3GPP TSG-RAN WG2 Meeting #109e R2-20xxxxx

Elbonia, Online, 24 February – 6 March 2020

**Agenda item: 6.9.4.2**

**Source: CATT (summary rapporteur)**

**Title: Report of [AT109e][215][NR MOB] Finalization of CPC and discussing remaining open issues**

**WID/SID: NR\_Mob\_enh-Core - Release 16**

**Document for: Discussion and Decision**

# 1 Introduction

This is to gather the company views on the open issues of CPC listed in conclusion of section of R2-2000901.

* [AT109e][215][NR MOB] Finalization of CPC and discussing remaining open issues (CATT)

Scope:

* + - Agreeing on the proposals as per [R2-2000901](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000901.zip) (as much as possible).
    - Discuss open items as per [R2-2000901](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_109_e/Docs/R2-2000901.zip) to seek companies feedback on open issues for CPC.

      Intended outcome:

* + - Proposals with consensus that can be incorporated (if needed) in the running CR(s) (aim to agree to those over email)
    - List of remaining open issues that need to be pursued in next meeting (if any).
    - Issues that should no longer be pursued

      Deadline for providing comments:

* + - Companies input: Thursday, Feb. 27th 3:00 CET
    - Rapporteur proposals: Friday, Feb. 28th 12:00 CET
    - Comments on proposals’ wording, Monday March 2nd by 17:00 CET

# 2 Open issues for discussion

In R2-2000901, it was considered that the following agreements can easily be agreed.

**Agreements proposed to be agreed in this meeting (easy agreements)**

S1\_1: While executing CPC procedure, the UE continues to receive RRC reconfiguration from the MN. However, the UE should finalise the ongoing CPC execution before processing the RRC message received from the MN (same as in the conventional PSCell change). i.e. legacy behaviour and no specific UE requirement.

S1\_2: As in legacy PSCell change, the UE sends *RRCReconfigurationComplete* to the MN at execution of CPC when no SRB3 is configured and the MN informs the SN. i.e the complete message to MN includes an embedded complete message to the SN.

S1\_4. Upon RLF on PCell during the execution of Conditional PScell change for intra-SN change without MN involvement, the UE supports the Rel-16 MR-DC procedures, i.e. performs connection re-establishment procedure without any fast MCG link recovery,

S3\_11. UE checks the validity of conditional PSCell change execution criteria configuration immediately on receiving the conditional PSCell change RRC Reconfiguration message, either embedded in the MN RRC message over SRB1 or received over SRB3 (same as CHO).

S3\_12. Introduce no specification changes regarding compliance checking of embedded Reconfiguration message containing configuration of conditional PSCell candidate (same as for CHO).

