**3GPP TSG-RAN WG2 Meeting #113-e** ***R2-21xxxxx***

**Online, 25th Jan - 5th Feb, 2021**

**Agenda item: 5.3.1**

**Source: Huawei, HiSilicon**

**Title: Report of [AT113-e][003][NR15] User Plane II (Huawei)**

**Document for: Discussion and Agreement**

# 1 Introduction

This is to report the result of the following email discussion in RAN2#113-e Meeting [1].

* [AT113-e][003][NR15] User Plane II (Huawei)

 Scope: MAC RLC PDCP Treat R2-2101344, R2-2101349, R2-2101773, R2-2101774, R2-2100317, R2-2100315, R2-2100316 R2-2101441, R2-2101442, R2-2101775

 Phase 1, determine agreeable parts, Phase 2, for agreeable parts Work on CRs.

 Intended outcome: Report and Agreed CRs.

 Deadline: Schedule A

A first round with **Deadline for comments Thursday Jan 28 1200 UTC** to settle scope what is agreeable etc

A Final round with **Final deadline Thursday Feb 4 1200 UTC.** to settle details / agree CRs etc. Additional check points etc if needed are defined by the Rapporteur. In case some parts of an email discussion need more time, doesn’t converge, need on-line treatment etc Rapporteur please contact chair.

# 2 Contact Information

|  |  |
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# 3 Phase 1 Discussion

## 3.1 LCP restriction (Rel-15 and 16)

LCP restrictions

[R2-2101344](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2101344.zip) Clarification to LCP restrictions Ericsson, Mediatek CR Rel-15 38.306 15.12.0 0504 - F NR\_newRAT-Core

[R2-2101349](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2101349.zip) Clarification to LCP restrictions Ericsson, Mediatek CR Rel-16 38.306 16.3.0 0505 - A NR\_newRAT-Core

These CRs propose to add the clarification of “RRC configured restriction” for LCP in the field description of lcp-Restriction to both Rel-15 and Rel-16, as follows.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***lcp-Restriction***Indicates whether UE supports the selection of logical channels for each UL grant based on RRC configured restriction using RRC parameters *allowedSCS-List*, *maxPUSCH-Duration*, and *configuredGrantType1Allowed*. | UE | No | No | No |

|  |  |  |
| --- | --- | --- |
| Company | Agree as is (from which release);Agree with changes;To capture it in the meeting minutes;Disagree | Detailed Comments |
| HW | Disagree | We think the added clarification should have already been the common understanding. For other restrictions that are not indicated, e.g. allowedServingCells, allowedCG-List and allowedPHY-PriorityIndex, each restriction is already associated with a UE capability. Therefore, this lcp-Restriction is only applied to restrictions that are not explicitly indicated from UE. The current spec should already be clear enough, and if needed, this kind of clarification should be captured into the rapporteur CR as there is no functional change. |
| OPPO | Agree | We are ok on this clarification. |
| Qualcomm | Agree with change | Some other LCP restriction parameters seem to be missing in the proposed text, e.g. allowed serving cells, CG list (R16), PHY-priority index (R16). Another concern is that it is not very future proof, i.e. whenever we add a new LCP restriction in the future release, we have to update this list again. We wonder if companies would consider replacing the TP with a reference to 38.321 instead. |
| MediaTek | Agree | We think the clarification is useful. Otherwise, people may misunderstood that *lcp-Restriction* cover all LCP parameters. |
| Xiaomi | Agree |  |
| Samsung | Agree (from Rel-15) | We are ok with the clarification.We also have sympathy for the comments from Qualcomm, but in most cases, a separate capability would be introduced for a new feature (like as we have e.g. *lch-ToSCellRestriction*, *lch-ToGrantPriorityRestriction-r16*, and *lch-ToConfiguredGrantMapping-r16*), so it should be okay.  |
| Ericsson | Agree | We welcome that Huawei seem to agree in principle on the CR as they have the same interpretation of the current text. However, an alternative interpretation could be that *lcp-restriction* is to support the function LCP restrictions and then additional parameters come on top. Hence, the need to clarify this.To Qualcomm: Our understanding is that this capability only covers the LCP restriction parameters from Rel-15 which do not have specific UE capabilities. There are therefore no parameters missing in this list, nor will it need update later on. |
| LG | Disagree | The LCP restriction is clear from the current specification. Moreover, if we list all the related parameters, 306 specification should be updated each time a new parameter is introduced. We want to avoid such unnecessary effort. |
| ZTE | Agree | This clarification seems useful, and avoid some misinterpretation of this capability is prerequisite of other LCH restriction feature. |
| CATT | Agree | We would also be fine with the proposal by Qualcomm which is more future proof.  |
| Lenovo | Agree | Fine to have this clarification |
| vivo | Agree | This clarification is needed. Frankly, when coming to 306 spec for the first time, I was quite confused why we need a separate capability for *allowedServingCells,* which can be also configured by *logicChannelConfig* message with *allowedSCS-List*, *maxPUSCH-Duration*, and *configuredGrantType1Allowed*.Besides, to be more succinct, we think the term “RRC parameters” can be removed since we already have said “RRC configured restriction”. Specifically, we propose, Indicates whether UE supports the selection of logical channels for each UL grant based on RRC configured restriction using ~~RRC parameters~~ *allowedSCS-List*, *maxPUSCH-Duration*, and *configuredGrantType1Allowed*. |
| Apple | Agree | The set of LCP restrictions supported by the UE is clear by examining other mapping restrictions (such as lch-ToConfiguredGrantMapping-r16, lch-ToGrantPriorityRestriction-r16, lch-ToSCellRestriction). However, given the current description of *lcp-Restriction*, which is a Rel-15 feature only, it is not immediately clear that the capability does not apply to the full set of LCP restrictions. Therefore, a clarification is OK. |
| Intel | Disagree | We think current specification is clear since capability *lcp-Restriction* only covers LCP restrictions (in TS 38.321 clause 5.4.3.1.2) not indicated by other UE capabilities. But we’re OK to follow majority view.  |
| Sequans | Agree | This clarification is needed. |
| Nokia, Nokia Shanghai Bell |  | This seems to be clear already from MAC. |

