3GPP TSG-RAN WG2 Meeting #114 Electronic R2-21xxxxx

Online, 2 – 13 November 2020

**Agenda item:**

**Source: CATT**

**Title: Summary of [Post113-e][234][eDCCA] CPAC procedures (CATT)**

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

**Document for: Discussion and Decision**

# 1 Introduction

This is the report for the following email discussion:

[Post113-e][234][eDCCA] CPAC procedures (CATT)

Scope: Continue discussion on CPAC procedures, including P1-4 from R2-2101970 and CPAC/CHO coexistence. Attempt to provide Stage-2 signalling flows for CPAC procedures.

Intended outcome: Discussion report + Stage-2 TP

Deadline: Long- 26th March 2021 @ 1100 UTC

Rapporteur plans to have an intermediate deadline on the discussion of solutions (phase 1). This is to understand solutions and identify any issue associated with the solutions(s).

Phase 1 deadline: 5th March 2021 @ 1100 UTC

Phase 2 deadline: 26th March 2021 @ 1100 UTC

# 2 Discussion

**2.1 Phase 1: Discussion of solutions for SN initiated inter-SN CPC**

At RAN2\_112-e meeting, the following agreement was made on SN initiated inter-SN CPC.

**Proposal 1: Option 1 should be used for the generation of conditional reconfiguration for SN initiated inter-SN conditional PSCell change.**

**Option 1: The MN generates CPC. The source SN sets the execution condition and communicates it to the MN. The MN generates the conditional reconfiguration message including the execution condition(s) provided by the source SN and RRCReconfiguration provided by the candidate PSCell(s).**

As discussed in R2-2010734, Figure 1 is an illustration of signaling flow for SN initiated Inter-SN CPC based on Option 1. The figure follows the steps used in a conventional SN initiated SN change procedure as shown in Figure 10.5.1-2 of TS37.340. Note that Figure 1 shows the signaling flow up to the signaling of the conditional configuration for SN initiated Inter-SN CPC to the UE. Signaling upon the execution of CPC is not shown in the figure as the main focus of this discussion is on the generation of conditional reconfiguration for SN initiated Inter-SN CPC.

In this solution, the MN generates a CPC configuration, i.e., the IE *ConditionalReconfiguration* as an MN configuration based on reconfiguration per target candidate (denoted RRCReconfiguration\*\* in Figure 1) and the execution condition per candidate cell. RRCReconfiguration\*\* per target candidate is provided by each target candidate cell in response to a conditional SN Addition Request. The execution condition per candidate cell is provided by the S-SN in the conditional SN Change Required.



**Figure 1: Configuration of SN-initiated inter-SN CPC based on agreement.**

**Steps 1:** Based on e.g. RRC measurement report received from the UE, source SN decides to initiate the CPC procedure. Source SN determines the set of target SNs for the CPC procedure,. The source SN initiates the conditional SN change procedure by sending SgNB Change Required message which contains target SN information, and measurement results related to the target SN. For each candidate target PSCell frequency, source SN determines the CPC execution condition. In the SN Change Required message, source SN provides information relevant to CPC configuration to the MN. In addition to the content of conventional SN Change Required message, CPC execution condition for each candidate target PSCell frequency is included in the SN Change Required message.

**Steps 2:** MN initiates the SN Addition procedure with the set of target SNs indicated in SN Change Required. As a base line, the content of SN addition Request is similar to the conventional SN Addition Request message (how the conditionality of the request is indicated is FFS).

**Step 3:**  The target SN determines the target PSCell and generates RRCReconfiguration\*\* for the selected candidate PSCell and provides it to the MN in SN addition request acknowledgement message. FFS on inclusion of multiple candidate cell configurations.

**Step 4:**  The MN generates an RRCReconfiguration to be provided to the UE including CPC configuration (as an MN configuration), mapping the execution condition configuration to an RRCReconfiguration\*\* provided by the target SN for candidate PSCell.

**Step 5:** the UE provides RRCReconfigurationComplete message to the MN upon reception of RRCReconfiguration message (to confirm the reception of the CPC configuration).

The preparation of execution condition for SN initiated Inter-SN CPC was further discussed in the last meeting, RAN2\_113-e [R2-2101970]. As shown in Figure 1, the source SN provides the execution condition for the target candidate cells(s). The target SN may not accept all the candidate cells which the source SN has provided execution conditions. The MN generates the conditional reconfiguration (in step 4 of Figure 1) by mapping the execution condition(s) and an RRCReconfiguration\*\* provided by the target SN for candidate PSCell.

An issue was identified during last meeting discussion that **the source SN may need to update its configuration depending on the accepted candidate cells by the target SN**. The source SN may have configured the measurements taking into account the execution condition for CPC candidate target cells. However, as the target SN may have only accepted some cells for CPC configuration, there may have some measurement configurations (configured by the source SN) which are no longer is required. For example, if the source SN has configured measurement gaps for measuring a candidate target cell and that cell is not accepted by the target SN for CPC, there remains some unrequired measurement configurations of source SN. Whether this is an issue which needed a standardised solution should be discussed. The severity of the issue depends on frequency of this happening. Also it should consider the UE behaviour in case there is an unrequired measurement configuration.

If this issue to be resolved, there are two solutions which can be considered.

**Solution 1:** The network updates the source SN configuration after step 4 (in Figure 1). In Step 4, the RRC Reconfiguration including the conditional configuration for CPC is sent to the UE. Upon reception of the conditional reconfiguration for CPC, the UE can start evaluating the CPC execution. The source SN prepares the execution condition for CPC without assistant information from the MN or target SN. Signalling flow shown in Figure 1 is applicable for solution 1. The source SN can update its configuration anytime (business as usual) and update the measurement configuration for the UE after step 4, if required.

