**3GPP TSG-RAN WG2 Meeting #117-e *R2-2xxxxxx***

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

**Agenda item: 5.3 User Plane corrections**

**Source: Huawei, HiSilicon**

**Title: Report of [AT117-e][025][NR15] User-plane Corrections**

**Document for: Discussion and decision**

1. Introduction

This document is to report the outcome of the following email discussion at RAN2#117-e Meeting:

* [AT117-e][025][NR15] User-plane Corrections (Huawei)

Scope: Treat R2-2202109, R2-2203129, R2-2203130, R2-2203241, R2-2203242, R2-2203240, R2-2202552, R2-2202553, R2-2203239, R2-2202194. Ph1 Determine agreeable parts. P2 agree CRs for agreeable parts.

Intended outcome: Report, Agreed CRs.

Deadline: Schedule 1

Discussions with Deadline **Schedule 1**:

A **first round** with **Deadline for comments W1 Thur Feb 24th 1200 UTC** to settle scope what is agreeable etc

A Final round with **Final deadline W2 Wed March 2nd 1200 UTC** to settle details / agree CRs etc.

2. Contact Information

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| --- | --- |
| **Company** | **Contact: Name (E-mail)** |
| **Qualcomm** | **Linhai He (linhaihe@qti.qualcomm.com)** |
| **ZTE** | **Fei Dong(dong.fei@zte.com.cn)** |
| **Samsung** | **Jaehyuk Jang (jack.jang@samsung.com)** |
| **Huawei, HiSilicon** | **Chong Lou (louchong@huawei.com)** |
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| **CATT** | **Pierre Bertrand (pierrebertrand@catt.cn)** |
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3. Phase 1 discussion

## 3.1 Initial state of elements controlled by MAC CE

[1] R2-2202109 Reply LS on initial state of elements controlled by MAC CEs (R1-2112860, Contact: Huawei) LS in Rel-15 To:RAN2 Cc:RAN4

[2] R2-2203129 Clarification on the initial state of elements controlled by MAC CE (based on LS R1-2112860, Contact: Huawei) Huawei, HiSilicon CR Rel-15 38.321 15.12.0 1208 - F NR\_newRAT-Core, TEI16

[3] R2-2203130 Clarification on the initial state of elements controlled by MAC CE (based on LS R1-2112860, Contact: Huawei) Huawei, HiSilicon CR Rel-16 38.321 16.7.0 1209 - F NR\_newRAT-Core, TEI16

[4] R2-2203241 Correction to 38.321 on the term of the handover in handling of MAC CE ZTE Corporation,Sanechips CR Rel-16 38.321 16.7.0 1212 - F NR\_newRAT-Core

[5] R2-2203242 Discussion on Initial State of Elements Controled by MAC CEs ZTE Corporation,Sanechips discussion Rel-15 NR\_newRAT-Core

[6] R2-2203240 Correction to 38.321 on the term of the handover in handling of MAC CE ZTE Corporation,Sanechips CR Rel-15 38.321 15.12.0 1211 - F NR\_newRAT-Core

The issue of initial state of elements controlled by MAC CE was discussed in RAN2#116 and a LS was approved to ask RAN1 views on RAN2 identified questions, and RAN1 has provided their anwers in [1].

[2][3][4][5][6] all discussed this issue and also provided the corresponding R15 and R16 corrections but with different understandings on some particular questions. Therefore, as the rapporteur, we would like to first understand company’s views on these questions, respectively.

**Q1-1**: Do you agree that “the initial deactivation when using handover is applied for both PCell change and PSCell change/addition” based on RAN1 answer to question 1 as follows?

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| 1. Whether the initial deactivation when using handover should be applied for both PCell change and PSCell change/addition of DC?   [RAN1 answer]: Initial state of deactivation is applied for both PCell change and PSCell change/addition in the case of DC. |

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| ZTE | Yes |  |
| Samsung | Yes | - |
| Huawei, HiSilicon | Yes |  |
| OPPO | Yes |  |
| Lenovo/Motorola Mobility | Yes |  |
| vivo | Yes | We share the same understanding of RAN1. |
| Nokia | Yes |  |
| CATT | Yes |  |

**Q1-2**: If your answer to Q1-1 is “Yes”, do you agree that handover” should be corrected to “reconfiguration with sync” as in [2][3][4][6]?

