**3GPP TSG-RAN WG2#117-e Draft R2-2203637**

**Online, 21 February - 3 March 2022**

**Source:** Samsung

**Title:** [AT117-e][223][DCCA] CPAC procedures from network perspective (Samsung)

**Agenda Item:** 8.2.3.1

**Document for:** Discussion and decision

# 1 Introduction

This document discusses on the remaining issues of CPAC procedure from network perspective based on the Tdocs submitted to 8.2.3.1, with the following information from WI chair:

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| **NR Rel-17 DCCA (started immediately at meeting start)** |

**[AT117-e][223][DCCA] CPAC procedures from network perspective (Samsung)**

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| * Scope: Attempt to resolve critical open issues for CPAC procedures from network perspective based on contributions to 8.2.3.1
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| * Intended outcome: Discussion report in [R2-2203637](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_117-e%5CR2-220xxxx.zip).
* NOTE: CR rapporteur (CATT) is allowed to submit updated CRs based on the report proposal to illustrate the impacts of the proposals
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| * Deadline: Deadline 3
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| **Deadline 3 (discussions for 2nd week Tue online):** |

* **Comment deadline:** FridayW1, 0800 UTC (for collecting views)
* **Rapporteur proposals:** Friday W1, 0900 UTC (proposed resolution of issues)
* **Document deadline:** Monday W2, 1200 UTC (report or agreed CRs)
* No extensions to this deadline for regular discussions. Discussions handling CRs may continue to short post-meeting email (based on chair decision).

Mainly issues related to the OpenIssueList [12] is first summarized and discussed, and then ones related to running CR are discussed next.

# 2 References

[1] R2-2202304, Discussion on CPAC procedures from NW perspective, RAN2#117-e, Vivo

[2] R2-2202468, Open issues on Rel-17 CPAC procedures from NW perspective, RAN2#117-e, Nokia, Nokia Shanghai Bell

[3] R2-2202577, On support of CPAC replace, RAN2#117-e, Lenovo, Motorola Mobility

[4] R2-2202702, CPAC procedures from network perspective, RAN2#117-e, Qualcomm Incorporated

[5] R2-2202824, Remaining issues on CPAC from NW perspective, RAN2#117-e, ZTE Corporation, Sanechips

[6] R2-2202914, Discussion on the CG-CandidateList, RAN2#117-e, Google

[7] R2-2202916, (Draft CR) Support modification and cancellation of C-PSCells in the CG-CandidateList, RAN2#117-e, Google

[8] R2-2203045, Discussion on support for coexistence of Rel16 and Rel17 CPC, RAN2#117-e, NTT DOCOMO, INC

[9] R2-2203100, Remaining issues on CPAC from NW perspective, RAN2#117-e, CATT

[10] R2-2203170, Remaining issues for CPAC in network perspective, RAN2#117-e, Samsung

[11] R2-2203432, CPAC network procedures, RAN2#117-e, Ericsson

[12] R2-2202029, Open issues for MR DC/CA further enhancements, RAN2#116bis-e, Huawei, HiSilicon

# 3 Discussion

## 2.1 Coexistence of R17 SN-initiated CPC and R17 MN-initiated CPC

While most of companies discuss about the coexistence of R16 and R17 CPC, there was opinion to discuss on the R17 MN-initiated CPC (MI-CPC) and R17 SN-initiated CPC (SI-CPC). Since these two sub features have different network side signalling, and possible have different capability at the UE. Moreover this is solely related to the R17 CPAC WI completion and more than the optimization. Therefore, it is worth to discuss this issue.

**Question 1. Do companies agree on the support of the coexistence between Rel-17 SN-initiated CPC (SI-CPC) and Rel-17 MN-initiated CPC (MI-CPC) ?**

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| Company  | Yes/No | Comments  |
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Obviously there also should be a discussion on the coexistence between Rel-17 CPA and Rel-17 CPC.

**Question 2. Do companies agree on the support of the coexistence among Rel-17 CPA, Rel-17 MI-CPC and Rel-17 SI-CPC ? (if no, please comment on the possible coexistence combination)**

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## 2.2 Coexistence of R16 CPC and R17 CPC

Now for the new behaviour, one of the representative consideration regarding R17 CPAC is to allow the coexistence between R16 CPC and R17 CPAC.