**Question 1: Is the above list of proposals agreeable?**

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Agreeable proposals | Not agreeable proposals | Comments |
| OPPO | All proposals |  |  |
| Samsung | Agree on S1\_1, S1\_2, S1\_4, S3\_11, S3\_12 |  |  |
| ZTE | S1\_4, S3\_11, S3\_12 | S1\_1, S1\_2 | For S1\_1, we think the main issue is that it is not clear whether the RRC reconfiguration received in MN side can be used to process SN change or MN change with SN change, in which case it is not clear which configuration should be used as the baseline of delta configuration for SN side. Since only the CPC without MN involved will be considered in Rel-16, we assume the MN may trigger SN change or MN involved SN change as well, in which case the MN will assume the CPC has not been executed. If the UE finalizes the ongoing CPC execution first and then process the RRC message received from the MN, the delta configuration based on the old SCG configuration may become invalid. Therefore, we prefer that the UE stop the on-going CPC execution and roll-back to the old SCG configuration.  For S1\_2, considering two RRCReconfigurationComplete messages for SN shall be transmitted upon reception of RRCReconfiguration message from MN and execution of CPC in case SRB3 is not configured, we prefer that the second RRCReconfigurationComplete message for SN (i.e. transmitted upon execution of CPC) can be encapsulated in ULInformationTransferMRDC in SRB1, instead of using RRCReconfigurationComplete in SRB1 ( i.e. RRCReconfigurationComplete in MN side can only be sent if there is a RRCReconfiguration message sent from MN to UE). |
| Ericsson | The proposals seem fine. |  | A question related to S1\_1is if the UE receives an RRC message during the CPC execution, it will also take some time before it has decoded it (per existing requirements). It will therefore really be a corner case where the UE receives the new RRC message and manages to decode it, before the CPC execution has finished. The issue brought up by ZTE would exist in legacy also, no need to specify CPC more than legacy- |
| Nokia | All proposals are OK |  |  |
| Lenovo&MM | Agree all proposals |  |  |
| Sharp | All proposals |  |  |
| Intel | All proposals |  |  |
| Futurewei | S1-1, S1-2, S3-11 | S1-4, S3-12 | For S1-4, it appears the reestablishment is started too early, There are three phases of CPC, during the first phase: after CPC is configured and before CPC execution, UE is basically under DC, if PCell RLF, DC fast PCell recovery can be simply applied, no spec. change. The second phase: CPC execution. In this phase, UE can simply follow the normal rule that execution should not be interrupted. The spec change is minimal for this behaviour. The third phase is after execution is completed: if connection is built with the target, simply conduct PCell fast recovery; if execution is failed, then it is the time go to reestablishment. In general, except the execution phase, both phase 1 &3 is under typical DC PCell RLF scenario, the required changes are minimal.  For S3-12, it un-necessarily triggers the reestablishment when PCell link is good. CPC operations are in general under DC. The PCell link is even more reliable than CHO case, It is over kill to break an existing good connection due to that conditional PSCell configuration is invalid, and the configuration is even not applied yet. Although invalid configuration occurs at very small chance, but the tail behavior matters for service performance. We don’t see new from existing mechanism is a good reason to give up this approach. CPC is new, necessary changes should be made if we see clear improvement. The existing SCG failure report message can be used with new failure code for compliance failure. |
| NEC | All proposals |  |  |
| ETRI | All proposals except S1\_2 | S1\_2 | For S1\_2, we share the view with ZTE. We prefer a different message (e.g., ULInformationTransferMRDC or a new one) than RRCReconfigurationComplete message. |
| CATT | All proposals |  |  |
| LG | All proposals |  |  |

**Open items proposed to be further discussed in this meeting**

There are number of open issues identified for discussion in this meeting [R2-2000901]. I try to gather company opinions on each of the discussion point aiming to conclude or find a way forward to the open issues.

S1\_3: Discuss message formatting for *RRCReconfigurationComplete* to the MN at configuration of CPC when no SRB3 is configured.

* Option 1: the complete message to MN includes an embedded complete message to the SN.
* Option 2: the complete message to MN does not include an embedded complete message to the SN.

**Question 2: Which message formatting is to be used for *RRCReconfigurationComplete* to the MN at configuration of CPC when no SRB3 configured?**

