3GPP TSG-RAN WG3 #121 R3-234632

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Toulouse, France

Agenda Item: 14.3

Source: ZTE, Samsung, ?Huawei, ?Ericsson, ?Nokia, Nokia Shanghai Bell

Title: (TP to TS 37.340 BC CR on CHO with SCG) Support of CHO with multiple SCGs

Document for: Approval

# Introduction

This TP is used to capture the following progress.

CHO with multiple SCGs:

**For CHO with multiple SCGs among different T-SNs, include list of info of multiple SCGs in Handover Request Ack message, e.g., PDU Session admission results, data forwarding addresses and list of prepared PSCells for each prepared T-SN. This agreement can be revisited after RAN2 agreement.**

**The initiating node provides “maximum number of Conditional reconfigurations to prepare” in Rel-17, “(maximum) number of Conditional reconfigurations to prepare*”* could be indicated by the**

* + **S-MN to T-MN within the Handover Request message,**
  + **T-MN to T-SN within the SN Addition Request message**

**The PDU session admission result in Handover Request Acknowledge message is per T-SN.**

**The Tunnel granularity in Handover Request Acknowledge message is per T-SN.**

**Enhancement of Handover SUCCESS message considering early data forwarding, to inform S-SN which PSCells/T-SN in the HO Req ACK is selected in the HO Req ACK message. T-SN ID could be enough.**

**Whether transmit SN ID directly or use the PSCell ID (including SN ID) for future proof is FFS.**

**Option 1. Include T-SN ID in the HO SUCCESS message**

**Option 2. Include PSCell ID in the HO SUCCESS message**

# Text Proposal to 37.340

**--------------------------------------------------------- the start of change -------------------------------------------------------------**

10.19.2 MR-DC with 5GC

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.

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**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 provides “maximum number of Conditional reconfigurations to prepare” to candidate MN 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 *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 provides “maximum number of Conditional reconfigurations to prepare” to candidate SN 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.

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 4a0: In CHO with (multiple) SN configurations, the (candidate) SN assigns the same data forwarding addresses for multiple data forwarding requests from different target MNs. If available, the (candidate) SN indicates direct data forwarding path availability with the source node(s).

*Editor’s note: Details of the indication(s) from the target SN are FFS.*

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.

* For CHO with multiple candidate SCGs among different T-SNs, the target MN includes list of info of multiple SCGs in the *Handover Request Acknowledge* message, e.g., PDU Session admission results, data forwarding addresses and list of prepared PSCells for each prepared T-SN. The PDU session admission result and Tunnel granularity are per T-SN.

*Editor’s note: This agreement can be revisited after RAN2 agreement.*

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.

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 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 RRC reconfiguration complete\* 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 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), enhancement of *Handover Success* message considering early data forwarding, informs source SN which PSCells/T-SN in the *Handover Request Acknowledge* messag is selected in the *Handover Success* message. T-SN ID could be enough.

*Editor’s note: Whether transmit SN ID directly or use the PSCell ID (including SN ID) for future proof is FFS.*

* + *Option 1. Include T-SN ID in the HO SUCCESS message*
  + *Option 2. Include PSCell ID in the HO 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). 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.

**--------------------------------------------------------- the end of change -------------------------------------------------------------**