3GPP TSG-RAN WG2 #109 electronic Tdoc R2-2001917

Elbonia, USA, 18th– 22nd November2019

Agenda Item: 6.13.1

Source: Ericsson

Title: Summary of CP open issues

Document for: Discussion, Decision

# 1 Introduction

This document treats the e-mail discussion:

* [AT109e][508][2-step RA] CP open issues (Ericsson)

Scope:

* + - Identify/Summarize all remaining open issues related to CP open issues f4rom AI 6.13.3 and related CP issues in 6.13.4 and seek companies feedback on the need to solve the critical issue and preferred solutions.

 Intended outcome:

* + - Set of proposals with full consensus (aim to agree to those over email)
		- Set of proposals with almost full consensus and easy to agree
		- Set of open issues and proposals to postpone to next meeting.
		- Open issues that should no longer be pursued

 Deadline for providing comments:

* + - Companies input: Thursday, Feb. 27th 18:00 CET
		- Rapporteur proposals: Friday, Feb. 28th 18:00 CET (one day for rapporteur to make conclusions)
		- Comments on proposals’ wording, Tuesday, March 3rd by 08:00 CET

This summary will not deal with issues that are discussed as part of the on-going e-mail discussions, which currently are the RRC running CR [2] and MAC running CR [3] e-mail discussion.

The topic of this summary is concentrated on issues related to control plane part of 2-step random access, while the discussion in [4] deals with user plane issues.

Where the proposal contains a set of options, we ask companies to input their preference or changes to the options. At submission, the proposals should not contain any options. This means that a proposal that currently looks like this:

***Proposal 1 On issue X:***

***Option 1:*** *Use Y method.*

***Option 2:*** *Use Z method*

Should be made into the following by the end of e-mail discussion:

***Proposal 2 On issue X, the method Z is used.***

# 2 Discussion

## 2.1 UE capabilities

For this meeting only one contribution deals with capabilities:

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| **Contribution** | **Summary** |
| R2-2001095 (Intel) | Discusses RAN2-specific capability and more specifically 2-step CFRA and whether support of 2-step CBRA implies 2-step CFRA support.Proposals are: 1) Same capability for 2-step CBRA and CFRA is introduced and 2) If separate capabilities is introduced for 2-step CFRA, RAN2 to discuss whether 2-step CFRA is per-band or per-UE. 3) No separate capability is introduced for csi-rs based 2-step RA.  |

Based on the fact that no other company has mentioned this in any contribution, no conclusion can be made at this point in time based on company input.

To progress on RAN2 capabilities we believe that the following could be pursued:

**1)** Start e-mail discussion on RAN2-specific capabilities for next meeting,

**2)**Wait for RAN1 feature list,

**3)** Conclude on UE features and capabilities for 2-step RA.

**Initial Proposal 1 RAN2 to start detailing RAN2-specific capabilities(if any).**

For the RAN2-specific parts, i.e 1) above, then a first proposal could be the following:

**Initial Proposal 2 2-step CBRA support implies 2-step CFRA support, thus no capabilities for 2-step CFRA support shall be introduced.**

Whether the capabilities are band-limited or not, we propose that this is FFS up to RAN1:

Initial Proposal 3 On whether capabilities are band-limited, RAN2-capabilities can follow that of RAN1.