**Conclusion:** Majority view is that the intention of CRs is agreeable. Not sure if UP session is eligiable to approve UE capability CRs, but as the rapporteur, we think UP has better view of technical discussions, so we can attempt to agree the text proposal, and how to approve the CRs can follow the general guidance of UE capability, e.g. individual CRs or misc CR if any.

**Proposal 1a: RAN2 agree to clarify the LCP restrictions for both Rel-15 and Rel-16.**

**Proposal 1b: The text proposal can be updated as below:**

***lcp-Restriction***

Indicates whether UE supports the selection of logical channels for each UL grant based on RRC configured restriction using RRC parameters *allowedSCS-List*, *maxPUSCH-Duration*, and *configuredGrantType1Allowed* as specified in TS 38.321 [X].

**Proposal 1c: To provide the updated CRs for Phase 2 review.**

## 3.2 CSI reporting for DRX (Rel-15 and 16)

CSI reporting

[R2-2101773](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2101773.zip) Correction on CSI reporting when CSI masking is setup Huawei, HiSilicon CR Rel-15 38.321 15.11.0 1052 - F NR\_newRAT-Core

[R2-2101774](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2101774.zip) Correction on CSI reporting when CSI masking is setup Huawei, HiSilicon CR Rel-16 38.321 16.3.0 1053 - F NR\_newRAT-Core

These CRs propose to add a case that is motivated the the past discussions that the CSI multiplexed with other overlapping UCI maybe reported outside the “DRX Active Time” and it is up to UE implementation whether to report or not. Similar to the CSI mask case, where the p-CSI multiplexed with other overlapping UCI is outside the “On duration” and these CRs propose to align it with above behaviour.

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| --- | --- | --- |
| Company | Agree as is (which CR; from which release);Agree with changes;To capture it in the meeting minutes;Disagree | Detailed Comments |
| HW  | Agree as is (from Rel-15) | We confirm that the case mentioned in this CR is valid when CSI mask is setup and the UE behaviour should be aligned to other discussed cases. Since it proposes to leave it up to UE implementation, so the backward compatibility issue can be eliminated.  |
| OPPO | Disagree | We think the current note may have already capture the case proposed by the CRs, in our minde, “outside DRX Active Time” also includes “outside onduration”.[HW]: Actually we think outside “on duraton” doesn't imply outside “DRX Active Time” as the UE may still run in “Active Time” due to other DRX timers and conditions, but on duration timer is indeed not running. And that is the reason why we think a CR is needed. |
| Qualcomm | Agree as is |  |
| MediaTek | Agree as is |  |
| Xiaomi | Disagree | If the onDurationTimer is not running, it is obvious that the UEis outside the DRX active time.[HW]: See replies to OPPO as above. |
| Samsung | Agree (from Rel-15) | - |
| Ericsson | Merge to rapporteur's CR with changes | We think the CR covers a corner case. If *csi-mask* is configured the UE should not transmit PUCCH if *onDurationTimer* is not running, which can be part of Active Time as Huawei correctly commented above. The whole point of *csi-mask* is to share the PUCCH resource among several UEs and then we need the deterministic behaviour of the *onDurationTimer*. However, now we have to accept a note instead.We think the text can updated like this:NOTE: If a UE multiplexes a CSI configured on PUCCH with other overlapping UCI(s) according to the procedure specified in TS 38.213 [6] clause 9.2.5 and this CSI multiplexed with other UCI(s) would be reported on a PUCCH resource either outside DRX Active Time or if *drx-onDurationTimer* is not running if CSI masking is setup by upper layers, it is up to UE implementation whether to report this CSI multiplexed with other UCI(s).We would welcome any feedback from UE vendors on existing implementations though. |
| LG | Disagree | The CSI mask is not visible in 38.213. Thus, if CSI mask is configured, the UE shall follow MAC procedure, i.e. the UE shall not report CSI during On Duration. |
| ZTE | No strong point of view/ follow majorities  | We think each company knows what should UE do when CSI mask is configured. And with this change, it shall be up to UE implementation, without this change, it is also up to UE implementation, is this really essential to capture this on the spec? |
| CATT | Agree | With the simplification by Ericsson but keeping the “DRX group” |
| Lenovo | Agree | Agree with the suggested Note by Ericsson |
| vivo | Agree with changes | We agree with the intention. Just a minor editorial comment as follows with revision in red (take Rel-15 CR as an example),NOTE: If a UE multiplexes a CSI configured on PUCCH with other overlapping UCI(s) according to the procedure specified in TS 38.213 [6] clause 9.2.5 and this CSI multiplexed with other UCI(s) would be reported on a PUCCH resource either outside DRX Active Time or outside the ~~duration that~~ *~~drx-onDurationTimer~~* ~~is running~~ on-duration period of the DRX cycle if CSI masking is setup by upper layers, it is up to UE implementation whether to report this CSI multiplexed with other UCI(s). |
| Apple | Agree | As a side-note, the text box in the CR’s ‘reason for change’ referencing chapter 5.7 is not based on the latest version of 38.321. |
| Intel | Agree as is (from Rel-15) |  |
| Sequans | Agree |  |
| Nokia, Nokia Shanghai Bell | Disagree | If mask configured, should not report CSI beyond on-duration. There is no ambiguity in that sense. |