1. Coexistence of R16/R17 CPC supported?
	1. Y: Vivo, Nokia, ZTE, DOCOMO, Samsung
	2. N: CATT (NW implementation to guarantee that R16 CHO, CPC, Rel17 CPAC are not simultaneously configured)
	3. Partially support: Ericsson (Support for the coexistence between R16 CPC and R17 SI-CPC, but not between R16 and R17 MI-CPC.)

Most of companies support the coexistence of R16 and R17 CPC operation with the reason that better reliability on the connection with the network can be accomplished, which subsequently result in the less latency to recover the connection for pscell once deteriorates. However there is also the consideration on the specification impact for this coexistence compared to the short remaining time given, which is correct. Moreover also R17 CPC sub features can be impact to the coexistence combination with R16 CPC. Therefore, we need to find out possible combination first.

*Opt 1: No coexistence between R16 and R17 CPC, i.e., only R17 CPC can work without R16 CPC*

*Opt 2: partial coexistence: only R16 CPC and R17 SI-CPC*

*Opt 3: partial coexistence: only R16 CPC and R17 MI-CPC*

*Opt 4: full coexistence: R16 CPC and whole R17 CPC*

**Question 3. Which option do companies prefer to have?**

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| Company  | Preferred option | Comments  |
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The estimated specification impact is to include UE behaviour on the configuration release upon one type of CPC execution, MN/SN coordination on the maximum number of conditional reconfiguration / conditional Reconfiguration ID assignment, and indication of intra-SN CPC execution to the MN.

1. Configuration release after other type CPC’s execution:
	1. Vivo:
		1. After R16 CPC execution, UE keeps R17 CPC configs if it includes A4/B1 execution conditions and does not depend on source SCG config. Otherwise it’s released.
		2. After R17 CPC execution, UE releases the R16 ones.
	2. ZTE: Upon any type of CPC executed, UE removes all stored CPC configs including R16 and 17.
	3. Samsung: UE releases R17 CPC configurations after successful R16 CPC execution, and vice-versa.

Once any type of co-existence i.e., full support of partial support is agreed, there should be a UE behaviour on CPC config release. Even the simplest one is that just release of all the stored CPC configs including R16 and R17, we need further to see the views from each company based on the options:

*Opt 1. UE keeps R17 CPC configs if it include A4/B1 execution conditions, and does not depend on source SCG config. Otherwise it’s released. After R17 CPC execution, UE release the R16 ones.*

*Opt 2. After R17 CPC execution, UE releases the R16 ones.*

*Opt 3. UE releases R17 CPC configurations after successful R16 CPC execution, and vice-versa.*

**Question 4. Which option do companies prefer to have?**

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| Company  | Preferred option | Comments  |
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1. MN/SN coordination needed?
	1. Vivo: Needed (intra-SN CPC indication)
		1. For SN to inform MN of the R16 CPC execution when R17 CPC configuration is delta config based on the source PSCell config after R16 CPC execution.
		2. R17 CPC candidate cell configurations are full configuration (which doesn’t need the MN/SN configuration)
	2. Nokia: Needed (intra-SN CPC indication)
		1. MN first informs S-SN about MI-CPC, and then S-SN informs MN when intra-SN CPC is executed and includes new SCG configuration such that MN can use it for re-triggering the preparation of MN-initiated CPC.
		2. LS to R3 on this coordination signalling.
	3. ZTE: Needed (conditional Reconfig ID space assignment, and max # of CPAC)
		1. Conditional reconfiguration ID space to be determined by MN.
		2. The max number of CPAC candidate pscells is 8.
		3. MN and SN coordinates the maximum number of SI-CPC including inter-/and intra-SN CPC. In detail, consider inter node renegotiation procedure where MN indicates the max # of candidate pscell allowed to S-SN, and if S-SN wants more, S-SN can send the requested value to the MN. (with TP)
	4. DOCOMO: Needed (Xn message to carry the max number of the candidate pscells)
		1. if R16 CPC and R17 SI-CPC are simultaneously configured, S-SN set the max # of pscell to prepare in the SNChangeRequired message (to MN) by taking account of already configured Rel-16 CPC configs not to exceed the maxNrofCondCells. If Rel16 CPC and Rel17 MI-CPC are simultaneously configured, and total # of CPC config exceed the maxNrofCondCells, UE shall prioritize to apply rel-17 CPC config and discard Rel-16 configs.