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| **Company** | **Comments on proposals** |
| Huawei | We know from our RAN1 colleague that RAN1 is not going to discuss UE capability issues in this meeting and has decided to postpone it to the next meeting. Besides, there is only one contribution on this topic and we think different companies need more thinking on this. So we propose to postpone this to the next meeting with an email discussion preceding the meeting.  |
| CATT | Agree with Huawei. |
| Potevio | Proposal 1~3: agree. |
| OPPO | We also think more discussions are needed on capabilties for 2-step RACH given there is only one contribution. We can postpone to next meeting but would prefer to have a Email discussion triggrered after this meeting. |
| Samsung | Postpone to next meeting |
| Intel | Agree to all proposals and Proposal 2 should be agreeable. We are discussing only whether CFRA capability is needed from the RAN2 perspective. It is not related to L1 feature list for 2-step RACH which we agree will have to wait for RAN1 to complete their analysis. |
| ZTE | We agree with proposals 1/2/3. We think anyway, this discussion will be postponed, but depending on the decisions made in the main session for general capability disucssion, we support some preliminary discussion in RAN2 for this. Since the basic featureset for this WI seems relatively stable in RAN1 for this, may be we can attempt a preliminary RAN2 work based on the latest RAN1 draft (may be via email as proposed above by Oppo).  |
| LG | Needs to be postponed. |
| SONY | Delay to the coming meetings. |
| vivo | Same view as Huawei. |
| Qualcomm | Postpone to the next meeting. |
| MediaTek | Postpone to the next meeting |

Rapporteur comment:

Most companies are for postponing the discussion until next meeting or that more discussions are needed. A good venue for such discussion could be an e-mail discussion, which would also be good for the sake of progress.

Proposal 1: E-mail discussion on RAN2-specific capabilities.

## 2.2 CFRApreamble-to-PRU mapping

In the e-mail discussion on the running RRC CR[1], the issue of CFRA resource signallingwas discussed, in particular whether the resources for 2-step RA shall be shared between 2-step CFRA and 2-step CBRA. As this is still FFS, we will not address it here, but rather go more into detail on the signalling on how a preamble should map to a PRU (PUSCH Resource Unit) for 2-step CFRA.

The following contributions deal on the details of CFRA signalling:

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| **Contribution** | **Summary** |
| R2-2000224 (Samsung) | Discusses PUSCH resource configurations and how the mapping between CFRA RO and preamble should identify a msgA PUSCH resource.The proposals are that:- PUSCH occasion index in the signaled PUSCH configuration is signaled along with the preamble indices.- The PUSCH occasions are indexedin order by - Increasing order of frequency resource index for freq. multiplexed PUSCH resources, - Increasing order of time resources, for time-multiplexed resources, -Increasing order of indices for PUSCH slots corresponding to a PRACH slot. |
| R2-2000410 (Oppo) | Proposes that the parameters for CFRA PUSCH configurations are configured independently of CBRA msgA PUSCH resources.  |
| R2-2000650 (CATT) | Proposes that the full *MsgA-PUSCH-Resource-r16* is used to configure CFRA resources for 2-step RACH and that no further optimization is required in this release and that no LS to RAN1 is needed. |
| R2-2000778 (Fujitsu) | Discusses RO and PO configurations for CFRA and number of options for sharing of RO and PO between 4-step CBRA, 2-step CBRA and 2-step CFRA. Proposes the following:For ROs- Sharing of ROs between 4-step and 2-step CFRA should be supported and that the parameter *msgA-TotalNumberOfRA-Preambles* should be used for this.- Three different options for ROs are suggested:- ROs sharing with 4-step RA- ROs sharing with 2-step CBRA, - Separate ROsFor msgA PUSCH: - The Information element *MsgA-PUSCH-Config* shall be reused for 2-step CFRA. - The PUSCH configuration for ROs sharing with 4-step RA and/or 2-step CBRA should be included in SIB1 while for separate ROs, this can be signalled dedicately.For preamble-to-PRU mapping for CFRA: - Reuse the mapping rule between PRACH and msgA PUSCH as for CBRA for CFRA - For shared ROs between 2-step CBRA and CFRA, the PUSCH configuration associated to the shared ROs can be shared between 2-step CBRA and 2-step CFRA.  - Fallback to 4-step RA should be supported by CFRA and if fallback to 4-step RA is not supported by CFRA, then dedicated PRU should be used for CFRA.  |
| R2-2000998 (ZTE) | Discusses resource configurations for 2-step CFRA. Proposes:- Separate RACH configurations for 2-step CFRA should be allowed and if not configured then the configuration for 2-step CBRA will be reused.- The method for the configuration of contention-free preambles for each SSB/CSI-RS in 4-step CBRA can be resued for 2-step CFRA. - The IEs used to to signal the configuration for MsgA PUSCH shall be reused.- For determining the PRU based on the preambles reserved for SSB/CSI-RS: - It is proposed to usethe mapping rule for 4-step CBRA along with an offsetand signaling the number of preambles used for contention-free 2-step RA. |

