**3GPP T****SG-RAN WG3 Meeting #107bis-e R3-202500**

**Electronic Meeting, April 20th – 30th, 2020**

**Agenda item: 15.3.1.1**

**Source: Intel Corporation**

**Title:** **Summary for CB: # 17\_Email\_MobEnh\_CHO\_CondPSCell\_General**

**Document for: Discussion and Decision**

# 1 Introduction

This is to discuss the following CB: #17:

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| **CB: # 17\_Email\_MobEnh\_CHO\_CondPSCell\_General**  **- Use DL RRC Mess Trsf + modify signaling flow + modify X2AP SgNB Reconfig complete? (Intel); Merge from 1879 (HW), 2243-45 (GG) if possible**  **- go for minimum agreeable set**  (Intel - moderator)  Summary of offline disc |

Phase 3 – please check the proposed TPs until **April 27th (Monday) 1300 UTC**

# 2 For the Chairman’s Notes

TBD

# 3 Discussion

Three issues were identified from Intel[2293-96], Google[2244-45], Huawei[1879].

## 3.1 Correction Issue 1 – DL RRC MESSAGE TRANSFER

The following were observed and proposed in Intel[2293-96]:

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***Figure 8.2.1.X-1: Inter-gNB-DU Conditional Handover or PSCell Change for intra-NR***

***Observation 1:*** *During conditional mobility, the UE maintains connection and data delivery with the source gNB-DU until an execution condition is met for a candidate cell.*

***Observation 2:*** *Unlike in legacy HO, when configuring CHO command to the UE, the source gNB-DU is not told to stop data transmission to the UE. No need to use an expensive UE CONTEXT MODIFICATION procedure to transfer an RRC message in the intra-NR scenario step 5.*

***Proposal 1: For intra-NR scenario, use DL RRC MESSAGE TRANSFER in step 5 to carry CHO command to the source gNB-DU, instead of using the UE Context Modification procedure.***

***Proposal 2: Apply Proposal 1 in the same way for the Inter-gNB HO involving CU-UP change step 6.***

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### **Question 1: Please provide comments for the above proposals.**

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| **Company** | **Agree?** | **Comments** |
| Google | Yes/neutral | It seems that DL RRC Message Transfer also works for carrying the CHO/CPC command. |
| Samsung | Yes |  |
| ZTE | Neutral | DL RRC Message Transfer can also work. |
| NEC | Yes |  |
| Huawei | Neutral | No strong view, but could this be done by CU implementation? |
| CATT | Neutral | DL RRC Message Transfer can work, but using the UE Context Modification procedure also has no problem. So both messages are feasible. |
| QC | Neutral | DL RRC Message Transfer may be more efficient. But, UE Context Modification is also fine. So, we’d better leave it up to implementation. |
| Nokia | No/neutral | We do not have a strong opinion, but logically, if there is already UE context set up, wouldn’t it be more logical to use the Context Modification? Again, not sure, but it is similar in E1, isn’t it? |

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### **Summary**

* Yes (4) : Intel, Google, Samsung, NEC
* Neutral (5) : ZTE, Huawei, CATT, QC, Nokia
* No (1) : Nokia

The proposals 1 and 2 above are up for agreement. The corresponding TP for 38.401 BL CR was dropped.

**Proposal 1: For intra-NR scenario, use DL RRC MESSAGE TRANSFER in step 5 to carry CHO command to the source gNB-DU, instead of using the UE Context Modification procedure.**

**Proposal 2: Apply Proposal 1 in the same way for the Inter-gNB HO involving CU-UP change step 6.**

Replying to Nokia’s comment, Yes, using the UE Context Modifcation procedure is natural when there is something to modify the UE context, which is the case of a classic HO where the CU indicates to stop data transmission to the UE while forwarding HO CMD to the DU. However, in CHO or CPC, there is no such modification at all, simply forwarding HO CMD.

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## 3.2 Correction Issue 2 – Sequence of Steps 12-15.