**Conclusion:** Majority view is the intention of CRs are agreeable and the text proposal can be slightly reworded and the coversheet should be updated as suggested.

**Proposal 2a: RAN2 agree to capture a NOTE to clarify CSI reporting when CSI masking is setup for both Rel-15 and Rel-16.**

**Proposal 2b: The text proposal can be updated as below and the coversheet should be updated:**

NOTE: If a UE multiplexes a CSI configured on PUCCH with other overlapping UCI(s) according to the procedure specified in TS 38.213 [6] clause 9.2.5 and this CSI multiplexed with other UCI(s) would be reported on a PUCCH resource either outside DRX Active Time or if *drx-onDurationTimer* is not running if CSI masking is setup by upper layers, it is up to UE implementation whether to report this CSI multiplexed with other UCI(s).

**Proposal 2c: To provide the updated CRs for Phase 2 review.**

## 3.3 MAC inactivity timers at empty scheduling (Rel-16 only)

MAC inactivity timers at empty scheduling

Moved from 6.1.3

[R2-2100317](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113-e%5CDocs%5CR2-2100317.zip) Configuration and capability signaling for not starting MAC timers Qualcomm Incorporated CR Rel-16 38.331 16.3.0 2320 - F TEI16

[R2-2100315](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113-e%5CDocs%5CR2-2100315.zip) Correction to MAC timer procedures Qualcomm Incorporated CR Rel-16 38.321 16.3.0 1013 - F TEI16

[R2-2100316](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2100316.zip) UE capability for not starting MAC timers Qualcomm Incorporated CR Rel-16 38.306 16.3.0 0484 - F TEI16

These CRs propose that UE UE does not re-/start drx-InactivityTimer, bwp-InactivityTimer and sCellDeactivationTimer if it skips a dynamic UL grant for new data or it transmits a MAC PDU without any MAC SDU in Rel-16.

1) please indicate your answer to the MAC CR (R2-2100315)

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| --- | --- | --- |
| Company | Agree as is;Agree with changes;To capture it in the meeting minutes;Disagree | Detailed Comments |
| HW | Disagree | Not essential but significant complexity added to UE implementation. The UE has to check each time about the outcome of UL skipping. In addition, it also brings the riks of misalignment between UE and NW with respect to the “timer” status. And the interaction may impact the time point of taking effect of the corresponding timers, e.g. BWP inactivity timer, which should be consulted with RAN1 and RAN4. |
| OPPO | Disagree | We think the current behaviour is clear and the proposed change may bring extra implementation complexity for UE. |
| Qualcomm | Agree as is | This change is not complicated to implement by UE, i.e. only when UE skips a UL grant, it adjusts the residual life of MAC timers. And there is little impact by state misalignment between UE and gNB, i.e. if network misses a UL Tx by UE, UE stays in active time longer than network expects it does; and it is an extremely rare event that UE does not transmit anything but network successfully receives a TB. |
| MediaTek | - | We have sympathy with the CRs and we believe this can bring power saving gain. However, we share same view with HW that this feature may bring more risk of NW/UE misalignment and indeed will create extra implementation complexity in both UE and NW side, when considering UL skipping. To have a compreshensive evaluation on the impact, we suggest to postpone the discussion to R17 and allow companies to have more time to check. |
| Xiaomi |  | It seems very difficutl to configure the value of the “skipMAC-TimerRestart” as the UL traffic would be very unpredictable. If the uplink traffic is known by the gNB, then the gNB should configure a shorter value of onDurationTimier or inactivityTimer. |
| Samsung | Disagree | We have sympathy on the proposal for the power saving, but think that we may rely on the (smart) network implementation. For instance, upon detection of no data, network can send DRX command MAC CE/DCI for the BWP switching/SCell deactivation to the downlink. |
| LG | Disagree | If we follow the CR, there would be high probability of timer misalignment between UE and network. |
| ZTE | Disagree | It will definitely complicate the NW’s implementation, and this is a enhancment not a correction. |
| CATT | Disagree | It is late in Rel-16 and it is an important functional change. So we would not support it. |
| Lenovo |  | No strong view, but we think that this change is not really required |
| vivo |  | Obviously, this is an optimization, instead of an essential correction. We can further discuss it in Rel-17 TEI. |
| Apple | See comment | We share the view that this feature can bring power saving gains also considering that the UE skipping an UL grant is not always a rare event. However, the concern of a potential state misalignment between network and UE is also valid and we agree with MediaTek that implementation aspects need to be checked in more detail. Feedback on the feasibility of the network sending a DRX command upon detection of no data, as already indicated by Samsung, would be valuable in our view as well. We would prefer to first conclude on the changes for the new/updated UL skipping feature before making further changes to this area, if any. Therefore, we are ok to postpone the discussion to next meeting to allow for more time to evaluate implementation complexity, yet it could still be discussed in the context of Rel-16.  |
| Intel | Disagree | We think this is an optimization and may have some issues. The potential DRX state misalignment between UE and gNB is in the ambiguity period between supposed UE Tx time and gNB detection time, since gNB does not know whether UE starts *drx-InactivityTimer* until gNB detects whether a transmission is performed or not.  |
| Sequans |  | No strong view. It looks like it can bring power saving, but it depends on NW pre-scheduling algorithm (NW may also want to bring UE in active time for a UL transmission to come, like a RLC SR)  |
| Nokia, Nokia Shanghai Bell | Disagree | New functionality for a frozen release. |