Based on the submitted contributions there seem to be two suggested methods for signalling the PRU:

1) Reusing the preamble-to-PRU mapping rule defined by RAN1 along with the number of preambles and an offset for the start of the preambles in each SSB/CSI-RS.

2) Signaling the index of the PUSCH occasion index in each SSB/CSI-RS.

Given that agreements are made on CFRA options in [2], we propose the following for signalling the PRU in CFRA:

**Initial Proposal 4: On signalling the PRU for CFRA:**

**Option 1:**Reuse the preamble-to-PRU mapping rule defined by RAN1 along with the number of preambles and an offset for the start of the preambles in each SSB/CSI-RS.

**Option 2:**Signal the index of the dedicated PUSCH occasion in each SSB/CSI-RS.

**Option 3:**FFS awaiting the outcome of the discussion in [3].

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| **Company** | **Comments on proposals** |
| Huawei | Option3. This is correlated with the dicussion in the MAC procedure and we expect the discussion to happen in one place |
| CATT | Option 1 is OK. RAN1 is progressing on this mapping. But Option 3 should also be OK as these two threads will anyway sync quite well.  |
| Potevio | Prefers option 1. |
| OPPO | Solution in Option2 may introduce impacts to RAN1, that is, the indexing rules of the PUSCH occasions associated with a PRACH slot should be explained in RAN1 specs. Maybe we need more time to check on how to mapping preamble to RPU for 2-step CFRA, it’s not sure whether it has impact on RAN1 or not for each of the options proposed. |
| Fujistu | Option 1 should be ok. |
| Samsung | We prefer Option 2. Indexing rule is straighforward. Note that we have defined similar rule for CSI RS occasion indexing in field description of CSI RS occasion index in RRC.Option 1 changes the way CFRA preambles are assigned. Currently network can allocate any preamble not used for CBRA for CFRA for any SSB. There is no SSB specific partition of CFRA preambles. For example lets say number of CB premables per SSB 8 and there are two SSBs per RO. In this case preamble 0 to 7 and 32 to 39 are used for CBRA. From remaining preambles i.e. 8 to 31 and 40 to 63, gNB can use any one for any SSB.Option 1 would also require changes in RAN1 spec to define CFRA preambles and their association with SSBs based on *msgA-TotalNumberOfCFRA-Preambles* and *msgA-PreambleStartIndex.*If majority view is to go with option 1, number of CFRA preambles per SSB can simply start from end of 2 step CBRA preambles. There is no need to signal starting index (i.e. msgA-PreambleStartIndex). |
| Intel | We also need more time to check how the mapping from the preamble to PRU defined in RAN1 can be reused for CFRA and what impact they may have to define the new mapping. |
| ZTE | To minimize the impact on RAN1, we prefer to adopt the option 1 and reuse the mapping rule defined for 2-step CBRA. |
| LG | This issue should be discussed by RAN1, not RAN2. |
| SONY | Option 1. Reuse the preamble-to-PRU mapping rule as defined by RAN1. |
| vivo | In our understanding, it seems option1 has the least impact on RAN1/2 specification. Specifically, we only need to introduce a new parameter to indicate the number of preambles used for 2-step CFRA in a valid PRACH occasion. Then we can directly reuse the defined mapping rule with some minor clarifications for the meaning of *Tpreamble* and*Tpusch* inRAN1 specification.  |
| Qualcomm | Option1, less impact to RAN1. |
| MediaTek | Agree with LG, wait for RAN1 discussion to be completed. |

Rapporteur comment:

6 companies prefer option 1,

1 companies prefer option 2,

6 companies mention that either it should be up to RAN1 or need more time to decide.