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| **Company** | **Agree as is/**  **Agree with change/**  **No change needed** | **Comments** |
| Qualcomm | Agree with [2][3] with a minor change | For the spatial relation of PUCCH resource, it seems clearer without “initially”, since the TP includes both initial configuration and reconfiguration. |
| ZTE | Agree with [5][6] |  |
| Samsung | Agree with [2][3] | We also support the change from Qualcomm above. |
| Huawei, HiSilicon | Agree with [2][3] | We are okay with the proposed changes from QC |
| OPPO | Agree with [2][3] | No strong view on Qualcomm’s improvement. |
| Lenovo/Motorola Mobility | Agree with [2][3] | OK to go with the improvements proposed by Qualcomm |
| vivo | Agree as [2][3] | We are fine with those two CRs. By the way, we think “initially” can be kept as it is also used for the other MAC CEs that involve both initial configuration and RRC reconfiguration. We prefer to align the wording style. |
| Nokia | Agree with [2][3] | Also fine with Qualcomm’s clarification |
| CATT | Agree with [2][3] |  |

**Q2-1**: Do you agree that “initial deactivation when using configuration should be applied for both “initial configuration by RRC” and “reconfiguration by RRC” based on RAN1 answer to question 2 as follows?

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| 1. Whether the initial deactivation when using configuration should be applied for both “initial configuration by RRC” and “reconfiguration by RRC”?   [RAN1 answer]: Initial state of deactivation is applied for “initial configuration by RRC”, and is applied for “reconfiguration by RRC” with PCell change and PSCell change/addition in the case of DC or when the corresponding elements are newly added or modified by the reconfiguration message (unimpacted elements should maintain their previous state). |

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes with comment | We think RAN1’s reply indicates both   1. RRC initial configuration and RRC reconfiguration (or simply RRC configuration); 2. 2 RRC reconfiguration with sync |
| ZTE | Yes |  |
| Samsung | Yes | - |
| Huawei, HiSilicon | Yes |  |
| OPPO | Yes |  |
| Lenovo/Motorola Mobility | Yes |  |
| vivo | Yes | We share the same understanding of RAN1. |
| Nokia | Yes |  |
| CATT | Yes |  |

**Q2-2**: If your answer to Q2-1 is “Yes”, do you agree that “upon configuration” should be corrected to “upon RRC (re-)configuration” as in [2][3]?

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| **Company** | **Agree as is/**  **Agree with change/**  **No change needed** | **Comments** |
| Qualcomm | Agree as is in [2][3] |  |
| ZTE | No change needed | No need to correct, we think ‘configuration’ indicate both initial configuration and re-configuration, and RAN1 LS does not give a clear mind about the wording issue, how to capture the wording is up to RAN2. In addition, in LTE (36.321), we also have the similar wording as below:  ----------- From 36.321 --------------------------------------  **5.19 Activation/Deactivation of CSI-RS resources**  The network may activate and deactivate the configured CSI-RS resources of a serving cell by sending the Activation/Deactivation of CSI-RS resources MAC control element described in clause 6.1.3.14. The configured CSI-RS resources are initially deactivated upon **configuration** and after a handover.  ----------- From 36.321 --------------------------------------  So we do not think this is an essential issue to be corrected, if not, maybe we should consider correct LTE SPEC as well. |
| Samsung | Agree as is in [2][3] | Since we are improving the text now, the changes in [2][3] look good to us. |
| Huawei, HiSilicon | Agree as is in [2][3] | Note that it indeed caused some confusions in RAN2#116 and that is the reason why we asked RAN1 for clarification. Thus we think it is okay to improve the MAC text for clarity. |
| OPPO | Agree as is in [2][3] |  |
| Lenovo/Motorola Mobilty | Agree [2][3] |  |
| vivo | Agree as [2][3] |  |
| Nokia | Not exactly. | We usually use "(re-)configuration by upper layers", not "RRC (re-)configuration" |
| CATT | Agree | Also OK with Nokia’s wording. |

**Q3-1**: Do you agree that “UE behavior relevant to (Enhanced) PUCCH spatial relation Activation/Deactivation MAC CE should be aligned with the other MAC CEs” based on RAN1 answer to question 3 as follows?