2) If you answered “agree” in 1), please indicate your answer to the RRC CR (R2-2100317)

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| --- | --- | --- |
| Company | Agree as is;Agree with changes;To capture it in the meeting minutes;Disagree | Detailed Comments |
| Qualcomm | Agree as is |  |
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3) If you answered “agree” in 1), please indicate your answer to the UE capability CR (R2-2100316)

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| --- | --- | --- |
| Company | Agree as is;Agree with changes;To capture it in the meeting minutes;Disagree | Detailed Comments |
| Qualcomm | Agree as is |  |
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**Conclusion: There is no sufficient support for not starting MAC timers with empty scheduling.**

**Proposal 3: CRs in R2-2100315, R2-2100316 and R2-2100317 are not pursued.**

## 3.4 Clarification to RLC PDU polling at HO (Rel-15 and16)

Text Enhancement

[R2-2101441](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2101441.zip) Clarification to RLC PDU Polling at Handover Ericsson CR Rel-16 38.322 16.2.0 0038 - F NR\_newRAT-Core

[R2-2101442](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2101442.zip) Clarification to RLC PDU Polling at Handover Ericsson CR Rel-15 38.322 15.5.0 0039 - F NR\_newRAT-Core

These CRs propose to reflect the RRC statement “the UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message” in RLC as well.

|  |  |  |
| --- | --- | --- |
| Company | Agree as is (from which release);Agree with changes;To capture it in the meeting minutes;Disagree | Detailed Comments |
| HW | Disagree | First there is a CR in this meeting to revise RRC CR to clarify the same thing and we think both CRs are not needed. The exising RRC spec has already specified how to handle the RLC/HARQ feedback for RRC signalling, and the user plane handling depends on the indication of reestablishRLC.Anyway, this kind of clarification should be taken into account in RRC spec and we should not duplicate the text in RLC spec as normally RRC messages and procedures should be transparent to RLC. |
| OPPO | Disagree | If it’s already captured in the RRC, there is no need to further clarify in RLC. |
| Qualcomm | Disagree | We think the current spec is clear and no further clarification is needed. |
| MediaTek | Disagree | Agree with QC. |
| Xiaomi | Disagree | Agree with QC and OPPO that the RRC already reflects such UE behaviour. No need to duplicate the texts in RLC. |
| Samsung | Disagree | The UE behaviour is already clear and nothing is broken. We don’t think that the proposed NOTE would be beneficial. |
| Ericsson | Agree | The RRC specification says:“NOTE 1: The UE should perform the reconfiguration with sync as soon as possible following the reception of the RRC message triggering the reconfiguration with sync, which could be before confirming successful reception (HARQ and ARQ) of this message.”wherein “this message” in the NOTE above is the RRC message triggering the reconfiguration with sync. Hence, from RLC perspective, it is not clear whether the above statement also implies that the UE might not reply to a polled STATUS PDU after receiving the HO command. This clarification is needed in our view, otherwise from the RLC point of view, it seems that the UE shall always reply to a polled status PDU.In any case, even if the change in the above CRs are not agreed, clarifications to the mentioned RRC note are needed to address CHO in Rel.16 (see [R2-2101268](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_113-e/Docs/R2-2101268.zip)). |
| LG | Disagree | It is already clear from RRC specification. |
| ZTE | Disagree | Agree with above companies |
| CATT | Disagree | Current specification is clear and no change is needed. |
| Lenovo | Disagree | Agree with other companies |
| vivo | Disagree | The UE behavior has been clearly captured in the RRC spec. Duplicated text amongst multiple specs is not needed. |
| Apple | No strong view | The intended behavior is already clear from the RRC specification. To clarify the detailed implication in the RLC spec does not harm though. |
| Intel | Disagree | RRC spec is already clear, so no need to further capture in RLC spec.  |
| Sequans | Disagree | This “Upon reception of the RRC message triggering the reconfiguration with sync, the UE should perform the reconfiguration with sync as soon as possible” should be only part of RRC specification, not RLC. |
| Nokia, Nokia Shanghai Bell | Disagree | This seems to be clear from RRC already. Furthermore, if something would be needed, more natural place seems to be Stage-2 (as we had in LTE). |

