**3GPP TSG-RAN WG2 Meeting #117-e (draft) R2-220xxxx**

**Online, 21 February – 03 March 2022**

**Agenda Item: 8.19.2**

**Source: ZTE Corporation**

**Title: [AT117-e][111][CovEnh] MAC CR (ZTE)**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion.

* [AT117-e][111][CovEnh] MAC CR (ZTE)

Scope: Update the MAC CR

Intended outcome: Agreed MAC CR

Initial deadline (for companies' feedback): Tuesday 2022-03-01 1800 UTC

Initial deadline (for Stage 2 CR in R2-2203553): Wednesday 2022-03-02 1000 UTC

Status: Ongoing

In this offline document, we mainly discuss the following contributions:

[R2-2202652](file:///C:\Data\3GPP\Extracts\R2-2202652%20TS%2038.321%20CR%20for%20NR%20coverage%20enhancements.docx) TS 38.321 CR for Rel-17 Coverage enhancement ZTE Corporation, Sanechips CR Rel-17 38.321 16.7.0 1199 - B NR\_cov\_enh-Core

* LG thinks the CR touches the legacy text and would prefer not to do so.
* ZTE thinks it's different to do without touching legacy.
* Noted
* Revised in R2-2203553
* Continue in offline 111

[R2-2203284](file:///C:\Data\3GPP\Extracts\R2-2203284%20BWP%20with%20only%20CE-RACH%20resources.docx) BWP with only CR-RACH resources Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_cov\_enh-Core

Proposal 1: In case RSRP threshold for CE is configured for BWP with only CE-RACH, the UE switches to initial BWP for RA procedure in case the RSRP is above the threshold.

* Vivo thinks this is discussed in RAN1 as well
* Can be discussed in offline 111, with the understanding this needs to be confirmed by RAN1.

[R2-2203128](file:///C:\Data\3GPP\Extracts\R2-2203128%20On%20measurement%20gap%20handling%20for%20Msg3%20repetitions.docx) On measurement gap handling for Msg3 repetitions Huawei, HiSilicon discussion Rel-17 NR\_cov\_enh-Core

Proposal 1: During a measurement gap, the MAC entity shall transmit on UL-SCH for all repetitions of the Msg3 transmission.

* Discussed in offline 111

For other comments on MAC CR, please add your comments to the CR using “comments bubbles”.

# Contact from companies

|  |  |
| --- | --- |
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# Discussion

## Handling of Contention Resolution timer in MAC CR

In the latest MAC running CR, to capture the RAN2 agreement, we have following update

|  |
| --- |
| 5.1.5 Contention Resolution  Once Msg3 is transmitted the MAC entity shall:  1> if the Msg3 transmission (i.e. initial transmission or HARQ retransmission) is scheduled with Type A PUSCH repetition:  2> start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of all repetitions of the Msg3 transmission;  1> else:  2> start or restart the *ra-ContentionResolutionTimer* in the first symbol after the end of the Msg3 transmission;  1> monitor the PDCCH while the *ra-ContentionResolutionTimer* is running regardless of the possible occurrence of a measurement gap; |

During Tuesday GTW session, one company raised concern that the legacy text should be untouched. For this comment, the rapporteur would like to explain that the intention of above change is to capture the case:

1. Even if Msg3 was initial transmitted with repetition, upon HARQ retransmission, network may disable Msg3 repetition by indicating “rep-number=1” in RAR.

So for *ra-ContentionResolutionTimer*, we can focus on the each Msg3 transmission, and describe the UE behaviour depends on whether Type A PUSCH repetition is enabled. For each Msg3 transmission, if Msg3 repetition is not enabled, the UE enters the grey branch, otherwise, the UE enters the yellow branch.

So “at each HARQ retransmission” can be considered to be moved to the top level.

During last meeting, many comments and suggestions were raised, but after some offline discussion, we think the above modification is the cleanest one. Companies are invited to show your views on this.