From the responses and lack of detailed technical discussions it is clear that companies need more time to consider this. The appropriate response would be to treat this the next meeting and/or send RAN1 an LS.

**Proposal 2: RAN2 send an LS to RAN1 on the identified options for preamble-to-PRU mapping for CFRA.**

## 2.2 RRC configuration

The following contributions deal with details on RRC configurations that are not discussed as part of the running RRC discussion:

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| **Contribution** | **Summary** |
| R2-2000586 (Apple) | For 2-step only BWP, if a fallback RAR is sent, the UE needs to apply parameters associated with 4-step random access. The proposal is to include the parameters *msg3-DeltaPreamble* and *ra-ContentionResolutionTimer* in the 2-step only BWP case. |

At first it can be beneficial to agree whether fallback RAR should be supported for 2-step only BWP.

Initial proposal 5 Fallback RAR shall be supported for 2-step only BWP.

If fallback RAR is supported for 2-step only BWP:

Initial proposal 6 Include *msg3-DeltaPreamble* and *ra-ContentionResolutionTimer* in the 2-step only BWP configuration.

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| **Company** | **Comments on proposals** |
| Huawei | According to the running CR, regardless whether the BWP is configured with 4-step RACH resource, the UE will monitor msgB-RNTI for fallbackRAR/successRAR after msgA transmission. So this is already supported that fallbackRAR can be supported for BWP with 2-step only RACH.It is reasonable that these two parameters are added for msg3 transmsission.  |
| CATT | Seems OK. |
| Potevio | Proposal 5: not prefer. |
| OPPO | Agree with Proposal5 and Proposal6. UE will receive a fallbackRAR in MsgB when network does not decode the MsgA payload successfully. No 4-step RA resource is involved in this fallback procedure. UE should support the transmission of Msg3 and the reception of the corresponding response regardless of whether 4-step RA is configured or not. |
| Fujitsu | Seems OK to support fallback on 2step only BWP. |
| Samsung | No strong view |
| Intel | Proposals are ok to us |
| ZTE | Since fallbackRAR is supported in 2-step only BWP (per MAC procedure), we think we have to support proposals 5/6. So, we agree.  |
| LG | Fallback RAR is sent if preamble is detected but payload is successfully recieved. Thus Fallback RAR should be supported on all BWPs where 2-step RA resources are configred. Regarding proposal 6, *ra-ContentionResolutionTimer* needs to be included, but we don’t know why *msg3-DeltaPreamble* is needed for 2-step RA. |
| SONY | Proposals 5 and 6 are OK. |
| vivo | According to the current running CR, there is no doubt that P5 is already supported. So we are fine with P6. |
| Qualcomm | Proposals are fine for us. |
| MediaTek | Agree on P5. Fallback should be supported for 2-step RA-only BWP. In any case, fallback only means that the UE will transmit the MsgA payload in Msg3 using the UL grant it receives in the fallbackRAR. There is no static resource cost, therefore no reason not to support this. If it is not supported, the only option for the case when the network cannot decode the payload would be to wait for the MsgB-window expiry, which will cause delay.On P6, agree with LG that *msg3-DeltaPreamble* is not needed, as this is used in resource selection step 5.1.2, which will be skipped for the fallback scenario.  |

Most companies seem to agree to Initial Proposal 5 and several companies aleady mentions that this is supported. Thus it should be easy to agree:

Proposal 3: Fallback RAR shall be supported for BWP(s) where 2-step RA resources are configured (no changes to the current running CR).