**Conclusion: There is no sufficient support to clarify RLC PDU polling at HO in RLC spec.**

**Proposal 4: CRs in R2-2101441 and R2-2101442 are not pursued.**

## 3.5 RoHC handling during PDCP re-establishment (Rel-15 and 16)

[R2-2101775](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2101775.zip) Discussion about RoHC handling during PDCP re-establishment Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

During PDCP re-establishment, the UE may retransmit the PDCP data from the first missing SDU. However, there is a risk that the receiver side may discard the duplicated PDCP data carrying the new RoHC context. In this case, RoHC context state is misaligned between transmitter and receiver side. This paper would like to identify this issue and propose one solution similar to the DAPS that the transmitter should maintain IR state for retransmitted PDCP SDU during PDCP re-establishment.

1) please indicate your view on the issue identified in this paper (R2-2101775)

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| --- | --- | --- |
| Company | Agree with the issue;Disagree | Detailed Comments |
| HW | Agree with the issue | We confirm the issue is valid when, for instance, drb-ContinueROHC is enabled. Without a specific solution in the spec, it is likely that the RoHC context could be misaligned between UE and NW during PDCP retransmissions, i.e. upon PDCP re-establishment. |
| OPPO | Agree with the issue |  |
| Qualcomm | Agree with the issue | We agree this is a genuine issue and needs to be fixed. |
| MediaTek | Agree with the issue |  |
| Xiaomi | Agree with the issue |  |
| Samsung | Agree with the issue |  |
| Ericsson | Agree | Maybe this also need to cover EHC, and a more generic text could be useful (below) |
| LG | Disagree | This issue was discussed long time ago, i.e. in the early stage of LTE. The conclusion at that time was that the transmitter should wait PDCP status report from the receiver before retransitting RLC unacked PDCP SDUs. |
| ZTE | Agree with the issue,  | For the scenario of PDCP re-establishment ,we think this issue may happen only if the ROHC is back to the IR state before the PDCP re-establishment and using U mode. |
| CATT | Agree with the issue |  |
| Lenovo | Agree with the issue |  |
| vivo | Agree with the issue |  |
| Apple | Agree with the issue |  |
| Intel | Agree with the issue |  |
| Nokia, Nokia Shanghai Bell | The issue can be valid, but | The specification already implies with “if not decompressed before” that the NW can account this during HO and decompress before discard. |

2) If you answered “agree” in 1), please indicate your views on the proposed solution in the annext TP in this paper (R2-2101775)

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| --- | --- | --- |
| Company | Agree as is (from which release);Agree with changes;To capture it in the meeting minutes;Disagree | Detailed Comments |
| HW | Agree as is, But open to other solutions | We understand that, the proposed solution is motivated by the DAPS RoHC handling that has been discussed in Rel-16. So we slightly prefer to extend the solution to the PDCP re-establishment case without introducing a brand new one. However, as long as the issue can be resolved, we are open to other suggested solutions either by NW side or UE side or both sides. |
| OPPO | The note is ok to us |  |
| Qualcomm | Disagree | The proposed solution, i.e. falling back to IR state upon re-establishment, seems a fix. However, it is not a desired solution for us because:* Not needed when RoHC is reconfigured, as anyway RoHC will start from IR state
* For other case, i.e. ContinueRoHC was enabled,
	+ ContinueROHC loses its value as continuity is not maintained, when UE starts from IR states. That defies the purpose of the ContinueRoHC feature;
	+ It introduces undesired complexity at the UE;
	+ In addition, RoHC has an existing mechanism for recovery (feedback system) in place.