**Q1. Do companies agree with above changes? (If not, please elaborate your proposed TP)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Disagree** | **Comments** |
| ZTE | Agree |  |
| Nokia | Agree |  |
| Ericsson | Agree |  |
| Samsung | Agree |  |
| Xiaomi | Agree |  |
| Huawei, HiSilicon | Agree |  |
| OPPO | Agree |  |
| Qualcomm | Agree |  |
| CATT | Agree |  |
| LGE | Disagree | The legacy text has been there since Rel-15 and has no problem. So, we think the legacy text should not be touched as long as it has a critical problem and the new added text for Msg3 repetition should be aligned with the legacy text.  In my memory, a controversial point in the RAN2 discussion on this TP is whether to determine the wording between “If Msg3 was transmitted with Msg3 repetition” and “If Msg3 repetition is applicable”. In the discussion, the common understanding is that if the past tense, i.e., “was transmitted”, is used, the legacy text may not be sufficient to cover all cases. However, RAN2 finally determine not to use past tense and “if the Msg3 transmission is scheduled with Type A PUSCH repetition” is captured now. Thus, we think that the legacy text should be as it is and the new text for Msg3 repetition should be aligned with the legacy text as much as possible as shown in the following our TP.  1> if the Msg3 transmission ~~(i.e. initial transmission or HARQ retransmission)~~ is scheduled with Type A PUSCH repetition:  2> start ~~or~~ *ra-ContentionResolutionTimer* and restart the *ra-ContentionResolutionTimer* at each HARQ retransmission of the bundle in the first symbol after the end of all repetitions of the Msg3 transmission;  1> else:  2> start the ra-ContentionResolutionTimer and restart the *ra-ContentionResolutionTimer* at each HARQ retransmission in the first symbol after the end of the Msg3 transmission;  We also think that the MAC behaviour of our TP is same as the latest rapporteur’s TP. Hope to hear other company’s views on our TP.  [Rapp-ZTE] Thanks for the comment and TP, based on previous discussion, the green part may cause confusion.  1> if the Msg3 transmission is scheduled with Type A PUSCH repetition:  2> start ~~or~~ *ra-ContentionResolutionTimer* and restart the *ra-ContentionResolutionTimer* at each HARQ retransmission of the bundle in the first symbol after the end of all repetitions of the Msg3 transmission;  1. For the first time Msg3 is transmitted with repetitions, the UE enters this branch. Since it captures both transmission and HARQ retransmission, then the UE will process only based on what described in “2>”. However, if Msg3 repetition is not applicable to HARQ retransmission, then the yellow part becomes incompatible because it describes the Msg3 repetitions case.  2. If you think for HARQ retransmission without Msg3 repetition, the UE can jump to the “1> else:” branch, it means that the UE needs to evaluate condition: “1> if the Msg3 transmission is scheduled with Type A PUSCH repetition:” upon each Msg3 transmission. Then there is no need to mention “HARQ retransmission” in “2>…” branches, and it becomes what proposed in the current MAC CR.  Hope this clarifies. |
| Apple | Agree |  |

**Summary:**

10 companies agree with the modified text procedure in current MAC CR, 1 company shows concern on the change of legacy sentence, but no further comment is received after the rapporteur’s clarification. So the rapporteur understands the text proposal is agreeable now.

**Proposal 1 On *ra-ContentionResolutionTimer*, the text proposal in current MAC CR is agreeable， further update is not needed.**

## CE only BWP

Following working assumption is agreed in RAN2#116bis-e, and an LS is sent to RAN1 to check the feasibility:

Working assumption:

1. From RAN2’s perspective, a dedicated UL BWP can be configured with only CE RACH resources. Its feasibility is to be confirmed by RAN1.

In R2-2203284, it suggests to further clarify the UE behaviour when the dedicated BWP is configured with only CE RACH resources.

