example signaling flow for Conditional Handover with Secondary Node.

NOTE 1: For a CHO without SN change, the source SN and the target SN shown in Figure 10.19.1-1 are the same node.

NOTE 2: For a CHO with SN addition, the source SN and steps involving the source SN in Figure 10.19.1-1 are ignored.

1. The source MN starts the conditional handover procedure by initiating the X2 Handover Preparation procedure including MCG configuration and, if the UE is configured with an SCG, SCG configuration. The source MN may include the (source) SN UE X2AP ID, SN ID, the UE context in the (source) SN and the Conditional Handover Information Request IE in the *Handover Request* message.

NOTE 3: In case of the CHO with/without SN change, the source MN may trigger the MN-initiated SN Modification procedure (to the source SN) to retrieve the current SCG configuration, if configured, before step 1.

2. If the candidate MN decides to keep the UE context in the SN, the candidate MN sends the *SgNB Addition Request* message to the SN including the SN UE X2AP ID as a reference to the UE context in the SN that was established by the source MN. If the candidate MN decides to change the SN allowing delta configuration, the candidate MN sends the *SgNB Addition Request* message to the candidate SN including the UE context in the source SN that was established by the source MN. Otherwise, the candidate MN may send the *SgNB Addition Request* message to the candidate SN including neither the SN UE X2AP ID nor the UE context in the source SN that was established by the source MN. Within the *SgNB Addition Request* message, the candidate MN also includes the CHO related information, i.e., the source MN ID and the MN UE X2AP ID in the source MN, in order to indicate that the SgNB Addition Preparation procedure is triggered in relation to a CHO and to enable the SN to identify requests related to the same UE.

NOTE 3a: The target MN and other potential target MNs may trigger the SgNB Addition Preparation procedure to the same (target) SN.

NOTE 3b: The source MN may initiate additional X2 Handover Preparation procedures towards the same or other target MNs. Based on each X2 Handover Preparation procedure, each target MN may decide to trigger SgNB Addition Preparation procedure.

3. The (candidate) SN replies with the *SgNB Addition Request Acknowledge* message. The (candidate) SN may include the indication of full or delta RRC configuration.

NOTE 4: In CHO with SCG configuration, it is up to the candidate MN implementation to make sure that the CG-Config provided from the (candidate) SN can be used in all CHO preparations.

4. The candidate MN includes within the *Handover Request Acknowledge* message a transparent container to be sent to the UE as an RRC message to perform the conditional handover, and may also provide forwarding addresses to the source MN. The candidate MN indicates to the source MN that the UE context in the SN is kept if the candidate MN and the SN decided to keep the UE context in the SN in step 2 and step 3.

NOTE 4a0: Steps 1-4 may be produced in several instances, each instance initiated with a separate Handover Preparation procedure (step 1). The order of messages belonging to separate instances is not defined.

4a. The source MN sends the *Data Forwarding Address Indication* message to the (source) SN. This *Data Forwarding Address Indication* message notifies conditional handover to the (source) SN, which 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 source MN.

NOTE 4a: Separate Data Forwarding Address Indication procedures may be initiated to provide different forwarding addresses of the prepared conditional handovers. In this case, it is up to the source MN and SN implementations to make sure that the *Early Status Transfer* message(s) from the source SN, if any, is forwarded to the right target MN. The Data Forwarding Address Indication procedure may further be initiated to indicate to the (source) SN to stop already initiated early data forwarding for some SN-terminated bearers, if they are no longer subject to data forwarding due to the modification or cancellation of the prepared conditional handovers.

5. The source MN sends an *RRCConnectionReconfiguration* message to the UE, including the CHO configuration, i.e. a list of *RRCConnectionReconfiguration\** messagesand associated execution conditions, in which each *RRCConnectionReconfiguration\** message contains an MCG configuration and possibly an SCG configuration in the *RRCReconfiguration\*\** messagereceived from the candidate SN in step 3.