Regarding intra-SN execution indication, there could be an indication to the MN from the SN because MN doesn’t have the information on this execution. For handling of related UE operation, we need the company view. This question also can be applied to the whole combinations of coexistence:

*Opt 1: No coexistence between R16 and R17 CPC, i.e., only R17 CPC can work without R16 CPC*

*Opt 2: partial coexistence: only R16 CPC and R17 SI-CPC*

*Opt 3: partial coexistence: only R16 CPC and R17 MI-CPC*

*Opt 4: full coexistence: R16 CPC and whole R17 CPC*

**Question 5. Please companies indicate which option(s) need the intra-SN execution indication between MN and SN among above options? (Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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Regarding the maximum number of CPAC candidate PSCells,

From ZTE’s proposal, the max number of CPAC candidate PSCell needs to be defined regardless of the coexistence issue, and first for R17 CPAC itself.

**Question 6. Do company agree that the maximum number of candidate pscells for R17 CPAC is 8? (Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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| Company  | Yes/No | Comments  |
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And if considering any type of coexistence, then there might be another opinion on this maximum number of CPAC candidate PSCells.

**Question 7. Do company agree that maximum number of candidate PSCells for R16 CPC and R17 CPAC is 8, if any type of coexistence of R16/17 CPC is agreed?**

**(Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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| Company  | Yes/No | Comments  |
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Further ZTE’s proposal on MN/SN coordination on conditional Reconfiguration ID space is always needed for any type of coexistence of R16/R17 CPC, i.e. both partial coexistence and full coexistence, because MN handles the condReconfig ID assignment for R17 CPC (including both SI-CPC and MI-CPC) while S-SN handles the assignment for R16 CPC. If without MN/SN coordination, the MN and the SN may set the same condReconfig ID for different candidate PSCells configured via R16 CPC and R17 CPC. However there was also the counter argument from Huawei that there are separate variables in the UE (maybe *VarConditionalReconfiguartion*) for MN and SN’s configurations for conditional reconfiguration including condReconfig ID. There there will be no conflict on the condReconfig IDs assigned by MN and SN. Rapporteur need to see the company view on this with two options as below:

*Opt 1. MN/SN coordination on conditional Reconfiguration ID space is necessary*

*Opt 2. No need of coordination for conditional Reconfiguration ID conflict because of separate Variables in the UE.*

 **Question 8. Which option do companies agree for possible conditional reconfiguration ID conflict?**

**(Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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| Company  | Option  | Comments  |
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Regarding the coordination betweem MN and SN on the maximum number of candidate target PSCells allowed to S-SN

The node initiating the configuration procedure can control the number of candidate pscells to be prepared. MN initiate the procedure for MI-CPC and CPA while SN initiates the procedure SI-CPC. Since even R17 SI-CPC and MI-CPC might not be coexisted, this coordination between MN and SN on the max number of candidate tartget pscells allowed to S-SN is not straightforward. With the following coexistence options, we need the view on the necessity of the coordination between MN and SN on the max # of candidate target Pscells allowed to S-SN.

*Opt 1. Only R17 MI-CPC allowed*

*Opt 2. Only R17 SI-CPC allowed*

*Opt 3. Only R17 MI- and SI- CPC allowed*

*Opt 4. Only R16 CPC and R17 SI-CPC allowed*

*Opt 5. Only R16 CPC and R17 MI-CPC allowed*

*Opt 6. R16 CPC and whle R17 CPC allowed*

**Question 9. Which options do companies think the coordination between MN and SN on the maximum number of candidate target PSCells allowed to S-SN is necessary for?**

**(Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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From DOCOMO’s proposal, it is assumed that there is no distinguished UE capability of maximum number of candidate pscells i.e., unified capability for R16 CPC and R17 SI-CPC or R16 CPC and R17 MI-CPC. Therefore there is a case that sum of the number of candidate pscell configured by SN and MN exceed the given threshold value. However, this issue can be further discussed when above Proposal 6 is once agreed.