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| 1. Whether the UE behavior relevant to (Enhanced) PUCCH spatial relation Activation/Deactivation MAC CE should be aligned with the other MAC CEs?   [RAN1 answer]: RAN1 assumed the UE behavior relevant to (Enhanced) PUCCH spatial relation Activation/Deactivation MAC CE is aligned with other MAC CEs, i.e., initial state of deactivation is applied for configured candidate spatial relations. So, nothing is to be aligned from RAN1 perspective. Whether or not to reflect this in the specification for (Enhanced) PUCCH spatial relation Activation/Deactivation MAC CE is up to RAN2. From RAN1 perspective, either is OK. |

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| ZTE | Yes, but | According to RAN1 reply, they have confirmed that the same rule have been applied in RAN1, so that’s why:  So, nothing is to be aligned from RAN1 perspective. Whether or not to reflect this in the specification for (Enhanced) PUCCH spatial relation Activation/Deactivation MAC CE is up to RAN2. From RAN1 perspective, either is OK  And also confirm , it is not a critical issue if nothing is captured in RAN2 specification. Consider this correction is involving the R15 UE , we suggest not to touch the part which is not essential |
| Samsung | Yes | - |
| Huawei, HiSilicon | Yes |  |
| OPPO | Yes |  |
| Lenovo/Motorola Mobility | Yes |  |
| vivo | Yes |  |
| Nokia | Yes |  |
| CATT | Yes |  |

**Q3-2**: If your answer to Q3-1 is “Yes”, do you agree that “the UE behavior relevant to (Enhanced) PUCCH spatial relation Activation/Deactivation MAC CE should be corrected in order to align with other MAC CEs” as in [2][3]?

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| **Company** | **Agree as is/**  **Agree with change/**  **No change needed** | **Comments** |
| Qualcomm | Agree as is in [2][3] |  |
| ZTE | No change needed |  |
| Samsung | Agree as is in [2][3] | Since we are improving the text now, the changes in [2][3] look good to us. |
| Huawei, HiSilicon | Agree as is in [2][3] | No reason to overlook this MAC CE from the spec point |
| OPPO | Agree as is in [2][3] |  |
| Lenovo/Motorola Mobility | Agree [2][3] |  |
| vivo | Agree as [2][3] |  |
| Nokia | Agree as is in [2][3] |  |
| CATT | Agree as is in [2][3] |  |

**Summary: TBD**

## 3.2 DRX RTT timer with UL skipping

[7] R2-2202552 Clarification on the DRX RTT Timer operation with UL skipping configuration Apple CR Rel-15 38.321 15.12.0 1195 - F NR\_newRAT-Core

[8] R2-2202553 Clarification on the DRX RTT Timer operation with UL skipping configuration Apple CR Rel-16 38.321 16.7.0 1196 - A NR\_newRAT-Core

[7][8] think the following MAC text is ambiguous whether the UE should start the UL HARQ RTT timer if the UL transmission is skipped,

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| *2> if the PDCCH indicates a UL transmission:*  *3> start the drx-HARQ-RTT-TimerUL for the corresponding HARQ process in the first symbol after the end of the first transmission (within a bundle) of the corresponding PUSCH transmission;* |

and propose to further enhance the current MAC text by adding “actual” before “corresponding PUSCH transmission” to clearly indicate that the UE should not start the UL HARQ RTT timer if the UL transmission is skipped.

**Q4-1**. Companies are asked to provide your views on above issue:

* Option A: the UE shall not start the UL HARQ RTT timer when UL transmission is skipped
* Option B: the UE shall start the UL HARQ RTT timer when UL transmission is skipped
* Option C: the UE behaviour is not specified (i.e. up to UE implementation)

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| **Company** | **Option A/B/C** | **Comments** |
| Qualcomm | See comment | We support the intention of the CR. But in practice the proposed change probably would not make much difference if DRX inactivity timer is still re-/started by a new UL grant even if it is skipped, because DRX inactivity timer usually is much longer than a typical HARQ process. |
| ZTE | See comments | We think neither Option A nor Option B can make the RAN interface misalignment between NW and UE, in other word, nothing is missing, so we do not think this is an issue shall be resolved in maintenance period. |
| Samsung | Option A but | We think the current text already says Option A from the phrase '*after the end of the first transmission*'. However, even if others have different opinion, we do not see the need of specification change at this phase, as Qualcomm and ZTE said above. |
| Huawei, HiSilicon | Option A but | Agree with above |
| OPPO | Option A but | According to the current text, we understand the timer is started only after the PUSCH transmission, Thus, the UL HARQ RTT timer will not start when UL transmission is skipped. On the other hand, we also do not expect any spec change, as mentioned by the above companies. |
| Lenovo/Motorola | Comment | Our interpretation of the current spec is basically Option A. Therefore we don’t see a need to enhance the spec text. |
| vivo | Comments | From MAC perspective, transmission can only be triggered only if a MAC PDU to transmit has been obtained. In this sense, the existing terminology PUSCH transmission means that the MAC entity has already generated a MAC PDU. Otherwise, the transmission will not be triggered when UL skipping is done based on 5.4.2.2 and the DRX RTT timer would not be started. In this sense, we think everything works well and fail to figure out the motivation of this CR (i.e. no change is required). |
| Nokia | Option A but | Agree with Samsung. |
| CATT | Option A | As currently captured |