6. The UE applies the *RRCConnectionReconfiguration* message received in step 5, stores the CHO configuration and replies to the MN with an *RRCConnectionReconfigurationComplete* message.

7/8. The UE maintains connection with the source MN and, if the UE is configured with a PSCell, with the source PSCell, after receiving CHO configuration, and starts evaluating the CHO execution condition for the candidate cell(s). If at least one CHO candidate cell satisfies the corresponding CHO execution condition, the UE detaches from the source MN, applies the stored corresponding configuration for that selected candidate cell, synchronises to that candidate cell and completes the RRC handover procedure by sending *RRCConnectionReconfigurationComplete\** message to the target MN. If the stored configuration for the selected candidate cell includes an SCG configuration, the UE includes an embedded SN *RRCReconfigurationComplete*\*\* message for the target SN. The UE releases stored CHO configurations after successful completion of RRC handover procedure.

NOTE 5: In case the target SN includes the indication of full RRC configuration, the MN performs release of the SN terminated radio bearer configuration and release and add of the NR SCG configuration part towards the UE.

9. If configured with bearers requiring SCG radio resources, the UE synchronizes to the (target) SN.

NOTE 6: The order the UE performs Random Access towards the MN (step 7) and performs the Random Access procedure towards the (target) SN (step 9) is not defined.

10. If the RRC connection reconfiguration procedure was successful, the target MN informs the (target) SN via *SgNB Reconfiguration Complete* message.

11. The target MN sends the *Handover Success* message to the source MN to inform that the UE has successfully accessed the target cell.

12a/b. The source MN sends *SgNB Release Request* message to the (source) SN including a Cause indicating MCG mobility and, if applicable, data forwarding information. The source MN indicates to the (source) SN that the UE context in SN is kept, if it receives the indication from the target MN. The (source) SN acknowledges the release request.

12c. The source MN sends the *Handover Cancel* message toward the other signalling connections or other candidate MNs, if any, to cancel CHO for the UE.

12d/e. If the target MN is configured with other candidate PCell(s) associated with other candidate SN(s) than the target SN, the target MN sends the *SgNB Release Request* message(s) to the corresponding candidate SN(s). Other candidate MN(s) send(s) the *SgNB Release Request* message(s) to other candidate SN(s), if configured. The other candidate SN(s) acknowledges the release request.

13a. The (source) SN sends the *Secondary RAT* *Data Usage Report* message to the source MN and includes the data volumes delivered to and received from the UE over the NR radio for the related E-RABs.

NOTE 7: The order the source SN sends the *Secondary RAT Data Usage Report* message and performs data forwarding with MN/target SN is not defined. The SgNB may send the report when the transmission of the related bearer is stopped.

13b. The source MN sends the *Secondary RAT Data Usage Report* message to MME to provide information on the used NR resource.

14. For bearers using RLC AM, the source MN sends the *SN Status Transfer* message, including, if needed, SN Status received from the source SN to the target MN. The target MN forwards the SN Status to the target SN, if needed.

15. If applicable, data forwarding takes place from the source side (i.e. source MN or source SN) to the accessed target side (i.e. target MN or target SN). If the SN is kept, data forwarding may be omitted for SN-terminated bearers kept in the SN.

16-19. The target MN initiates the S1 Path Switch procedure.

NOTE 8: If new UL TEIDs of the S-GW are included, the target MN performs the MN initiated SN Modification procedure to provide them to the SN.

20. The target MN initiates the UE Context Release procedure towards the source MN.

21. Upon reception of the *UE Context Release* message, the (source) SN releases C-plane related resources associated to the UE context towards the source MN. Any ongoing data forwarding may continue. The SN shall not release the UE context associated with the target MN if the UE context kept indication was included in the *SgNB* *Release Request* message in step 12a.