1. Intra-SN CPC should be configured in R16 way ?
	1. Yes: Vivo, ZTE (keep legacy independent signalling for each R16/R17 CPC)
	2. No: Ericsson (support for the Intra-SN CPC including updates to the MCG configuration.)

The remaining issue was that there is any need to modify the R17 intra-SN CPC procedure related to the co-existence issue. There are two party to reuse the legacy and modify the intra-SN CPC by including the MCG configuration information. Further check on the company view on this issue with the following options.

*Opt 1. Reuse legacy independent signalling for intra-SN CPC for R17, i.e., no enhancing from R16 CPC*

*Opt 2. Support for intra-SN CPC including updates to the MCG configuration.*

**Question 10. Which option do companies agree for intra-SN CPC signalling for R17?**

**(Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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| Company  | Options  | Comments  |
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## 2.3 Coexistence of CHO and CPAC

Even WI rapporteur’s guidance on the submission contents i.e., AI 8.2.3.1 can only have NW perspective and coexistence of R16 and R17 CPC, there are several companies to submit this coexistence of CHO and CPAC issue which were guided to be submitted AI 8.2.3.2. Anyhow, this might further be discussed with **[AT117-e][224][DCCA] CPAC procedures from UE perspective (Nokia).** We can keep this section as a reference to be used later.

1. Coexistence supported ? :
	1. Yes: Vivo, Nokia, QC (implicitly), ZTE
	2. Partially: Ericsson (support for CHO and Rel-17 CPAC but not for CHO and Rel-16 CPC)

Maybe the partial coexistence from Ericsson is from the easiness on the signalling in the network since there is no need to exchange between MN and SN. Rapporteur would like to know the view on this issue:

*Opt 1. No coexistence of CHO and any CPAC release*

*Opt 2. Partial coexistence of CHO and R16 CPC*

*Opt 3. Partial coexistence of CHO and R17 CPC*

*Opt 4. Full coexistence of CHO and R16 and R17 CPC*

**Question 11. Which option do companies prefer to have?**

**(Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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| Company  | Options  | Comments  |
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1. Prioritization over CHO and CPC
	1. Stop/suspending UE behaviour:
		1. Vivo; ZTE: CHO is prioritized, aborts on-going CPAC execution upon CHO execution. Stops condition evaluation for CPAC upon CHO execution. If triggered cells exists for both CHO and CPAC, UE selects one for CHO.
		2. Nokia : N/A
		3. QC: when CHO and CPA are triggered together, CHO is prioritized. Then CPA configs are discarded, and network start the related procedure (receiving HO success message from target MN, and S-MN initiates SN release procedure toward the T-SNs.) Here CPA can be replaced with the CPC with the straightforward modification.

When both CHO and any release CPC are configured, UE might need the specific behaviour as above listed. With options the following is need to be discussed:

*Opt 1. Aborts on-going CPAC execution (including fall-back to the source SCG/MCG configuration, if any)*

*Opt 2. Stops conditional evaluation for CPAC*

*Opt 3. CPAC configs are discarded.*

**Question 12. Which option(s) do companies prefer to have, if any type of coexistence of CHO/CPC is allowed? (can be multiple options)**

**(Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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* 1. Release configuration:
		1. Vivo: Releasing all CPAC configs after CHO successful completion if CPAC config depends on the CHO configs.
		2. Nokia: may release all other conditional reconfig.
		3. QC:
			1. when CPA executed before CHO, Alt1. Discard CHO config, Alt 2. Keeps CHO config but doesn’t measure until receiving updated CHO configs from S-MN, Alt3. If a specific indication (per candidate target pscell in CPA) included in RRCReconfiguration message containing CHO or CPA configuration to keep the CHO config is received, UE keeps CHO configs. Same for CPC with straightforward modification
			2. When CHO executed before CPA, UE discard the CPA configs (UE perspective), S-MN initiates SN release procedures toward the T-SNs upon CHO successfully executed. Same for CPC with straightforward modification
		4. ZTE: Releasing all CPAC configs after CHO successful completion, vice-versa.