**Proposal 1: In case RSRP threshold for CE is configured for BWP with only CE-RACH, the UE switches to initial BWP for RA procedure in case the RSRP is above the threshold.**

If RAN1 confirms the feasibility of this scenario, RAN2 needs to discuss this issue and capture it in spec if needed.

Based on previous discussion, this is only applicable to dedicated BWP, per rapporteur’s understanding, there are two options on the table:

* Option 1: For dedicated BWP configured with only CE RACH resources, the network should not configure the RSRP threshold for requesting Msg3 repetition, which means RedCap UEs can only trigger CE RACH on this BWP, no need to perform CE vs non-CE selection;
* Option 2: For dedicated BWP configured with only CE RACH resources, the RSRP threshold for requesting Msg3 repetition can be configured, if the RSRP is above the threshold, then the UE should switch to initial BWP to perform RACH. (Proposal1 in R2-2203284)

Companies are invited to show your preference:

**Q2. If RAN1 confirms, for dedicated BWP configured with only CE RACH resources, which option do companies prefer?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option 1 or Option 2** | **Comments** |
| ZTE | Option 1 | We think Option 1 is simpler.  Since this is for dedicated BWP, if the network configures CE-only BWP, and indicates the UE to perform RACH on that BWP, it means the network wants the UE to perform CE RACH directly.  This is similar to *msgA-RSRP-Threshold,* the field is only present if both 2-step RA and 4-step RA are configured for the BWP.   |  | | --- | | ***msgA-RSRP-Threshold***  The UE selects 2-step random access type to perform random access based on this threshold (see TS 38.321 [3], clause 5.1.1). This field is only present if both 2-step and 4-step RA type are configured for the BWP. |   Option 2 is complex without clear benefit. |
| Nokia | Option 2 | This avoids unnecessary repetition of Msg3 in case the UE is in good coverage. |
| Ericsson | Option 1 | We would like to avoid BWP switching unless really needed and avoid excessive UE-autonomous resource-switching.  And we do not think that there would be any unnecessary repetitions as the network may always schedule R=1. |
| Samsung | Option 1 |  |
| Xiaomi | See comments | Firstly, BWP switch should be avoided.  Secondly, network need to ensure that UE can always select a feature combination. Otherwise, legacy RACH resource need to be configured on the BWP for the case that no RACH partition is selected. |
| Huawei, HiSilicon | Option 1 | We are concerned that Option 2 may not be compatible with RACH partitioning framework. It seems that common understanding is MAC will determine feature after BWP is selected. |
| OPPO | Option 1 | Agree with ZTE. |
| Qualcomm | Option 2 | We understand that network can choose number of repetitions (including R=1) based on received power of Msg1. But from UE’s perspective, UE is not able to know whether network would schedule unnecessary repetitions, which would cost UE extra power and latency. Hence we prefer Option 2 which gives UE more control. Delay by BWP switching is not significant when compared with the typical latency of a RACH procedure. |
| CATT | Option1 | Option 1 is simple. If the network finds that the channel condition has recovered, it reconfigures the UE. |
| LGE | Option 1 | In option 1, of course, even if the UE is in good coverage, the UE should request Msg3 repetition, but we think that, in this case, the network will give repetition number = 1 to the UE. So, option 1 doesn’t have a problem and unnecessary repetition of Msg3 may not occur as this contribution concerns. |
| Apple | Option 1 | We should avoid the BWP switching. |

**Summary:**

8 companies prefer Option 1, 2 companies prefer Option 2, and 1 company thinks BWP switching should be avoid and the network should ensure there is applicable RACH partition. So there is a clear majority to support Option 1.