We’d suggest to have further discussions to find a more efficient solution. |
| MediaTek | Agree | We think adding a note is ok, and we are fine for discussing other solution(s) if any. |
| Xiaomi | Disagree | In Rel-15 we agree not to decompress the duplicated PDCP PDU by changing the LTE PDCP behaviours, and this implies that the transmitter should not change the IR state which will lead to the decompression failure. However it was agreed that this is up-to the transmitter’s implementation, and no need to capture anything in the specification. |
| Samsung | Disagree | For DAPS handover, the similar scenario RAN2 discussed was downlink and drb-ContinueROHC was not supported and thus we added a NOTE to prevent decompression failure in UE side and avoid the introduction of UE’s special behaviour. However, the concerned scenario here is uplink. In the early stage of NR, we discussed similar issues. We think a high bar should be applied to this kind of already-discussed issues at this late stage since we do not mandate network implementation, i.e. there would be several ways to avoid decompression failure in the network side by network implementation. |
| Ericsson | Agree, prefer more generic text without “IR” | “Note: The transmitting PDCP entity should send uncompressed PDUs for retransmitted and the first few new PDUs following PDCP re-establishment.” |
| LG | Disagree | This issue was discussed long time ago, i.e. in the early stage of LTE. The conclusion at that time was that the transmitter should wait PDCP status report from the receiver before retransitting RLC unacked PDCP SDUs. |
| ZTE | Have no strong point of view | we understand the issue but not sure whether this is a critical one since ROCH can recover by itself in such case. We also share the view with Samsung that fallback to IR state is not a right way to go in Rel-15. Instead of that, if majority want to address this issue in Rel16, we prefer to adopt LTE similar behaviour that the reception side should decompress the ROHC header before the PDU is discarded |
| CATT | Disagree | We prefer to address this issue by UE implementation but we are OK for further discussion with other solutions. |
| vivo | Disagree | In our understanding, the UE implementation can completely resolve this issue. For example, the UE can send the PDCP PDU with a full header.  |
| Apple | Disagree | We agree with the problem but disagree to the remedy proposed. The proposal seems to remove the continue RoHC feature from NR and keep it only for LTE. A simple solution is that the network uses the PDCP status report feature where PDCP DL sends a status report to the receiver. Then PDCP UL does not send duplicate SDUs at all. We agree with LG and Samsung and think that no changes are needed. |
| Intel | Disagree | The proposed change basically disables *drb-ContinueROHC*. We think the issue can be handled by proper network implementation without specification change, e.g. PDCP status report sent by gNB. |
| Nokia, Nokia Shanghai Bell | Disagree | It would seem possible to clarify the decompression before discard can be performed as already implied by the extisting normative text “if not decompressed before”. |

**Conclusion:** Majority view is that the issue mentioned in [R2-2101775](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2101_R2_113e/Docs/R2-2101775.zip) is valid, but how to fix the issue needs to be discussed in Phase 2. For extension to EHC, the rapporteur think EHC is feedback-based, so there is no issue as the transmitter will continue to send uncompressed packet until a PDCH control PDU for EHC feedback for a CID is received.

**Proposal 5a: RAN2 agree that RoHC decompression failure may happen during PDCP re-establishment.**

**Proposal 5b: How to fix the issue needs to be discussed in Phase 2.**

# 4 Phase 2 Discussion

Per the request from the Chairman, the missing MAC reset will be discussed in Phase 2 in this email discussion.

## 4.1 MAC reset

MAC Reset

[R2-2101446](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113-e%5CDocs%5CR2-2101446.zip) Recommended bit rate query handling at MAC Reset Ericsson CR Rel-16 38.321 16.3.0 1032 - F NR\_newRAT-Core

[R2-2101447](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113-e%5CDocs%5CR2-2101447.zip) Recommended bit rate query handling at MAC Reset Ericsson CR Rel-15 38.321 15.11.0 1033 - F NR\_newRAT-Core

[R2-2101770](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113-e%5CDocs%5CR2-2101770.zip) Discussion on UE behaviors for MAC reset Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

[R2-2101771](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113-e%5CDocs%5CR2-2101771.zip) Correction to TS 38.321 on MAC Reset Huawei, HiSilicon CR Rel-15 38.321 15.11.0 1050 - F NR\_newRAT-Core

[R2-2101772](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113-e%5CDocs%5CR2-2101772.zip) Correction to TS 38.321 on MAC Reset Huawei, HiSilicon CR Rel-16 38.321 16.3.0 1051 - F NR\_newRAT-Core

**Conclusion in LTE session**

[R2-2101443](file:///C%3A%5CUsers%5Cterhentt%5CDocuments%5CTdocs%5CRAN2%5CRAN2_113-e%5CR2-2101443.zip)    Recommended bit rate query handling at MAC Reset      Ericsson CR   Rel-14     36.321    14.13.0   1519       -      F     LTE\_VoLTE\_ViLTE\_enh

* We agree to CR from Rel-16 with magic sentence from Rel-14. This needs to be also documented in the early implementation table.

**Questions:** please indicate your opinion regarding the MAC procedures in terms of Recommendated bit rate query, configured uplink grant confirmation and desired guard symbol query at MAC reset, and corresponding detailed comments if you have.

Y: cancel

N: not cancel

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Company | Recommonded bit rate query |  Configured uplink grant confirmation | Configured sidelink grant configuration | Desired Guard Symbol query | Detailed Comments |
| HW | Y | Y | Y | Y | We should have consistent principle for all relevant MAC procedures@MAC reset. |
| OPPO | N | N |  | N | Actually, we don’t see any issues. Besides, those are actually not cancelled in LTE spec, if anything needed, LTE spec needs to be updated as well. |
| LG | Y | Y |  | Y | MAC reset is similar to establishing a MAC entity. Thus, all procedures shall be cancelled. |
| Ericsson | Y | Y | Y | Y | We should do this from Rel-15 and onwards. |
| Nokia | Y | Y | Y | Y |  |
| Samsung | Y | Y | Y | Y | All these are merely missing parts, and should be done from Rel-15. |
| Intel | Y | Y | Y | Y |  |
| Xiaomi | Y | Y | Y | Y |  |
| ZTE | Y | Y | Y | Y |  |
| Qualcomm | N | Y | Y | Y | Recommended bit rate query is different from the other three. Since it is triggered by application layer, cancelation by MAC can create an issue for the application layer, unless MAC sends an indication back to application layer. Otherwise, even if application layer implements a timeout and triggers the query again, there will be unnecessary delay. In addition, unlike the other three, it is not a response to network or depend on RAN configuratio, whether it is canceled or not has no impact on gNB. So it is better to leave it up to UE implementation how to handle recommend bit rate MAC CE when MAC is reset, i.e. no spec change is necessary. |
| vivo | Y | Y | Y | Y | Since the MAC entity is reset, we think it is natural to cancel all the triggered MAC procedures. |

