**3GPP TSG-RAN WG2 Meeting #119bis-e *draftR2-2210810***

**Online, Oct 10th – 19th, 2022**

**Agenda item: 6.2.1**

**Source: ZTE Corporation**

**Title: Report of [AT119bis-e][201][DCCA] Stage-2 Corrections to DCCA (ZTE)**

**WID/SID: LTE\_NR\_DC\_enh2-Core – Release 17**

**Document for: Discussion and Decision**

# 1 Introduction

This document is to handle the following email discussion:

* **[AT119bis-e][201][DCCA] Stage-2 Corrections to DCCA (ZTE)**

      Scope: Discuss the documents marked for this discussion under AI 6.2.x and provide agreeable versions of CRs (if any) for endorsement.

Intended outcome: Report in in [R2-2210810](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210810.zip).

Deadline: Deadline 2 (report) / Deadline 3 (CRs)

The following documents are to be treated in this email discussion:

**By Email [201] (1)**

[R2-2210524](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210524.zip) Corrections for CHO with MR-DC ZTE Corporation (Rapporteur), Sanechips; Ericsson; CATT CR Rel-17 37.340 17.2.0 0350 - F TEI17, LTE\_NR\_DC\_enh2-Core

* **CR to be finalized under [201]**

**By Email [201] (2)**

[R2-2209478](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2209478.zip) Correction on CHO with MR-DC in TS 37.340 vivo draftCR Rel-17 37.340 17.2.0 F LTE\_NR\_DC\_enh2-Core

[R2-2210305](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_119bis-e/Docs/R2-2210305.zip) Correction on evaluations during CPAC execution Ericsson CR Rel-17 37.340 17.2.0 0349 - F LTE\_NR\_DC\_enh2-Core

The participants are invited to provide their contact information in the following table.

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# 2 Discussion

## 2.1 CHO with MR-DC in [1][2]

In the Monday online session, it’s agreed:

* 1: RAN2 introduces a new section with signaling flows to capture procedures for CHO with MR-DC in TS 37.340.
* FFS how to handle SCG addition with CHO. Can be discussed in [201].
* FFS if we need to send LS to RAN3 (can be checked once the CR has converged)

Both [1] and [2] proposed the related changes on how to capture the signalling procedures for CHO with MR-DC in TS 37.340.

In [1], it’s suggested to introduce a new section for the co-existence of conditional handover and MR-DC. A common procedural text and signalling flow can be used for both CHO with/without SN change procedure and CHO with SN addition procedures, with some notes and specific text descriptions to distinguish the different parts (see the highlighted part below).

Besides, some changes in section 10.1, 10.7 and 10.9 are proposed to detach CHO with SCG configuration procedure from legacy Inter-Master Node handover with/without Secondary Node change and eNB/gNB to Master Node change procedure.