|  |  |  |
| --- | --- | --- |
| Company | Option 1 or Option 2 | Comments |
| OPPO | Option 1 | SN needs to receive the compete message. |
| Samsung | Option 2 | We have the following reasons:  We assume option 1 would require UE to performs compliance check immediately upon receipt (i.e. seems odd to return embedded message without doing compliance check). I.e. this seems not consistent with the intention to not introduce specification changes regarding actual moment of compliance checking (i.e. to leave up to UE implementation)  • The response provided upon configuration is merely a general confirmation i.e. an embedded message would not add anything compared to MN indicating via Xx to SN that the SCG reconfiguration was successful  • Some argued that it is important for MN to be aware that configuration of conditional PSCell change was successful. We are not sure this is needed, but even if, we think that addition of an embedded message would also not really increase MN awareness  • Not transferring an embedded message upon configuration (but only upon execution) aligns with what we do for CHO |
| ZTE | Option 1 | As CHO, the UE shall reply the RRCReconfigurationComplete to the source node (i.e. the SN) upon reception of RRCReconfiguration regardless of whether SRB3 is used or not. |
| Ericsson | Option 1 | We have agreed that the UE should send a Complete message upon configuration of CHO. The same should be done for CPC. The last bullet by Samsung is not correct. |
| Nokia | Option 1 | Agree with ZTE. That should not depend on whether SRB3 is used or not. |
| Lenovo&MM | Option 1 | The complete message should be transmitted to SN for the SN-initiated CPC. In addition, it is same as the complete message transmitted to gNB in the CHO. |
| Sharp | Option 1 | SN needs the embedded RRC response message to know the CPC configuration is successfully received by UE. |
| Intel | Option 1 | Agree with ZTE and Nokia. |
| Futurewei | Option 1 |  |
| NEC | Option 1 | Agree with ZTE |
| MediaTek | Option 1 |  |
| ETRI | Option 1 | Same view as ZTE. |
| CATT | Option 1 |  |
| LG | Option 1 | The SN should know whether the UE receives successfully so that the SN modify CPC configuration in the future. This is because this is only way to inform of the SN the reception of CPC configuration i.e. MN cannot inform that to the SN due to CPC w/o MN involvement. |

S1\_5: Discuss how to handle the simultaneous CHO and CPC configurations.

Option 1: Leave it up to the network implementation (OAM) to ensure there is no simultaneous CHO and CPC configurations (majority opinion from the email discussion 108#67).

Option 2: Let RAN3 to consider a simple per UE based solution to ensure there is no simultaneous CHO and CPC configurations.

Option 3: Specify UE behaviour such that the UE should prioritise CHO over CPC configuration at the UE.

Option 4: UE shall treat it as network error. Leave the decision to RAN3 on whether any changes are needed to ensure no simultaneous CHO+CPC.

**Question 3: Which option to be used for handling the simultaneous CHO and CPC configurations?**

|  |  |  |
| --- | --- | --- |
| Company | Option 1,2 or 3 | Comments |
| OPPO | Option 1 | Both CHO and CPC are configured by the network and we think network implementation should ensure they are not configured together. |
| Samsung | Option 1 |  |
| ZTE | Option 1 | We think it can be left to the network implementation. |
| Ericsson | Option 3 | Option 1 is not possible without RAN3 updates as highlighted by some companies in contributions (MN and SN may not be aware of what the other one is doing respectively). Considering this, we prefer option 3. |
| Nokia | Option 2 | It is not as easy as OPPO claims, as CHO and CPC may be configured by different nodes and without a mutual coordination. It cannot be always handled by the NW. Leaving this issue to OAM will result in very static configurations – either the UEs will have CHO or CPC, for a large area and without any means to configure that with per UE granularity. This is why we believe RAN3 could specify inter-node coordination for this purpose, without any impact on Uu ignaling. Please consider what we have submitted in [R2-2001007](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2001007.zip). |
| Lenovo&MM | Option 1 |  |
| Sharp | Option 1 |  |
| Intel | Option 4 | From UE side, if the network (MCG and SCG) configure CHO+CPC together, the UE shall treat it as network error and perform reestablishment.  The network handling should be decided by RAN3, i.e, whether it is implementation (option 1) or specify something in RAN3 (option 2). We can inform RAN3 about our decision, and let them to conclude. |
| Futurewei | Option 1 |  |
| NEC | Option 2 |  |
| MediaTek | Option 4 |  |
| ETRI | Option 1 |  |
| CATT | Option 1 |  |
| LG |  | We think this scenario is unavoidable but this issue might not be a problem.  This is because the UE will perform CHO or CPC which is firstly initiated. We think that both CHO and CPC cannot be executed at once if RAN2 have separated monitoring procedure for the CHO and CPC in the specification.  If CHO is firstly initiated, the UE executes CHO and release CPC configuration such like legacy HO handling. If CPC is firstly initiated, the UE executes CPC and keep monitoring CHO candidate cells. |

S2\_6: Reconfirm the use of SCG failure information upon declaring SCG failure in the procedure of the conditional PSCell change.