The following were also observed and proposed in Intel[2293-96]:

***Observation 3:*** *In legacy, target gNB-DU, once it verifies the UE has successfully accessed, sends DDDS to gNB-CU as a confirmation, which can enable gNB-CU to trigger data transmission to the UE early as possible without having to rely on the RRCReconfigurationComplete message.*

***Observation 4:*** *However, current sequence of procedures relies on this RRC-layer acknowledgement (steps 12-13) for the subsequent action that gNB-CU informs the source gNB-DU, i.e., make it stop transmission and send DDDS of not delivered status (steps 14-15), which may delay data transmission to the UE through the target gNB-DU.*

***Observation 5:*** *Placing steps 14-15 earlier than steps 12-13 can enable fetching DDDS from the source gNB-DU to happen as soon as gNB-CU receives DDDS confirmation from the target gNB-DU that the UE successfully accessed.*

***Proposal 3: For intra-NR scenario, place the gNB-CU’s UE Context Modification procedure (steps 14-15) earlier than carrying the RRCReconfigurationComplete message (steps 12-13) so the latter does not stall the gNB-CU’s data transmission to the UE through the target gNB-DU.***

***Proposal 4: Apply Proposal 3 in the same way for EN-DC scenario.***

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### **Question 2: Please provide comments for the above proposals.**

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| **Company** | **Agree?** | **Comments** |
| Google | No | For CHO, the RRC Reconfiguration Complete message can be part of the Msg3 if it is a contention-based random access. So it seems not correct if UE CTXT MOD procedure is placed before the Msg3 in such case.  For CPC, the RRC Reconfiguration Complete message via SRB1 may actually be sent before the RACH procedure with target node (the order is not strictly defined but it is shown in such order in 37.340). So the proposal 4 seems not necessary. |
| INTEL | Yes | The step 11 (Random Access Procedure) includes DU receiving the C-RNTI MAC CE (as part of msg3) in case of contention-based random accesss, that’s why DU can safely send DDDS to CU as a confirmation that the UE successfully arrived. The step 12 does not mean DU receives the msg3. It means DU receives the RRC Reconfiguration Complete message from the UE.  The intention here is to allow CU to perform transmission early based on DDDS confirmation rather than waiting for the RRC Reconfiguration Complete message, which is usually sent later. As analysed in my paper R3-202293, the Reconfiguration Complete message is an UL-DCCH which has lower priority than the C-RNTI MAC CE, and even lower priority than BSR, which often makes that RRC ack not sent immediately if not enough resources allocated for msg3 in the first uplink grant.  The argument is the same for EN-DC, which is to make CU rely on DDDS confirmation rather than the Reconfiguration Complete message via SRB1. And in general, sending the Reconfiguration Complete message is after receiving RAR. |
| Samsung | No? | We could understand the enhancement, but we wonder how it works. We have question on how the DDDS can trigger the UE Context Modification procedure, especially in case of CP-UP split arhictecture. |
| ZTE | No | Although L2 DDDS can indicate that UE has accessed the target cell, but normally the CU (L3 entity) only confirms that arrival fully successfully after receiving L3 RRC Reconfiguration Complete message. Since CHO does not pursue interruption time performance, we tend to be more cautious. |
| NEC |  | It may not be so important if to think the stage 2 is only an example namely implementation can choose to send step 14 / 15 early if there is no inter-operability issue foreseen. But, likely need to have further look if rely on DDDS will work well. |
| Huawei | No | It seems problematic in CP-UP split case like Samsung said. This may need extra E1signaling. And furthermore, sucessful RACH procedure does not means the UE can send out the RRCreconfigcomplte message sucessfully. |
| CATT | No | On the one hand, Msg 3 can also include the RRC Reconfiguration Complete message, in addition, late data forwarding is less sensitive to transmission delay. |
| QC | No | The gain is small and UE Context Modification cannot be sent before we know UE successfully access to target. |

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### **Summary**

* Yes (1) : Intel
* No (7) : Google, Samsung, ZTE, Hauwei, CATT, Qualcomm
* FFS (1) : NEC

There is a clear majority not to seek for. But some clarifications to keep in mind are as follows.

* The reason why the order is not defined in TS 37.340 is because the successful RA procedure towards the SCG is not required for a successful completion of the RRC Connection Reconfiguration procedure. However, for CPC, the order matters as in CHO or HO. The UE should not confuse NW by sending RRCConnectionReconfigurationComplete message when RACH fails.
* The concerns for CP-UP separation will be no longer valid if we introduce new F1AP message like HO SUCCESS to inform CU which cell the UE has accessed after RACH is successful, which is under discussion in CB : # 22.

Given these, the rapporteur would like to propose a way forward, which does not touch the figure, but rather add a note that steps 14-15 may happen earlier than steps 12-13. This is reflected into the TP for 38.401 BL CR with some minor editorials.

**Proposal 3: For intra-NR, add a note that the gNB-CU’s UE Context Modification procedure (steps 14-15) could happen earlier than carrying the RRCReconfigurationComplete message (steps 12-13).**

**Proposal 4: Apply Proposal 3 in the same way for EN-DC scenario.**

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## 3.3 Resolving FFS – SGNB RECONFIGURATION COMPLETE or RRC TRANSFER?