### 10.19.2 MR-DC with 5GC

The Conditional Handover with Secondary Node procedure is used for configuration and execution of CHO with SN or CHO with candidate SCG(s). This procedure includes the cases where the SN is kept, changed or added. If the SN is kept, the UE context at the SN is kept. If the SN is changed, the UE context at the source SN is moved to the target SN.

CHO with candidate SCG(s) is not supported for NE-DC and NGEN-DC.



Figure 10.19.2-1: Conditional Handover with Secondary Node procedure

Figure 10.19.2-1 shows an example signaling flow for Conditional Handover with Secondary Node.

NOTE 1: For a CHO without SN change, the source SN and the target SN shown in Figure 10.19.2-1 are the same node.

NOTE 2: For a CHO with SN addition, the source SN and steps involving the source SN in Figure 10.19.2-1 are ignored.

1. The source MN starts the conditional handover procedure by initiating the Xn Handover Preparation procedure including MCG configuration and, if the UE is configured with an SCG, SCG configuration. The source MN includes the (source) SN UE XnAP ID, SN ID, the UE context in the (source) SN and the Conditional Handover Information Request IE in the *Handover Request* message. In case of CHO with candidate SCG(s), the source MN also provides the maximum number of conditional reconfigurations that the candidate MN can prepare for the UE in the *Handover Request* message.

NOTE 3: In case of the CHO with/without SN change or CHO with candidate SCG(s), the source MN may trigger the MN-initiated SN Modification procedure (to the source SN) to retrieve the current SCG configuration, if configured, before step 1.

2. If the candidate MN decides to keep the UE context in the SN, the candidate MN sends the *SN Addition Request* message to the SN including the SN UE XnAP ID as a reference to the UE context in the SN that was established by the source MN. If the candidate MN decides to change the SN allowing delta configuration, the candidate MN sends the *SN Addition Request* message to the candidate SN including the UE context in the source SN that was established by the source MN. Otherwise, the candidate MN may send the *SN Addition Request* message to the candidate SN including neither the SN UE XnAP ID nor the UE context in the source SN that was established by the source MN. Within the *SN Addition Request* message, the candidate MN also includes the CHO related information, i.e., the source MN ID and the MN UE XnAP ID in the source MN, in order to indicate that the SN Addition Preparation procedure is triggered in relation to a CHO and to enable the SN to identify requests related to the same UE. In case of CHO with candidate SCG(s), the candidate MN also provides the candidate PSCells recommended by the candidate MN via the latest measurement results for the candidate SN(s) to choose and configure the candidate SCG cell(s), and provides the maximum number of PSCells that the candidate SN can prepare for the UE in the *SN Addition Request* message.

NOTE 3a: The target MN and other potential target MNs may trigger the SN Addition Preparation procedure to the same (target) SN.

NOTE 3b: The source MN may initiate additional Xn Handover Preparation procedures towards the same or other target MNs. Based on each Xn Handover Preparation procedure, each target MN may decide to trigger SN Addition Preparation procedure.

3. The (candidate) SN replies with the *SN Addition Request Acknowledge* message. The (candidate) SN may include the indication of the full or delta RRC configuration. In case of CHO with candidate SCG(s), within the list of cells as indicated within the measurement results indicated by the candidate MN, the candidate SN decides the list of PSCell(s) to prepare (considering the maximum number indicated by the candidate MN) and, for each prepared PSCell, the candidate SN decides other SCG SCells and provides the new corresponding SCG radio resource configuration to the candidate MN in an NR RRC reconfiguration*\*\** message contained in the *SN Addition Request Acknowledge* message with the prepared PSCell ID(s).

NOTE 4: In CHO with SCG configuration, it is up to the candidate MN implementation to make sure that the CG-Config provided from the (candidate) SN can be used in all CHO preparations.

NOTE 4A1: In case of CHO with candidate SCG(s), the (candidate) SN assigns the same data forwarding addresses for multiple data forwarding requests from different candidate MNs and may set up only one bearer context. Then the (candidate) SN indicates to the candidate MN direct data forwarding path availability with the source SN and/or source MN, if applicable.