S2\_7. When the conditional PSCell configuration received over SRB3 is invalid, UE initiates SCG failure information procedure to report to the MN about the SN change failure due to invalid configuration (legacy procedure).

S2\_8). When the conditional PSCell configuration received over SRB1 is invalid, i.e. UE cannot comply with the embedded PSCell configuration for intra-SN Change, UE performs connection re-establishment procedure or actions upon going to RRC\_IDLE (legacy procedure).

S2\_9. Like CHO, UE shall follow the below procedures for handling the T310 and T304 timers during conditional PSCell addition/change procedure for EN-DC, NGEN-DC, NR-DC cases:

* UE shall not stop MN T310 or SN T310 and shall not start T304 when it receives configuration of a CPC-intra-SN
* The timer T310 (SN only in case of SN Change) is stopped and timer T304-like is started when the UE begins execution of a CPC-intra-SN.

**Question 4: Are proposals S2\_6 to S2\_9 agreeable?**

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Agreeable proposals | Not agreeable proposals | Comments |
| OPPO | All except S2\_8 |  | For S2\_8, for the case where the CPC configuration is for intra-SN change without MN involvement (since we only focus on this case in Rel-16), if UE cannot comply with only the CPC configuration part, we wonder whether triggering re-establishment is a good way. It seems UE can initiate SCG failure information, like the SRB3 case. |
| Samsung | all |  |  |
| ZTE | All proposals |  |  |
| Ericsson | All |  | The proposals seem fine. |
| Nokia | All seems OK |  |  |
| Lenovo&MM | Agree all proposals |  |  |
| Sharp | All proposals |  |  |
| Intel | All |  |  |
| Futurewei | All except S2-6, S2-8 | S2-8 | For S2-6, the failure report message structure can be reused. New failure code should be added for CPC\_intra\_SN. The most SCG failure handling procedure can also be reused, but some changes are needed. PSCell change failure does not need to reset the SN as long as the source PSCell is still good. If one target PSCell access is failed, the UE need to continue to search other candidates.  For S2-8, we have similar view as OPPO. We should do the same as S2-7 when MN is involved. The rationale is as explained for S3-12. |
| NEC | All proposals |  |  |
| MediaTek | All proposals |  |  |
| ETRI | All proposals |  |  |
| CATT | All proposals |  |  |
| LG | All proposals |  | For S2\_9, T304 should be configuration of the SN not the MN. |

**Open items can be discussed later**

The following list of proposals was discussed by one company or the issue was raised for the first time. Therefore these proposals were listed as for further discussion after the e-meeting, i.e email discussion after the meeting. I would like to check the company opinion on which proposals are agreeable in this meeting, to be further discussed in an email discussion after the meeting(for Rel-16), to be postponed to future release.

S3\_10: The UE shall inform the MN when CPC execution condition is fulfilled and the UE starts executing CPC, irrespective whether SRB3 is configured or not.

S3\_13: a threshold parameter is added to determine PCell quality and CPC is performed only when the Pcell quality is above the configured threshold.

S3\_14: After sending SCG failure information, the UE stop evaluating the measId associated with the CPC.

S3\_15: When CPC-intra-SN is configured, if the UE is failed to access a candidate PSCell, the UE need not suspend SCG transmission for all SRBs and DRB, and reset SCG MAC.

S3\_16: During the CPC-intra-SN execution on a candidate PSCell, the UE continues the measurement configured for CPC-intra-SN target selection and execution.

S3\_17: If access to one target PSCell failed and there is another qualified target PSCell for the UE to perform CPC right way, the UE need not report the failure information of the first failed target PSCell.

S3\_18: For CPAC failure report, the SCG failure information message including the ID(s) of CPC execution failed cell(s).