**Solution 2:** The updated source SN configuration is transmitted to the UE together with conditional configuration for CPC. Referring to Figure 1, after Step 3, the MN provides information on the accepted candidate cells by the target SN to the source SN. Based on the information received from the MN, the source SN updates the source SN configuration and sends it to the MN. The MN generates the conditional reconfiguration for CPC in the same way as in solution 1. The MN generates the final RRC Reconfiguration message to the UE including the conditional reconfiguration for CPC, MN configuration, if required and the updated source SN configuration. Figure 2 illustrates the signalling flow for solution 2.



**Figure 2: the procedure update required for solution 2.**

In Phase 1, rapporteur would like to form a common understanding of the procedure for SN initiated Inter-SN CPC and identify any issue which should be resolved. In order to form an interactive technical discussion (e.g. similar to face-to-face offline discussions), rapporteur welcomes the company opinions on the procedure, the identified issues and solutions in open/ flexible format. The company comments can be included in the below table and reply to a comment/question raised by another company can also be included. At the end of Phase 1, rapporteur aims to provide a list of identified issues.

|  |  |
| --- | --- |
| **Issue** | **Company comment** |
| measId(s) in SCG MeasConfig but not in CPC configuration | **Ericsson**: In Solution 1 the UE may end up configured with measId(s) in SCG MeasConfig associated to PSCell(s) not selected by a target candidate gNodeB i.e. they would not be in the CPC configuration. Maybe this is not a major issue, we can simply define that the UE ignores these measId(s) and not be required to perform measurements accordingly as they are not in CPC and as they are anyway deleted upon suspend/release and successful execution.  In Solution 2 this would not be a problem, as the UE only receives measId(s) in SCG MeasConfig that matches what the target candidate gNodeB(s) have selected. This makes solution 2 slightly better in that perspective, with the cost of an additional network procedure. |
| Measurement gap configuration outdated | **Ericsson**: In solution 2 this is not an issue as the MN receives the indication of the accepted frequencies / cells from target candidate gNodeBs and knows which measId(s) per frequency/cell to configure the UE with in SCG MeasConfig, and the required measurement gaps. We could check with RAN3 if they think Solution 2 brings issues in terms of latency and signaling.  However, in solution 1, the UE would first receive a measurement gap that is outdated (perhaps for measuring more frequencies than needed) to almost immediately get an updated version, which is not very nice as two sub-sequence RRC procedures will be triggered (increases signaling) and a gap re-configuration is triggered almost immediately after the UE has setup its first gap configuration.  In a way, it is quite bad that solution 1 leads to the UE to be configured with a wrong configuration to then immediately be re-configured. It is not easy to foresee how often this will happen.  So, if companies insist to have a single network procedure, like in Solution 1, something in between is anyway needed e.g. MN sends the update to S-SN from T-SN about accepted target candidates (cells/frequency) and waits before configuring the UE, at least for some time, to avoid the unnecessary double RRC procedures. |
| When to send SgNB Change Confirm message in response to SgNB Change Required (Step 1 in Figure 1) | **[CATT]** As per the legacy procedure, Reception of the SgNB Change Confirm message triggers the source SN to stop providing user data to the UE and, if applicable, to start data forwarding. For CPC, the source SgNB will only stop data transmission to the UE upon the CPC execution. Therefore, we need to discuss when to send the SgNB Change Confirm message to the S-SN, 1) after Step 5 in Figure 1 2) after execution of CPC. |
| which messages can be used for step 4/5 in solution 2 | **[CATT]** solution 2, step 4/5 should be performed prior to transmitting RRCReconfiguration message (step 6) to the UE. however for legacy procedure, SgNB Change Confirm message is transmitted to the S-SN after successful allocation of target SN resources, i.e. after receiving RRCReconfigurationComplete message (step7). We need to discuss which message can be used for step 4/5 in solution 2. And we don’t think the SgNB Change Confirm message can be used for step 4 as suggested by Ericsson. We think SgNB Modification Request can be used for step4, and SgNB Modification Request Acknowledge can be used for step5, |
| Solution 2/ Figure 2 | **[Nokia]** We were encouraged to use flexible and open format of the discussion, so we have inserted several comments already above. However, few remarks also here:  If steps 4 and 5 in Figure 2 are performed anyway (in this example, to update the source SN’s config) then we wonder why there is still a need to send the execution conditions already in Step 1? Due to the possibility the target SN may not prepare cells from the list provided by the source SN and to avoid sending unnecessarily large number of execution conditions, some of which will stay unused, we suggest the execution conditions are sent in Step 5, when the source SN has been informed which cells were accepted and prepared by the target SN**.** |
| Solution 1 | **[Nokia]** It is not clear how Solution 1 solves the problem since the source SN cannot know which PSCells the target SN has finally selected without getting the assistance information from MN. Moreover, providing an updated measurement configuration from the source SN would cause additional signaling. |
| Blind preparation | **[Nokia]** The source PSCell may trigger a blind preparation of target PSCells. In this case, the source SN does not have even measurement to identify the relevant target PSCell candidates. In this case, the source SN shall be informed about the prepared candidate cells to provide the corresponding CPC execution condition as performed in step 4 and 5 of Figure 2. |

Summary of Phase 1: [TBC]

**2.2 Phase 2 discussion**

# 5 Conclusion

# 6 Reference