**Conclusion:**

**TBD**

## 4.2 RoHC handling during PDCP re-establishment (Rel-15 and 16)

Given that all companies agree with the issue, as the rapporteur, we think it would be good to further align the understandings on the potential solutions. After that, we can try to figure out the most suitable way to fix this issue either by spec or implementation.

Note1: we don't need to debate if it has been discussed in the past. Obviously different company has different understandings and NR L2 protocol is different from LTE, e.g. RLC out-of-order delivery, not decompress for the duplicated/outdated packet@receiver.

Note2: Regarding whether a solution can be adopted as a high-level Stage-2 guidance or specified in Stage-3 spec or leave it totally to implementation, we will discuss it in the very last questions. So please be patient ☺.

### 4.1.1 Undersandling alignment

**Solution 1 (LTE-like approach):** The transmitter should wait PDCP status report from the receiver before retransitting RLC unacked PDCP SDUs.

As the rapporteur, we think it requires coordinaions between transmitter and receiver by implementation. More specific, the receiver has to send out the PDCP status report timely upon PDCP re-establishment, while the transmitter has to hold on the PDCP retransmission until PDCP status report is received.

**Questions**: please indicate your opinion and details comments to Solution 1:

From the transmitter perspective, do you think it is feasible to always send out PDCP status report timely upon PDCP re-establishment?

From the receiver perspective, do you think it is feasible to always wait for the PDCP status report before retransmitting the PDCP SDU upon PDCP re-estalishment?

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Transmitter:Y: feasibleN: not feasible | Receiver:Y: feasibleN: not feasible | Detailed Comments |
| HW | N |  N | Solution 1 seems to put restriction on both UE and NW implemention and perfect coordination is pre-requisite. So there is high risk that coordination doesn't work smoothly. For instance, the transmitter has no idea when the receiver will feedback the PDCP ACK and it would cause additional complexity for implementation. Another risk is we are not sure if Solution 1 has impact to NR pre-processing. Generally, we understand the packet needs to be transmitted timely for service continuity in NR senarios. |
| OPPO | Y | Y | This could be one alternative though not perfect one.  |
| LG | Y | Y | There was a discussion long time ago in RAN2#59bis. The UE shall prioritize PDCP status report after handover. No special handling is needed. This principle is inherited from LTE.[R2-074212](file:///D%3A%5C3GPP%5CRAN2%5C0000%20Old%5CTSGR2_59bis%5Cdocs%5CR2-074212.zip): Handling of PDCP Status Reports - Ericsson, LG Electronics Inc* + Ericsson thinks that within one logical channel, PDCP can prioritise the status reports and schedule them first at the handover.

Discussion* + NSN thinks this can be done in the DL. However in the UL NSN would like to send all status reports together. NSN thinks that in the Ericsson solution you cannot avoid that the status report does not cross an ongoing transmission that is not necessary.
	+ QC supports NSN, and they would also prefer to use a separate LCID.
	+ NSN thinks this could be a MAC control element. Could also be data inside this new logical channel.
	+ DCM thinks that in most cases only 1 RB active. If there are multiple RB’s active, then the high priority bearer would typically only have small packets. So DCM was thinking that probably nothing special would be needed.
	+ Samsung thinks this has been discussed already during several meetings.
	+ Panasonic wonders how the relation is between the collection of PDCP status reports and the HANDOVER COMPLETE ? Can we be sure we still get the HANDOVER COMPLETE through ?
	+ NEC questions whether we will only mandate the UE behaviour. We agree on this.
1. PDCP prioritises the PDCP status reports after handover; nothing special at MAC or RLC layers [11]
2. Special lower layer mechanism on which after handover all PDCP status reports are send together as highest priority [5]

=> Will have option 1. |
| Ericsson | Y\* | Y\* | It is feasible although it may have to be clarified that the UE should prioritize PDCP status report upon PDCP re-establishment. |
| Samsung | Y | Y | This could be one of the solutions, which is up to implementation. |
| Intel | Y | Y | It is feasible and up to gNB implementation. |
| Xiaomi | Y | Y | This is one possible gNB implementation. |
| ZTE | Y | Y | Agree with above companies, this may be a solution which seems feasible. |
| Qualcomm | - | - | It’s feasible, but this waiting for PDCP status report can lead to undesired delays in some cases. So we would like to avoid such approach |
| vivo | Y | Y | We think this is an easy and feasible implementation. No bug is observed anyway. |

**Solution 2 (NR DAPS-like approach)**: The transmitter should maintain IR state/uncompressed packet during PDCP re-establishment.