S3\_19: If there is no SRB3, the UE sends an RRC message via SRB1 to inform the SN of CPC execution, and the RRC message doesn’t need to set transaction Id for responding to MN e.g. *ULInformationTransferMRDC*.

**Question 5: From the above list of proposals, which proposals are agreeable in this meeting, which proposals to be further discussed for Rel-16 (email discussion after the meeting) and which proposals to be postponed to future release?**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Company | Agreeable proposals in this meeting | Proposal to be further discussed for Rel-16 | Proposals to be postponed to future release | Comments |
| OPPO | S3\_14 | S3\_10, S3\_15, S3\_18, S3\_19 | S3\_13 | S3\_10, we are ok for the SRB1 case, but not sure UE needs to inform the MN for the SRB3 case.  S3\_16, not agree. UE should stop CPC evaluation when executing CPC-intra-SN.  S3\_17, not agree. Should align with CHO on selecting only one candidate. |
| Samsung | Nothing |  |  |  |
| ZTE | S3\_14, S3\_19 | S3\_10, S3\_18 | S3\_13, S3\_15, S3\_16, S3\_17 | We prefer to reuse the legacy SCG failure information procedure in case of CPC failure in Rel-16. And some optimization for the procedure (e.g. S3\_18) can be considered in Rel-16 if time is allowed. But other optimization should be considered in the later release, if needed. |
| Ericsson | S3\_14 | S3\_15 | S3\_10, S3\_13, S3\_16, S3\_17, S3\_18, S3\_19 | S3\_10 doesn’t fulfil the criteria of “no MN involvement”. Needs to be discussed in rel-17.  S3\_15 not clear. Should work the same as for the legacy case.  S3\_13, S3\_16, S3\_17, S3\_18 optimizations for future release.  S3\_19 probably not an issue. |
| Nokia | S3\_10 | S3\_10 (if not agreed now)  S3\_18 | S3\_13  S3\_14  S3\_15  S3\_16  S3\_17  S3\_19 | S3\_10: essential for avoiding any reconfigurations from the MN when CPC is executed. Shall be agreed still in Rel-16, either now or ‘next meeting’.  S3\_18: The content of SCG Failure Information, specifically for indicating CPC failure, can be further discussed. |
| Lenovo&MM |  |  | all |  |
| Sharp | S3\_14 | S3\_10,  S3\_15,  S3\_16,  S3\_18  S3\_19 | S3\_13,  S3\_17, | S3\_10, not agree for SRB3 case.  S3\_13, cannot understand the benefit, especially we consider the fast MCG recovery + CPC case.  S3\_16, UE should stop CPC measurement and evaluation during a CPC procedure, this is similar to CHO case.  S3\_17, this is kind of optimization and not align with CHO. |
| Intel |  | S3-14  S3-16 | Rest | S3-14, there is similar discussion in CHO. We can wait a bit.  S3-16, RAN2 has agreed, for CHO.  Proposal 4. It is up to UE implementation whether the measurement on other candidate cell shall be continued during CHO execution period. The EN can be removed;  We can take the same decision for CPC.  We consider other issues are not essential for Rel-16, and would prefer to postpone all of them. |
| Futurewei | S3-10  S3-15 | S3-14  S3-16  S3-17  S3-18 | S3-13  S3-19 | S3-14: disagree on this proposal. The behaviour is current SCG failure handling. CPC access failure is different. Since there are multiple CPC candidates, if the first target is failed, the UE should not stop the CPC measurement and evaluation procedure until network sends new instruction, or the PCell RLF occurs, or the source PSCell RLF occurs. |
| NEC | S3-14 | S3-10  S3-16 |  | S3-10: agreeable, while our preference is to apply only for SRB1 case (but not when SRB3 is configured).  S3-16: agree with Intel |
| MediaTek |  | S3-14,  S3-16,  S3-17 | Others | For S3-14, S3-16, and S3-17, there are similar behaviours in CHO, and thus we can discuss whether they are also applicable in CPC. |
| ETRI | S3\_10, S3\_14, S3\_19 | S3\_18 | S3\_13, S3\_15, S3\_16, S3\_17 | S3\_10: same view as Nokia.  S3\_14: it is natural that the UE waits for further Reconfiguration message to resolve the SCG failure.  S3\_19: see answer to Q1. |
| CATT |  | S3\_14  S3\_16  S3\_18 | others |  |
| LG | S3\_14,  S3\_19 | S3\_18 | S3\_10,  S3\_13,  S3\_15, S3\_16, S3\_17, | S3\_10, we think this is out of scope because it means the MN should involve to CPC.  S3\_13, it is hard to understand the motivation.  S3\_14, this is essential because the measurement configuration associated with the CPC is still left after declaring SCG failure so that execution conditions can be met while the current SCG is suspended.  S3\_15, S3\_16, S3\_17, we prefer to reuse the legacy SCG failure information procedure as much as possible.  S3\_18, we wonder if the SN can know CPC problem w/o any indication. But it may be beneficial even though it is essential.  S3\_19, the transaction Id must be a problem which is occurred by sending the additional RRC signaling to SN for indicating the CPC complete. This is because the additional RRC signalling to SN should be contained by the RRC Reconfiguration Complete of MN according to current specification, then the new transaction Id should be decided for the RRC signalling on the MN side. |