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| **Change#1:** Add a new section with signaling flows for the co-existence of conditional handover and MR-DC.  10.x Coexistence of Conditional Handover and MR-DC  10.x.1 EN-DC  The coexistence of Conditional Handover and MR-DC procedure is used to transfer a UE context from a source MN to a target MN while CHO is configured with SCG. In case of the coexistence of Conditional Handover and Inter-Master Node handover with/without Secondary Node change, the UE context at the SN is kept or moved to another SN.    **Figure 10.X.1-1: Coexistence of Conditional Handover and EN-DC procedure**  Figure 10.x.1-1 shows an example signaling flow for coexistence of Conditional Handover and EN-DC.  NOTE 1: For a coexistence of Conditional Handover and Inter-Master Node handover without Secondary Node change, the source SN and the target SN shown in Figure 10.x.1-1 are the same node.  NOTE 1a: For a coexistence of Conditional Handover and eNB to Master Node change, the source SN and steps involved with the source SN in Figure 10.x.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 2: In case of the coexistence of Conditional Handover and Inter-Master Node handover with/without Secondary Node change, the source MN may trigger the MN-initiated SN Modification procedure (to the source SN) to retrieve the current SCG configuration 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., CHO Information SN Addition IE.  3. The (candidate) SN replies with the *SN Addition Request Acknowledge* message. The (candidate) SN may include the indication of full or delta RRC configuration.  NOTE 2a: 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.  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 the SCG configuration in the *RRCReconfiguration\*\** messagereceived from the candidate SN in step 3 and an MCG configuration.  6. The UE applies the *RRCConnectionReconfiguration* message received in step 5, starts evaluating the CHO execution conditions for the candidate cell(s), stores the CHO configuration and replies to the MN with an *RRCConnectionReconfigurationComplete* message.  Editor’s Note: FFS. It’s up to RAN3 decision when to perform early data forwarding for SN-terminated bearers.  7/8. 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. The UE releases stored CHO configurations after successful completion of RRC handover procedure.  NOTE 3: 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 4: The order the UE performs Random Access towards the MN and performs the Random Access procedure towards the (target) SN 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 *SN Release Request* message to the (source) SN including a Cause indicating MCG mobility. The (source) SN acknowledges the release request. 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.  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. The target MN or/and other candidate MN(s) sends the *SgNB Release Request* message(s) to other candidate SN(s), if configured. The other candidate SN(s) acknowledges the release request.  13a. The SN 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 5: 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 forwards the SN Status to the target SN, if needed.  15. If applicable, data forwarding takes place from the source side. 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 6: 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.  Note: There are similar procedures for MR-DC with 5GC as well.  **Change#2:** Remove the notes for CHO with SCG configuration in section 10.7 and 10.9.  NOTE 3b: Void.  NOTE 2a0: Void.  NOTE 0: Void.  NOTE 0: Void.  **Change#3:** Update the text in section 10.1 to clarify that CHO is supported in Master Node to eNB/gNB Change procedure, and Coexistence of Conditional Handover and MR-DC procedure.  In MR-DC, CHO is supported in Master Node to eNB/gNB Change procedure and Coexistence of Conditional Handover and MR-DC procedure. |

In [2], it’s proposed to introduce new sections for CHO with/without SN change procedure and CHO with SN addition procedure, respectively:

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| **10.x CHO with/without MN initiated Secondary Node change****10.x.1 EN-DC** CHO with/without MN initiated Secondary Node change is used to transfer context data from a source MN to a target MN while the context at the SN is kept or moved to another SN. During an Inter-Master Node conditional handover, the target MN decides whether to keep or change the SN (or release the SN, as described in clause 10.8).    Figure 10.x.1-1: CHO with/without MN initiated SN change procedure  Figure 10.x.1-1 shows an example signaling flow for CHO with or without MN initiated Secondary Node change:  NOTE 1: For CHO without Secondary Node change, the source SN and the target SN shown in Figure 10.x.1-1 are the same node.  1. The source MN starts the conditional handover procedure by initiating the X2 Handover Preparation procedure including both MCG and SCG configuration. The source MN includes 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 2: The source MN may trigger the MN-initiated SN Modification procedure (to the source SN) to retrieve the current SCG configuration before step 1.  2. If the target MN decides to keep the UE context in SN, the target MN sends *SgNB Addition Request* 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 target MN decides to change the SN allowing delta configuration, the target MN sends the *SgNB Addition Request* to the target SN including the UE context in the source SN that was established by the source MN. Otherwise, the target MN may send the *SgNB Addition Request* to the target 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 target MN includes the CHO Information SN Addition IE.  3. The (target) SN replies with *SgNB Addition Request Acknowledge*. The (target) SN may include the indication of the full or delta RRC configuration.  NOTE 3: In CHO with SCG configuration, it is up to the target MN implementation to make sure that the CG-Config provided from the (target) SN can be used in all CHO preparations.  4. The target MN includes within the *Handover Request Acknowledge* message a transparent container to be sent to the UE as an RRC message to perform the handover, and may also provide forwarding addresses to the source MN. The target MN indicates to the source MN that the UE context in the SN is kept if the target MN and the SN decided to keep the UE context in the SN in step 2 and step 3.  5. The source MN sends an *RRCConnectionReconfiguration* message to the UE, containing the configuration of CHO candidate cell(s), CHO execution condition(s), and SCG configuration.  6. UE sends the MN *RRCConnectionReconfigurationComplete* message to confirm the reception of CHO configuration message. Upon receiving the MN *RRCConnectionReconfigurationComplete* message from the UE, the source MN may start early data forwarding. The PDCP SDU forwarding may take place during early data forwarding.  7/8. The UE starts evaluating the CHO execution conditions for the candidate cell(s). If at least one CHO candidate cell satisfies the corresponding CHO execution condition, the UE synchronizes to the target MN and replies with *RRCConnectionReconfigurationComplete* message.  NOTE 4: 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 5: The order the UE performs Random Access towards the MN (step 7) and performs the Random Access procedure towards the 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 informs the source MN via HANDOVER SUCCESS message.  12. The source MN sends *SgNB Release Request* message to the (source) SN including a Cause indicating MCG mobility. The (source) SN acknowledges the release request.  13. The source MN sends the HANDOVER CANCEL message toward other candidate target MNs, if any, to cancel CHO for the UE.  14a. The 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 6: 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.  14b. The source MN sends the *Secondary RAT Report* message to MME to provide information on the used NR resource.  15. 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 forwards the SN Status to the target SN, if needed.  16. If applicable, data forwarding takes place from the source side. If the SN is kept, data forwarding may be omitted for SN-terminated bearers kept in the SN.  17-20. The target MN initiates the S1 Path Switch procedure.  NOTE 7: 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.  21. The target MN initiates the UE Context Release procedure towards the source MN.  22. 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 12. **10.y CHO with Secondary Node Addition****10.y.1 EN-DC** The CHO with secondary node addition procedure is used to transfer context data from a source eNB to a target MN that adds an SN during the conditional handover.    Figure 10.y.1-1: CHO with SN addition procedure  Figure 10.y.1-1 shows an example signaling flow for CHO with Secondary Node addition:  1. The source eNB starts the conditional handover procedure by initiating the X2 Handover Preparation procedure. The source eNB includes the Conditional Handover Information Request IE in the *Handover Request* message.  2. The target MN sends *SgNB Addition Request* to the target SN. Within the *SgNB Addition Request* message, the target MN includes the CHO Information SN Addition IE.  3. The target SN replies with *SgNB Addition Request Acknowledge* message. If data forwarding is needed, the target SN provides forwarding addresses to the target MN.  NOTE 1: In CHO with SCG configuration, it is up to the target MN implementation to make sure that the CG-Config provided from the target SN can be used in all CHO preparations.  4. The target MN includes within the *Handover Request Acknowledge* message a transparent container to be sent to the UE as an E-UTRA RRC message, including a NR RRC configuration message which also includes the SCG configuration, to perform the conditional handover, and may also provide forwarding addresses to the source eNB.  5. The source eNB sends an *RRCConnectionReconfiguration* message to the UE, containing the configuration of CHO candidate cell(s), CHO execution condition(s), and SCG configuration.  6. UE sends the *RRCConnectionReconfigurationComplete* message to confirm the reception of CHO configuration message. Upon receiving the *RRCConnectionReconfigurationComplete* message from the UE, the source eNB may start early data forwarding. The PDCP SDU forwarding may take place during early data forwarding.  7/8. The UE starts evaluating the CHO execution conditions for the candidate cell(s). If at least one CHO candidate cell satisfies the corresponding CHO execution condition, the UE synchronizes to the target MN and replies with *RRCConnectionReconfigurationComplete* message.  9. If configured with bearers requiring SCG radio resources, the UE synchronizes to the (target) SN.  NOTE 2: The order the UE performs Random Access towards the MN (step 7) and performs the Random Access procedure towards the 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 informs the source eNB via HANDOVER SUCCESS message.  12. The source eNB sends the HANDOVER CANCEL message toward other candidate target MNs, if any, to cancel CHO for the UE.  13. For bearers using RLC AM, the source eNB sends the *SN Status Transfer* message, which the target MN forwards then to the target SN, if needed.  14. If applicable, data forwarding from the source eNB takes place.  15-18. The target MN initiates the S1 Path Switch procedure.  NOTE 3: If new UL TEIDs of the S-GW are included, the target MN performs MN initiated SN Modification procedure to provide them to the target SN.  19. The target MN initiates the *UE Context Release* procedure towards the source eNB.  Note: There are similar procedures for MR-DC with 5GC as well. |