3a. For the SN terminated bearers using MCG resources, the candidate MN provides Xn-U DL TNL address information in the *Xn-U Address Indication* message.

4. The candidate MN includes within the *Handover Request Acknowledge* message the MN RRC reconfiguration message to be sent to the UE in order to perform the conditional handover, and may also provide forwarding addresses to the source MN. If PDU session split is performed in the target side during handover procedure, more than one data forwarding addresses corresponding to each node are included in the *Handover Request Acknowledge* message. The candidate MN indicates to the source MN that the UE context in the SN is kept if the candidate MN and the SN decided to keep the UE context in the SN in step 2 and step 3. In case of CHO with candidate SCG(s), the candidate MN includes a list of one or more (candidate) SNs in *Handover Request Acknowledge* message with the PDU Session admission results, data forwarding addresses and list of prepared PSCells for each prepared (candidate) SN. The candidate MN also indicates to the source MN the parameters of the execution condition of each prepared candidate PSCell.

NOTE 4A2: In case of CHO with candidate SCG(s), the candidate MN indicates direct data forwarding path availability between the target node and the source SN in per PDU session granularity in the *Handover Request Acknowledge* message, if applicable.

NOTE 4a0: Steps 1-4 may be produced in several instances, each instance initiated with a separate Handover Preparation procedure (step 1). The order of messages belonging to separate instances is not defined.

4a. The source MN sends the *Xn-U Address Indication* message to the (source) SN. This *Xn-U Address Indication* message notifies conditional handover to the (source) SN, which 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 source MN.

NOTE 4a: Separate Xn-U Address Indication procedures may be initiated to provide different forwarding addresses of the prepared conditional handovers. In this case, it is up to the source MN and SN implementations to make sure that the *Early Status Transfer* message(s) from the source SN, if any, is forwarded to the right target MN. The Xn-U Address Indication procedure may further be initiated to indicate to the (source) SN to stop already initiated early data forwarding for some SN-terminated bearers, if they are no longer subject to data forwarding due to the modification or cancellation of the prepared conditional handovers.

5. The source MN sends an RRC reconfiguration message to the UE, including the CHO configuration, i.e. a list of RRC reconfiguration\* messagesand associated execution conditions, in which each RRC reconfiguration\* message contains an MCG configuration and possibly an SCG configuration in the RRC reconfiguration\*\* message received from the candidate SN in step 3. For each configuration of CHO with candidate SCG(s), the source MN provides an execution condition for the candidate PCell and an execution condition for the candidate PSCell. Besides, each RRC reconfiguration\* message contains an MCG configuration and an SCG configuration in the RRC reconfiguration\*\* message received from the candidate SN in step 3.

NOTE 4b: In case of CHO with candidate SCG(s), the source MN can provide multiple CHO configurations for the same candidate PCell (i.e. without the SCG configuration or with the SCG configuration of different candidate PSCell).

6. The UE applies the RRC reconfiguration message received in step 5, stores the CHO configuration and replies to the MN with an RRC reconfiguration complete message.

7/8. The UE maintains connection with the source MN and, if the UE is configured with a PSCell, with the source PSCell, after receiving CHO configuration, and starts evaluating the execution condition for the candidate PCell(s) and if any, the execution condition for the candidate PSCell(s):

- If at least one candidate PCell satisfies the corresponding execution condition and the associated candidate PSCell satisfies the corresponding execution condition, the UE detaches from the source MN, applies the stored corresponding configuration for that selected candidate PCell and the associated candidate PSCell, synchronises to that candidate PCell, and completes the RRC handover procedure by sending RRC reconfiguration complete\* message to the target MN. The UE includes an embedded SN RRCReconfigurationComplete\*\* message for the target SN, and information enabling the target MN to identify the target SN of the selected candidate PSCell.