**Q4-2**. If you answer to Q4-1 is “Option A”, do you agree the text proposal in [7][8] to the current MAC spec?

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| **Company** | **Agree as is/**  **Agree with change/**  **No change needed** | **Comments** |
| Samsung | No change needed | As commented in Q4-1 above. |
| Huawei, HiSilicon | No change needed |  |
| OPPO | No change needed | See comments above in Q4-1. |
| Nokia | No change needed | Current spec is clear in our opinion. |
| CATT | No change needed | Current text is clear. |

**Summary: TBD**

## 3.3 Abnormal handling of UL retransmission

[9] R2-2203239 Discussion on An Abnormal Case for Retransmission ZTE Corporation,OPPO, Sanechips discussion Rel-15 NR\_newRAT-Core

[9] discusses the case that the UE receives a UL grant for retransmission with a different TBS from the previous transmission, i.e. the TBS doesn’t match the size of MAC PDU stored in the HARQ buffer, and proposes to discuss the UE behaviour in this case.

**Q5**: Companies are asked to provide your views on the above issue:

* Option A: the UE shall ignore the UL grant
* Option B: the UE shall consider the UL grant for a new transmission, and then generate a MAC PDU for it
* Option C: the UE behaviour is not specified (i.e. up to UE implementation between option A or Option B)

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| **Company** | **Option A/B/C** | **Comments** |
| Qualcomm | Option C | We think it is an error case and hence its handling should be up to UE implementation. |
| ZTE | Proponent | We want companies to confirm whether UE may go to either A or B , and maybe ‘up to UE implementation between A and B’. Which means UE won’t re-transmit the MAC PDU saved in the buffer using the UL grant indicating an ill-suited size. |
| Samsung | Option C | We share the view with Qualcomm. |
| Huawei, HiSilicon | Agree with the intention, but | We share the sympathy on this issue. But we also understand this “old” issue is too late to fix in NR spec, so we can rely on sensible UE implementation to avoid any unexpected errors at the NW receiving side. |
| OPPO | See comment | As clarified by ZTE above, C intends to say whether to perform A or B depends on the UE implementation, and the UE does not retransmit the stored MAC PDU in this case.  We have no strong view on the solutions and would like to have a common understanding of how to handle this issue. If Option A or B is agreed, we expect the corresponding spec change, while if Option C is the majority view, it means that it depends on the UE implementation to choose A or B(no spec change). |
| Lenovo/Motorola Mobility | Comments | We think that such error cases have been already discussed in the past. In the past we always left such cases to UE implementation since they should occur only rarely. |
| vivo | Comments | We would like to point out that a similar question had been discussed in the Rel-15 RAN1 LDPC coding session. Specifically, there is no bug in such a case. Alternatively (it might be a common understanding from the RAN1 perspective), the UE can still perform the retransmission based on the scheduling info (rate matching framework can handle any misalignment, e.g. TBS 100 bit and code-rate 1/2 (assuming RV0) for initial transmission, then 200 bit (i.e. 100-bit system bit and 100-bit check bits) will be transmitted in the initial transmission. Assuming retransmission is set to 50 bit and code-rate with 1/2 and RV0, then 100 bit (i.e. all 100-bit system bit without check bit) will be transmitted. Soft combination can still be done as the BG pattern and all de-coding parameters will not be changed during retransmission).  In conclusion, the current spec works well. What’s worse, the proposed change would bring the NBC issue. It is not preferable at all. |
| Nokia | - | Since there is currently no behaviour specified to take such a grant into account, it will be ignored. Option B corresponds to a new behaviour. Thus, we believe Option A is the one already specified and nothing additional is required. We also feel this has been discussed a few times in the past already. |
| CATT | Option C | It has been discussed since LTE where it was decided to leave it up to UE implementation as in current specification. |

**Summary: TBD**

## 3.4 Handling of discardOnPDCP

[10] R2-2202194 Discussion on handling of discardOnPDCP OPPO discussion Rel-15 NR\_newRAT-Core

[10] proposes an interesting issue of SRB discard at UE receiving side when upper layers request a PDCP SDU discard (e.g. PDCP data recovery for intra-CU inter-DU handover), and thinks the PDCP receiving window at the UE side may get stuck if there is any stored PDCP PDU for SRB but discarded and the value of t-Reordering is set to “infinity”.