The following were also observed and proposed in Intel[2293-96]:



*Figure 8.2.2.X-1: Inter-gNB-DU Conditional PSCell Change using MCG SRB in EN-DC*

***Observation 6:*** *The successful SgNB Reconfiguration Completion procedure has been specified in X2AP that en-gNB shall stop the timer TDCoverall, which protects secondary node against failure during the SN-initiated SN modification procedure or MCG RRC reconfiguration as part of SN Addition or MN-initiated MN modification procedure. However, this timer has not been initiated when the step 13 happens in the EN-DC MCG SRB scenario.*

***Observation 7:*** *Another message without this timer involved, e.g. RRC TRANSER, requires major shifts in stage-3 in order to carry the RRCReconfigurationComplete message. However, the purpose of SGNB RECONFIGURATION COMPLETE well suits to carry this RRC-layer acknowledgement in step 13.*

***Proposal 5: For the EN-DC MCG SRB scenario step 13, remove FFS and go with the SGNB RECONFIGURATION COMPLETE message.***

***Proposal 6: Modify description accordingly in the X2AP SgNB Reconfiguration Completion procedure so that it is deemed successful even if the timer TDCoverall has not been initiated yet when receiving the SGNB RECONFIGURATION COMPLETE message.***

***Proposal 7: Apply Proposal 6 in the same way for the XnAP SN Reconfiguration Completion procedure.***

In addition, Google[2244-45] and Huawei[1879] also proposed to go with the SgNB Reconfiguration Complete message. As preferred by majority, this is now up for agreement.

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### **Question 3: Any objection to go with SgNB Reconfiguration Complete for the step 13?**

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| **Company** | **Comments** |
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So far, two TPs are on the table how to fix the mandatory behaviour for SN to stop the DCoverall timer:

* **Option 1** (from Intel[2295,2296])

Upon reception of the SGNB RECONFIGURATION COMPLETE message the en-gNB shall stop the timer TDCoverall. In case of conditional PSCell change, the en-gNB shall also consider the procedure successful even if the timer TDCoverall has not been initiated when receiving this message.

* **Option 2** (from Google[2244,2245])

Upon reception of the SGNB RECONFIGURATION COMPLETE message the en-gNB shall stop the timer TDCoverall if running.

### **Question 4: Please provide any views or comments to each option, and your preference.**

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| **Company** | **Preference** | **Comments** |
| Google | Opt 2 | Both options look OK. But the existing sentence should be corrected so that the en-gNB/NG-RAN node shall only stop the timer TDCoverall if it is running. |
| INTEL | Opt 1 | Appending “if running” works, but this is too broad, which can be applicable for any case. We should limit the scope only to conditional PSCell change for this exceptional case. |
| ZTE | Opt1+Opt2 | Both are fine. |
| NEC | Opt 2 | Simple way is enough. |
| Huawei |  | Either is OK. It seems 1 is more clear. |
| CATT | No | On the one hand, Msg 3 can also include the RRC Reconfiguration Complete message, in addition, late data forwarding is less sensitive to transmission delay. |
| QC | Opt 1 | No big difference. Opt 1 may be more accurate.  Furthermore, it seems to us that this scenario – i.e., timer TDCoverall has not been initiated when receiving this message – would occur even in case of regular PSCell change. Can you please check if it is the case? If it is true, the text needs to be further modified to include this case also. |
| Nokia | Opt 2 | Both proposals seem to describe the same behavior, so the simple the better. |

Different text proposals, if any, please add to the above.

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### **Summary**

* Option 1 (4) : Intel, ZTE, Huawei, Qualcomm
* Option 2 (4) : Google, ZTE, NEC, Nokia

Consensus is that both are fine in general. Breaking tie, the rapporteur suggests to go with Option 1 which is more accurate and confined within CPC. Minimalism creates confusions! R3-202295 and R3-202296 are up for agreement.