- Else if at least one candidate PCell satisfies the corresponding execution condition and there is no associated execution condition for a candidate PSCell, the UE detaches from the source MN, applies the stored corresponding configuration for that selected candidate PCell and, if included, the associated PSCell, synchronises to that candidate PCell and completes the RRC handover procedure by sending RRC reconfiguration complete\* message to the target MN. If the stored configuration for the selected candidate PCell includes an SCG configuration, the UE includes an embedded SN *RRCReconfigurationComplete*\*\* message for the target SN.

- The UE releases the stored CHO configurations after successful completion of the RRC handover procedure.

NOTE 5: In case the target SN includes the indication of the full RRC configuration, the MN performs release of the SN terminated radio bearer configuration and release and add of the NR SCG configuration part towards the UE.

9. If configured with bearers requiring SCG radio resources, the UE synchronizes to the (target) SN.

NOTE 6: The order the UE performs Random Access towards the MN (step 7) and performs the Random Access procedure towards the (target) SN (step 9) is not defined.

10. If the RRC connection reconfiguration procedure was successful, the target MN informs the (target) SN via *SN Reconfiguration Complete* message.

11. The target MN sends the *Handover Success* message to the source MN to inform that the UE has successfully accessed the target cell. In case of CHO with candidate SCG(s), the target PSCell ID may also be included in the *Handover Success* message.

12a/b. The source MN sends *SN Release Request* message to the (source) SN including a Cause indicating MCG mobility. The source MN indicates to the (source) SN that the UE context in SN is kept, if it receives the indication from the target MN. The (source) SN acknowledges the release request.

12c. The source MN sends *XN-U Address Indication* message to the (source) SN to transfer data forwarding information. More than one data forwarding addresses may be provided if the PDU session is split in the target side.

12d. The source MN sends the *Handover Cancel* message toward the other signalling connections or other candidate MNs, if any, to cancel CHO for the UE.

12e/f. If the target MN is configured with other candidate PCell(s) associated with other candidate SN(s) than the target SN, the target MN sends the *SN Release Request* message(s) to the corresponding candidate SN(s). Other candidate MN(s) send(s) the *SN Release Request* message(s) to other candidate SN(s), if configured. The other candidate SN(s) acknowledges the release request.

13a. The (source) SN sends the *Secondary RAT* *Data Usage Report* message to the source MN and includes the data volumes delivered to and received from the UE over the NR/E-UTRA radio as described in clause 10.11.2.

NOTE 7: The order the source SN sends the *Secondary RAT Data Usage Report* message and performs data forwarding with MN/target SN is not defined. The SN may send the report when the transmission of the related QoS is stopped.

13b. The source MN sends the *Secondary RAT Data Usage Report* message to AMF to provide information on the used NR/E-UTRA resource.

14. For bearers using RLC AM, the source MN sends the *SN Status Transfer* message to the target MN, including, if needed, SN Status received from the source SN. The target MN forwards the SN Status to the target SN, if needed.

15. If applicable, data forwarding takes place from the source side (i.e. source MN or source SN) to the accessed target side (i.e. target MN or target SN). If the SN is kept, data forwarding may be omitted for the SN terminated bearers or QoS flows kept in the SN.

16-19. The target MN initiates the Path Switch procedure*.* If the target MN includes multiple DL TEIDs for one PDU session in the *Path Switch Request* message, multiple UL TEID of the UPF for the PDU session should be included in the *Path Switch Ack* message in case there is TEID update in UPF.

NOTE 8: If new UL TEIDs of the UPF for SN are included, the target MN performs MN initiated SN Modification procedure to provide them to the SN.

20. The target MN initiates the UE Context Release procedure towards the source MN.

21. Upon reception of the *UE Context Release* message from source MN, the (source) SN releases C-plane related resources associated to the UE context towards the source MN. Any ongoing data forwarding may continue. The SN shall not release the UE context associated with the target MN if the UE contest kept indication was included in the *SN Release Request* message in step 12a.

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| **Remaining text not changed** |