**Proposal 2 If RAN1 confirms the feasibility of dedicated BWP configured with only CE RACH resources, in this case, the RSRP threshold for requesting Msg3 repetition will not be configured, so RedCap UEs can only trigger CE RACH in this BWP, no need to perform CE vs non-CE selection.**

**Q3. If answers “Option 1” to Q2, do you agree to capture the configuration restriction in RRC spec (e.g. in the field description of the CE RSRP threshold)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Disagree** | **Comments** |
| ZTE | Agree | See our comments to Q2. We can add similar restriction to the field description of CE RSRP threshold in RRC spec. e.g.  The field is only present if both CE and non-CE RACH resources are configured for the BWP. |
| Nokia | Yes |  |
| Ericsson | Yes | Agree with ZTE’s TP. There may also need to be some clarifications elsewhere and RIP WI needs to be made aware that sometimes the CE threshold may not be needed (unfortunately we cannot send inter-WG LSes 😊). |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes |  |
| OPPO | Agree |  |
| CATT | Agree |  |
| LGE | Agree |  |
| Apple | Agree |  |

**Summary:**

If Option1 is agreed, all companies agree to capture the restriction in the field description of CE RSRP threshold. Since the field will be implemented in RACH partitioning RRC CR, so rapporteur will coordinate with RIP RRC CR rapporteur (Ericsson).

**Proposal 3 For Proposal 2, to capture the configuration restriction in field description of CE selection RSRP threshold. E.g. “the field is only present if both CE and non-CE RACH resources are configured for the BWP” (will be implemented in RIP RRC CR).**

**Q4. If answers “Option 2” to Q2, do you agree to capture it in MAC spec (e.g. in section 5.15.1 BWP operation)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Disagree** | **Comments** |
| Nokia | Yes |  |
| Qualcomm | Yes |  |
|  |  |  |
|  |  |  |
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## Gap

In R2-2203128, it suggests to clarify that MAC entity shall transmit all Msg3 repetitions during measurement gap.

**Proposal 1: During a measurement gap, the MAC entity shall transmit on UL-SCH for all repetitions of the Msg3 transmission.**

Companies are invited to express your views on above proposal.

**Q5. Do companies agree with above Proposal 1?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or Disagree** | **Comments** |
| ZTE | Agree | We think Msg3 transmission is prioritized no matter it is initial transmission, HARQ retransmission or repetition. |
| Nokia | Yes |  |
| Ericsson | Yes | Agree, follow legacy msg3. |
| Samsung | Yes | As in legacy, no specification impact. |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Agree | Proponent company |
| OPPO | Yes |  |
| Qualcomm | Agree |  |
| CATT | Agree |  |
| LGE | Yes |  |
| Apple | Yes |  |

In addition, a text proposal is provided in R2-2203128:

|  |
| --- |
| 5.14 Handling of measurement gaps  During a measurement gap, the MAC entity shall, on the Serving Cell(s) in the corresponding frequency range of the measurement gap configured by *measGapConfig* as specified in TS 38.331 [5]:   1. not perform the transmission of HARQ feedback, SR, and CSI; 2. not report SRS; 3. not transmit on UL-SCH except for Msg3 (including all the repetitions within a bundle) or the MSGA payload as specified in clause 5.4.2.2; 4. if the *ra-ResponseWindow* or the *ra-ContentionResolutionTimer* or the *msgB-ResponseWindow* is running:   2> monitor the PDCCH as specified in clauses 5.1.4 and 5.1.5.   1. else:   2> not monitor the PDCCH;  2> not receive on DL-SCH. |

**Q6. If answers “Agree” to Q5, do you agree with above TP?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/ No** | **Comments** |
| ZTE | No | We think the change is not necessary.  The general term “Msg3” already covers all cases (initial transmission, HARQ retransmission and Rel-17 repetitions). Only if we have different treatments for different cases, there is a need to describe more details in spec.  Our concern is that, with this change, we might need to go through all other places that using “Msg3” in MAC/RRC specs, and to make similar update even if the UE behaviour is the same for Msg3 repetitions. |
| Nokia | No | Agree with ZTE this should be clear from the changes in the RA section of the MAC. |
| Ericsson | No | Not necessary and agree with ZTE. |
| Samsung | No |  |
| Xiaomi | No |  |
| Huawei, HiSilicon | No strong view | If majority thinks it is clear from the current spec, we are fine not to have this correction. |
| OPPO | No | Agree with ZTE |
| Qualcomm | No | Same comments as companies above |
| CATT | No | Agree with ZTE. |
| LGE | No | Agree with ZTE. |
| Apple | No |  |

**Summary:**

All companies agree that UE can transmit Msg3 repetitions during gap occasions, and the current spec can already cover this, further spec change is not needed.