As the rapporteur, we think it only mandatates the transmitter behaviour to maintain IR state/uncompressed packet for a while, and it is similar to the NOTE for DAPS. From the receiver side, nothing further needs to be done on top of Solution 2.

**Questions**: please indicate your opinion and details comments to Solution 3:

From the transmitter perspective, do you think it is feasible to maintain IR state/uncompressed packet during PDCP re-establishment.

From the receiver perspective, do you agree that it has no further impact but follow the legacy reception procedure?

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Transmitter:Y: feasibleN: not feasible  | Receiver:Y: agreeN: disagree | Detailed Comments |
| HW | Y |  Y | Compared with Solution1, it seems Solution2 is simpler and cleaner to resolve the issue. Regarding RoHC continue, we think the issue may be invalid as RoHC context has been maintained by both sides, so it is more worthy of IR state packet discard as discussed in early NR R15. |
| OPPO | N | N | For R15, it would be good to leave it as it is. |
| LG | Y | Y | Although it is feasible to maintain IR state in the PDCP transmitter, it is up to implementation. |
| Ericsson | Y | Y |  |
| Samsung | Y | Y | This could be one of the solutions, which is up to implementation. |
| Intel | Y\* |  Y\* | It is feasible, but we don’t’ think the solution should be used. This basically disables *drb-ContinueROHC,* then why configure *drb-ContinueROHC* at the first place? When network does not configure *drb-ContinueROHC,* transmitter already maintains IR state as in TS 38.323 clause 5.1.2, as below:When upper layers request a PDCP entity re-establishment, the transmitting PDCP entity shall:- for UM DRBs and AM DRBs, reset the ROHC protocol for uplink and start with an IR state in U-mode (as defined in RFC 3095 [8] and RFC 4815 [9]) if *drb-ContinueROHC* is not configured in TS 38.331 [3]; |
| Xiaom | Y | Y |  |
| ZTE | Y | Y | It is obviously a solution which may cause the NBC issue if we capture wording onto TS. |
| Qualclomm | - | - | Sending a RoHC packet in IR state seems a solution. However, this will add dependence between L2 and ROHC to keep IR state during retx, which is undesired as well. |
| vivo | Y | Y | This is another feasible implementation.  |

### 4.1.2 How to fix the issue

**Questions**: please indicate your preferred solution and the way to capture it, and details comments:

Solutions:

**Solution 1 (LTE-like approach):** The transmitter should wait PDCP status report from the receiver before retransitting RLC unacked PDCP SDUs.

**Solution 2 (NR DAPS-like approach)**: The transmitter should maintain IR state/uncompressed packet during PDCP re-establishment.

**Solution 3**: None above.

Alternatives to capture:

**Alt 1:** To capture it into Stage-3 spec as a NOTE for guidance for implementation.

**Alt 2:** To capture it into Stage-2 spec as high-level guidance for implementation, e.g. section 6.4.1.

**Alt 3:** To capture it into the Chairman notes as RAN2 common understandings on “sensible” implementations.

**Alt 4:** Postphoned.

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Prefered Solution (from which release)1,2,3 | Prefered Alternatives to capture (from which release)1,2,3,4 | Detailed Comments |
| HW | 2 (from R15)  | 1 or 2 (from R15) | Simlar to DAPS, a note in PDCP spec is preferred. |
| OPPO | 1 (R15) | 4 or 3 (R15) |  |
| LG | 1 | None or 3 | The PDCP status report is used to reduce duplicated transmission afterr handover. If the network wants to avoid duplicated UL transmission from the UE, the network sends PDCP status report and delays providing UL grant. It’s up to network implementation.The sensible UE implementation would prioritize PDCP status report over data PDUs. |
| Ericsson | 2 (from R15) | Alt 1 (from R15) |  |
| Nokia | 3 | 2/3 | It would seem possible to clarify the decompression before discard can be performed as already implied by the extisting normative text “if not decompressed before”. |
| Samsung | 1/2 | 3 | If different companies prefer different solution, it should be up to implementation. They can decide their own implementation. For R15 issue, we cannot mandate any specific implementation at this late stage. Since this issue is a well-known issue, we can simply capture in the meeting note “ROHC decompression failure during handover can be handled by implementation”. |
| Intel | 1 | None or 3 | The issue can be handled by network implementation. |
| Xiaomi | 1/2 | 2/3 | It seems that both Solution 1 and 2 are feasible from the specification, it is difficult to say which solution is more reasonable. A stage-2 guidance could be useful if a clear guidance can be provided.  |
| ZTE | 1 |  3 or none(FROM r15) | We agree with the intention. But we still have a concern that may cause a NBC issue if we capture anything on spec. |
| Qualcomm | 3 (R16) | Alt1 or Alt2 or Alt3 (from R16) | We’d propose to send the packet “uncompressed” (no RoHC) during PDCP re-establishment. |
| vivo | 1, 2 | 3 or none (from Rel-15) | It is up to the implementation to handle this issue. |

**Conclusion:**

**TBD**

# 5 Conclusion

**TBD**

# 6 References

[1] RAN2 113-e Chairman Notes 2021-01-25 0900 UTC.docx