As to what parameters shall be included in the 2-step configurations, there are some different concerns. All companies seem to be aligned that the *ra-ContentionResolutionTimer* is needed:

Proposal 4: Include *ra-ContentionResolutionTimer* in *RACH-ConfigCommonTwoStepRA-r16* for fallback RAR, which is only configurable for 2-step RA only BWP.

However, while most companies agree with the proposals above, there are some technical concerns on whether the *msg3-DeltaPreamble* should be included, citing that this is configured during the resource selection step which would be by-passed for fallback case, thus we suggest to have a discussion on whether it is supported.

Proposal 5: *Msg3-DeltaPreamble* can be present in *PUSCH-ConfigCommon* for fallback RAR when a 2-step only BWP is configured.

## 2.3 Others

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| **Contribution** | **Summary** |
| R2-2000392 (Ericsson) | Beam specific 2-step RA support.The proposals are that the RRC specification should support SSB-beam specific 2-step RA. And the contribution also contains a TP on how this can be supported.  |
| R2-2000956 (Huawei) | Prioritized 2-step RACH. The contribution considers further parameters to be used in the prioritized 2-step RA. The parameters are *msgA-rsrp-Threshold* and *msgA-TransMax* and these could be given a different value for prioritized random access in order to reduce the latency. |

As these contributions are addressing issues on CP that no other company is mentioning, we propose to either postpone these or discuss them in an e-mail discussion on remaining CP issues for 2-step RA.

**Initial Proposal 8 RAN2 to further discuss remaining CP issues for 2-step RA.**

**Option 1:** Postpone them

**Option 2:** Discuss in e-mail discussion

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| **Company** | **Comments on proposals** |
| Huawei | Option1 |
| CATT | Opiton 1 |
| Potevio | Proposal 9: prefer option 1. |
| OPPO | Prefer Option 1 |
| Fujitsu | Option 1. |
| Samsung | Do not see a need for Beam specific 2-step RA support and different configuration of *msgA-rsrp-Threshold* and *msgA-TransMax* prioritised RACH. However we do support different configuration of *msgA-TransMax* CFRA and CBRA. This enables network to independently control switching to 4 step CBRA for 2 step CFRA and 2 step CBRA. |
| Intel | Option 1 |
| ZTE | Option 1.  |
| LG | Option 1 |
| SONY | Option 1. |
| vivo | Option 1. |
| Qualcomm | Option 1 |
| MediaTek | Option 1 |

The view of all companies is that these can be postponed. One company further mentions different configuraitons of *msgA-TransMax* for CFRA and CBRA, but this does not seem to have any support of any other companies. Thuse we provide no proposals for these contributions for now.

# 3 Conclusion

The proposals below have the following color-coding(will be applied later):

**Easy agreement.**

**Might require discussions/clarifications.**

**Will most likely generate discussions.**

**Candidate for postponing.**

Proposal 3: Fallback RAR shall be supported for BWP(s) where 2-step RA resources are configured (no changes to the current running CR).

Proposal 4: Include *ra-ContentionResolutionTimer* in *RACH-ConfigCommonTwoStepRA-r16* for fallback RAR, which is only configurable for 2-step RA only BWP.

Proposal 5: *Msg3-DeltaPreamble* can be present in *PUSCH-ConfigCommon* for fallback RAR when a 2-step only BWP is configured.

**Proposal 2: RAN2 send an LS to RAN1 on the identified options for preamble-to-PRU mapping for CFRA.**

Proposal 1: E-mail discussion on RAN2-specific capabilities.

# 4 References

1. R2-2001217, 2-step RA 38.331 Running draft CR, Ericsson, RAN2#109e, March 2020, Elbonia (online meeting)
2. R2-2001218, RRC open issues, Ericsson, RAN2#109e, March 2020, Elbonia (online meeting)
3. R2-2000997, Running CR on 38.321 for 2-step RA, ZTE, RAN2#109e, March 2020, Elbonia (online meeting)
4. R2-2001916, Summary of UP open issues, ZTE, RAN2#109e, March 2020, Elbonia (online meeting)