**Proposal 4 During a measurement gap, the MAC entity can transmit all repetitions of the Msg3 transmission on UL-SCH for (no spec impact).**

## Other

Any other issue that needs discussion?

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | We agreed to introduce a new SSB threshold when having selected msg3 resources in RAN2#116-e:   1. A separate rsrp-ThresholdSSB threshold is introduced for requesting Msg3 repetition.   And in RAN2#116bis-e:   1. From CE’s perspective, CE RACH can be configured with a separate RSRP threshold for SSB selection and this threshold can be configured per BWP.   Was this missed in the CR? We don’t think that it has any impact with RACH indication and partitioning.  [Rapp-ZTE] Thanks for the comments. ; )  For the first agreement, since it relates to CE/non-CE selection (i.e. feature determination), so it is captured in RIP MAC CR, see below text procedure extracted from R2-2203307 section 5.1.1b.    For the second agreement, according to the conclusion of RIP, CE is considered as part of feature combination, so one RACH partition can be configured for either CE or non-CE, but not both. Since each RACH partition includes the *rsrp-ThresholdSSB* field, and the one included in CE related RACH partition can be considered as the SSB selection threshold specifically for CE. So there is no need to introduce separate SSB selection threshold IE from signalling point of view.  And for UE behaviour in MAC spec, it is captured in section 5.1.1 (also in RIP MAC CR) when the RACH related parameters are initialized. |
| Samsung | For the following change in 5.4.2.1 :  “ Within a bundle, HARQ retransmissions are triggered without waiting for feedback from previous transmission according to *REPETITION\_NUMBER* for a dynamic grant or configured uplink grant or uplink grant received in a MAC RAR unless the configured uplink grant is terminated as specified in clause 6.1 of TS 38.214 [7]. Each transmission within a bundle is a separate uplink grant delivered to the HARQ entity.”  In the legacy text, “they” refer to both dynamic grant and configured uplink grant. In the CR, the legacy behavior seems to be modified as now “they” is changed to “ the configured uplink grant”. Why is this change done? Prefer to not modify legacy behavior  [Rapp-ZTE] As also commented by HW, I think we can undo the change on “they are”. Thanks. |
| Huawei ,HiSilicon | Regarding the question from Samsung, we recalled this issue was raised by one comment that only CG grant can be terminated by CG-DFI as in TS 38.214, but we are also not sure if we missed something for DG grant given that termination operation is fully in RAN1 expertise. Since there is also a reference to TS 38.214 in the sentence and this is legacy text, we don’t see a big problem to keep “they are” in the MAC spec. |
|  |  |
|  |  |

**Summary:**

For the questions raised by companies, rapporteur already provides explanation and update the MAC CR accordingly, so no proposal will be provided for this.

# Conclusions

*For easy agreements:*

**Proposal 1 On *ra-ContentionResolutionTimer*, the text proposal in current MAC CR is agreeable， further update is not needed.**

**Proposal 2 If RAN1 confirms the feasibility of dedicated BWP configured with only CE RACH resources, in this case, the RSRP threshold for requesting Msg3 repetition will not be configured, so RedCap UEs can only trigger CE RACH in this BWP, no need to perform CE vs non-CE selection.**

**Proposal 3 For Proposal 2, to capture the configuration restriction in field description of CE selection RSRP threshold. E.g. “the field is only present if both CE and non-CE RACH resources are configured for the BWP” (will be implemented in RIP RRC CR).**

**Proposal 4 During a measurement gap, the MAC entity can transmit all repetitions of the Msg3 transmission on UL-SCH for (no spec impact).**