**Applicability of CHO agreements from RAN2#109e for CPC**

There is a discussion point on what CHO agreements from this meeting are also applicable for CPC. There are three categories of CHO agreements: MeasID aspects, RRC configuration and Editor Notes and behaviour left to UE/NW implementation.

**Question 6: are the following two agreements on MeasID aspects for CHO also applicable to CPC?**

MeasId aspects

Proposal 2. measID and reportConfig associated with CHO config shall be removed when CHO configuration is autonomously removed.;

Proposal 7. For the same candidate target cell, allows 1 execution condition with 2 trigger events and corresponding 2 measIDs;

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Agreeable proposals | Need further discussion | Comments |
| LG | All |  |  |

**Question 7: are the following two agreements on RRC configuration for CHO also applicable to CPC?**

**Agreements for CHO**

RRC configuration

Proposal 34. Upon reception of RRCReconfiguration message with CHO configuration, the UE shall generate RRCReconfigurationResponse message and delivery it to low layer (same handling as legacy HO command), no matter whether CHO condition is met immedicately or not.

Proposal 12. CHO configuration stored in UE shall be removed by the UE when entering IDLE or INACTIVE;

Proposal 13. The max number of CHO candidate cells is 8; Send LS to RAN4 to inform our conclusion.

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Agreeable proposals | Need further discussion | Comments |
| LG | All |  |  |

**Question 8: are the following two agreements on editor notes and aspects left to UE/NW implementation for CHO also applicable to CPC?**

**Agreements for CHO**

EN notes and behaviour left up to UE/NW implementation

Proposal 3. The EN on FFS on Stage-3 details: whether there are issues with configuration of different events (e.g. A3+A5)., can be removed;

Proposal 11. EN in LTE CR on UE autonomous actions regarding VarMeasConfig associated to conditional handover can be removed;

Proposal 4. It is up to UE implementation whether the measurement on other candidate cell shall be continued during CHO execution period. The EN can be removed;

Proposal 5. The quantity configuration is needed for CHO for filtering purpose. The EN can be removed;

Proposal 37. Scenarios, target CHO configuration in legacy HO command or target CHO configuration in target CHO command are not supported in Rel-16.

Proposal 38. The issue, race condition on CHO is left to network implementation.

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Agreeable proposals | Need further discussion | Comments |
| LG | All except P11 |  | Since P11 is also related to S3\_14, RAN2 should consider further for the case of SCG failure. This is because the measurement configuration associated with the CPC is still left after declaring SCG failure so that execution conditions can be met while the current SCG is suspended. |