Regarding how to capture the procedure and signalling flow for CHO with SCG addition, there are two options on the table:

* **Option 1**: Have one common procedure text and signalling flow for both CHO with/without SN change and CHO with SN addition procedures, with some notes and specific text descriptions to distinguish the different parts between these two procedures.
* **Option 2**: Introduce separate signalling procedures for CHO with/without SN change and CHO with SN addition.

**Rapporteur comments:**

Both options can work. However, the overall procedures for CHO with/without SN change and CHO with SN addition are very similar except some steps involved with the source SN could be ignored/skipped in CHO with SN addition procedure. So it’s preferred to go for option 1, to avoid the repeated procedure description and heavy maintenance work.

**Question 1: Regarding how to capture the procedure and signalling flow for CHO with SCG addition, which option do you prefer?**

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| Company | Option 1/2 | Comments if any |
| ZTE | Option 1 | Option 1 is clear enough for both CHO with/without SN change and CHO with SN addition procedures. And it would be more future proof considering that less maintenance work for each procedure description is required. |
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**Question 1a: If option 1 is preferred, do you agree with the changes proposed in [1]?**

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| ZTE | Yes | Proponent |
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**Question 1b: If option 2 is preferred, do you agree with the changes proposed in [2]?**

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## 2.2 Correction on evaluations during CPAC execution in [3]

**Reason for change:**

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| In the section 10.2.3 on Conditional PSCell Addition and 10.6 on PSCell Change, it is described that the UE is not required to continue evaluation of other candidate PSCell(s) while executing CPA or CPC, respectively. Since Rel-17, simultaneous configuration of CHO and CPC or CPA is however supported, which means that the UE can be configured with conditional configurations for both candidate PCells and candidate PSCells.  The descriptions in 10.2.3 and 10.6 can thus be interpreted as that the UE is required to still evaluate candidate PCells while executing CPA or CPC, which is not correct. |

**Summary for change:**

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| **Change#1:** In section 10.2.3, clarify that the UE is also not required to evaluate candidate PCells, i.e. for CHO, while executing CPA.  - While executing CPA, the UE is not required to continue evaluating the execution condition of other candidate PSCell(s) or PCell(s).  **Change#2:** In section 10.6, clarify that the UE is also not required to evaluate candidate PCells, i.e. for CHO, while executing CPC.  - While executing CPC, the UE is not required to continue evaluating the execution condition of other candidate PSCell(s) or PCell(s). |

**Rapporteur comments:**

Agree with the changes. The changes can be merged to the rapporteur CR.

**Question 2: Do you agree with the changes proposed in [3]?**

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| Company | Yes/No | Comments if any |
| ZTE | Yes |  |
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# 4 Conclusion

TBD

# 5 References

1. R2-2210524 Corrections for CHO with MR-DC ZTE Corporation (Rapporteur), Sanechips; Ericsson; CATT CR Rel-17 37.340 17.2.0 0350 - F TEI17, LTE\_NR\_DC\_enh2-Core
2. R2-2209478 Correction on CHO with MR-DC in TS 37.340 vivo draftCR Rel-17 37.340 17.2.0 F LTE\_NR\_DC\_enh2-Core
3. R2-2210305 Correction on evaluations during CPAC execution Ericsson CR Rel-17 37.340 17.2.0 0349 - F LTE\_NR\_DC\_enh2-Core