There are several proposals from companies to release behaviour on CHO/CPAC coexistence. Please indicate the company’s view on each proposals.

*Opt 1. Releasing all CPAC configs after CHO successful completion if CPAC config depends on the CHO configs.*

*Opt 2. Delete all other conditional reconfiguration when CHO/CPAC triggers.*

*Opt 3. When CPA executed before CHO, Alt1. Discard CHO config, Alt 2. Keeps CHO config but doesn’t measure until receiving updated CHO configs from S-MN, Alt3. If a specific indication (per candidate target pscell in CPA) included in RRCReconfiguration message containing CHO or CPA configuration to keep the CHO config is received, UE keeps CHO configs. When CHO executed before CPA, UE discard the CPA configs*

*Opt 4. Releasing all CPAC configs after CHO successful completion, vice-versa*

**Question 13. Which option(s) do companies prefer to have, if any type of coexistence of CHO/CPC is allowed?**

**(Please note that this is not conditional question, but for gathering possible spec impact, so all companies are required to answer.)**

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## 2.4 Support of NGEN-DC

As indicated in OpenIssueList, threre is FFS point whether to apply CPAC feature to NGEN-DC arthictecture.

CATT propose: R17 CPAC does not apply to NGEN-DC as well as NE-DC architecture, i.e., it only applies to EN-DC and NR-DC architecture.

And Ericsson also propose with TP: CPAC is not supported for NGEN-DC in Rel-17.

**Question 14. Do companies agree on that CPAC is not supported for NGEN-DC in Rel-17?**

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## 2.5 Issue related to running CR

The following proposals are related to the running CR. Therefore, we can discuss the proposals one-by-one based on the TPs in their contributions. The related TP is not attached for not making the summary to lengthy. Please refer each corresponding Tdoc including TPs.

From Nokia, with the TP in their Annex:

**Question 15. Do companies agree on the following proposal with the TP**[2]**?**

**“Source SN should always include the CPC execution condition for the suggested PSCell in *SN Change Required* message to MN. The Optional flag is to be removed from *condExecutionConditionSN-r17* in stage 3 CR for NR**.**”**

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**Question 16. Do companies agree on the following proposal with the TP**[2]**?**

**“Capture in stage-2 CR that source SN can update the CPC execution conditions (for the accepted PSCells) after being informed about the accepted candidate PSCells.”**

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**Question 17. Do companies agree on the following proposal with the TP**[2]**?**

**“Capture in stage-2 CR that the CPAC configuration may contain MCG and SCG reconfigurations.”**

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**Question 18. Do companies agree on the following proposal with the TP**[2]**?**

**“Consider the FFS in stage 2 CR (TS 37.340) on what defines a successful reconfiguration procedure to be already addressed by the current wording (i.e. FFS to be deleted).”**

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Lenovo&MM and Google propose the same solution for the below issue. CG-CandidateList field was updated to support add/mod/cancle structure of candidate pscell configs in INM from SN to MN

**Question 19. Do companies agree on the following proposal with the TP [3](for Lenovo) and [7] (for google)?**

**“Target SN provides the prepared PSCell configurations in a delta manner (e.g., add/modify/cancel) instead of always providing a full list, as shown in the TP.”**

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From ZTE, with the TP

**Question 20. Do companies agree on the following proposal with the TP[5]?**

**“RAN2 confirms the new inter-node RRC message that includes the full list of CG-Config(s) is only used from the target SN to the MN, i.e. not used from the source SN to the MN.”**

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From CATT with TP

**Question 21. Do companies agree on the following proposal with the TP[9]?**

**“The following Editor’s Note for MN initiated CPA in the stage 2 running CR is removed.**

**Editor’s Note: it is FFS how to capture the following agreement: The message carrying ‎conditionalReconfiguration for CPA/CPC is in MN format (i.e. contains ‎both MCG and SCG re-configurations).”**

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**Question 22. Do companies agree on the following proposal with the TP[9]?**

**“The following Editor’s Note for MN initiated CPA in the stage 2 running CR is removed.**

**Editor’s Note: it is FFS what defines a successful reconfiguration procedure.”**

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# 4 Conclusions