**Proposal 5: Agree R3-202295 and R3-202296.**

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# 4 Conclusion

**Proposal 1: For intra-NR scenario, use DL RRC MESSAGE TRANSFER in step 5 to carry CHO command to the source gNB-DU, instead of using the UE Context Modification procedure.**

**Proposal 2: Apply Proposal 1 in the same way for the Inter-gNB HO involving CU-UP change step 6.**

**Proposal 3: For intra-NR, add a note that the gNB-CU’s UE Context Modification procedure (steps 14-15) could happen earlier than carrying the RRCReconfigurationComplete message (steps 12-13).**

**Proposal 4: Apply Proposal 3 in the same way for EN-DC scenario.**

**Proposal 5: Agree R3-202295 and R3-202296.**

# 5 Reference

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| --- | --- | --- |
| * + - * 1. ***15.3.1.1. Conditional PSCell Change***   *Conditional PSCell change: previous summary of offline disc in* [*R3-196149*](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_105bis/Docs/R3-196149.zip)*, noted – to be continued…* | | |
| **GENERAL** | | |
| [R3-202076](C:\\3GPP\\RAN2-109bis\\TSGR3_107bis_e\\Inbox\\Drafts\\CB # 17_Email_MobEnh_CHO_CondPSCell_General\\Docs\\R3-202076.zip) | Supporting Conditional PSCell Change using MCG SRB (Samsung) | discussion |
| [R3-202077](C:\\3GPP\\RAN2-109bis\\TSGR3_107bis_e\\Inbox\\Drafts\\CB # 17_Email_MobEnh_CHO_CondPSCell_General\\Docs\\R3-202077.zip) | (TP for NR\_Mob\_enh BL CR for TS 38.401) Supporting Conditional PSCell Change using MCG SRB (Samsung) | other |
| [R3-202078](C:\\3GPP\\RAN2-109bis\\TSGR3_107bis_e\\Inbox\\Drafts\\CB # 17_Email_MobEnh_CHO_CondPSCell_General\\Docs\\R3-202078.zip) | (TP for LTE\_feMob BL CR for TS 36.423) Supporting Conditional PSCell Change using MCG SRB (Samsung) | other |
| [R3-202079](C:\\3GPP\\RAN2-109bis\\TSGR3_107bis_e\\Inbox\\Drafts\\CB # 17_Email_MobEnh_CHO_CondPSCell_General\\Docs\\R3-202079.zip) | (TP for NR\_Mob\_enh BL CR for TS 38.423) Supporting Conditional PSCell Change using MCG SRB (Samsung) | other |
| [R3-202293](file:///C:\Works\3GPP-RAN3\RAN3-Docs\2020\R3-202293_Corr_FFS_inter-DU_CHO_disc_vS.doc) | Correction and Resolving FFS on inter-gNB-DU conditional mobility scenarios (Intel Corporation) | discussion |
| [R3-202294](C:\\3GPP\\RAN2-109bis\\TSGR3_107bis_e\\Inbox\\Drafts\\CB # 17_Email_MobEnh_CHO_CondPSCell_General\\Docs\\R3-202294.zip) | (TP for NR\_Mob\_enh-Core BL CR for TS 38.401): Correction and Resolving FFS on inter-gNB-DU conditional mobility scenarios (Intel Corporation) | other |
| [R3-202295](file:///C:\Works\3GPP-RAN3\RAN3-Docs\2020\R3-202295_Corr_FFS_inter-DU_CHO_36.423_vS.doc) | (TP for LTE\_feMob-Core BL CR for TS 36.423): Correction and Resolving FFS on inter-gNB-DU conditional mobility scenarios (Intel Corporation) | other |
| [R3-202296](file:///C:\Works\3GPP-RAN3\RAN3-Docs\2020\R3-202296_Corr_FFS_inter-DU_CHO_38.423_vS.doc) | (TP for NR\_Mob\_enh-Core BL CR for TS 38.423): Correction and Resolving FFS on inter-gNB-DU conditional mobility scenarios (Intel Corporation) | other |
| [R3-202244](file:///C:\Works\3GPP-RAN3\RAN3-Docs\2020\R3-202244--TP-for-LTE_feMob-BL-CR-for-TS-36.423--RRC-RECONFIGURATION-COMPLETE.doc) | (TP for LTE\_feMob BL CR for TS 36.423) RRC Reconfiguration Complete for CPC (Google Inc.) | other |
| [R3-202245](file:///C:\Works\3GPP-RAN3\RAN3-Docs\2020\R3-202245--TP-for-NR-Mob-BL-CR-for-TS-38.423--RRC-RECONFIGURATION-COMPLETE.doc) | (TP for NR\_Mob\_enh BL CR for TS 38.423) RRC Reconfiguration Complete for CPC (Google Inc.) | other |
| [R3-201879](file:///C:\Works\3GPP-RAN3\RAN3-Docs\2020\R3-201879.doc) | (TP for NR\_Mob\_enh BL CR for TS 38.401): RRCReconfigurationComplete Transfer in Conditional Pscell Change (Huawei) | other |