**Q6-1**: Companies are asked to provide your views on the above issue:

* Option A: There are no stored PDCP PDUs at UE RX buffer at the time of receiving *discardOnPDCP* (i.e. interpretation-1 in [10]), and no change to the specification
* Option B: There might be stored PDUs at UE RX buffer at the time of receiving *discardOnPDCP* (i.e. interpretation-2 in [10]), and to discuss in Phase 2 the UE behaviour in this case
* Option C: Others (please indicate the details if any)

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| **Company** | **Option A/B/C** | **Comments** |
| Qualcomm | Option B |  |
| Samsung | See comment | We do not see the need of consideration on the RX side. SRB is associated with AM RLC entity and thus no data loss would be foreseen. The network will ensure that there is no data loss and no out-of-order PDCP PDU by retransmission, i.e. there would be no issue in the current specification.  [OPPO] can I understand it means that network implementation would ensure there would be NO case for RX\_DELIV < RX\_NEXT, i.e., option-A ? If yes, we need to make it clear UE does not have to handle such case. If no, what is the gap? |
| ZTE | See comments | We think the *discardOnPDCP* is only applied to the TX buffer which have been explained in [10], in other word, the data PDU is still stored in the RX buffer,  With option B, we think the received PDCP can send the PDU to upper layer as long as all PDCP SDUs within the re-order window are received  [OPPO] for it, the question is what if not all PDCP SDUs within the reordering window is received, deliver it to upper layer or not? If deliver, whether to update variable or not? |
| Huawei, HiSilicon | See comment | DL RRC messages are assumed to be lossless, so no matter we go with Option A or Option B, we don't see there is an issue and it is up to NW to avoid PDCP SN gap in the UE receiving side for SRB. Thus we think no change to the specification is needed.  [OPPO] can I understand it means that network implementation would ensure there would be NO case for RX\_DELIV < RX\_NEXT, i.e., option-A? If yes, we need to make it clear UE does not have to handle such case. If no, what is the gap?  [HW] when to trigger SRB discard/PDCP data recovery procedure is NW implementation, so we see it is very likely that NW could ensure there is no out-of-order PDCP PDU stored in the UE RX buffer (i.e. all PDCP PDUs for SRB have been received before and in-order delivered), we understand this operation corresponds to Option A. But we also think Option B may have no issue since NW could still perform PDCP retransmission after this procedure in order to ensure DL RRC messages lossless if there is a need (e.g. NAS message inside), which can be seen as also NW implementation. Thus we understand regardless of Option A or B, there is no issue at the UE RX side and no change to the specification is needed.  [OPPO] difficult for me to follow the part above, in case of option-B, i.e., reordering timer is running, and there is stored PDU in Rx buffer, and if UE clear the Rx buffer, i.e., the received PDU are discarded. So when you say “NW could still perform PDCP retransmission after this procedure”, do you mean that the network would not only retransmit the PDU that did not received by the UE, **but also the ones already received by the UE (which has been discarded)**, in order for the Rx window to move forward? Otherwise, the Rx window still get stuck |
| OPPO (Qianxi) | See comment | Either *discardOnPDCP* does not apply to Rx Buffer  Or we do not see another option besides option-A/B. If the view is leave to NW to handle it, i.e., option-A, we need to make it clear using R2 agreement. Otherwise, we need to clarify the left issue in option-B. |
| vivo | Option B with comments | We think the current behavior at the receiving side is quite clear, as per the highlighted text in TS 38.323 (i.e. discard the PDCH SDU). There is no essential issue found. 5.3 SDU discard For SRBs, when upper layers request a PDCP SDU discard, the PDCP entity shall discard all stored PDCP SDUs and PDCP PDUs.  NOTE: Discarding a PDCP SDU already associated with a PDCP SN causes a SN gap in the transmitted PDCP Data PDUs, which increases PDCP reordering delay in the receiving PDCP entity. It is up to UE implementation how to minimize SN gap after SDU discard.  [OPPO] The second highlighted one is for Tx entity, while the Q here is for Rx entity.. |
| Nokia | See comment | Since this is a network-triggered operation, the first interpretation seems like the right one to assume and thus and there's nothing to fix. |
| CATT | Option A | Our understanding is that Network makes sure there are no stored PDCP PDUs at UE RX buffer at the time of receiving *discardOnPDCP*. No strong view on whether anything needs to be captured for clarifying this. |

**Summary: TBD**

4. Phase 2 discussion

**TBD**

1. Conclusion

**TBD**