3GPP TSG-RAN WG2 #110-e R2-200xxxx

Electronic meeting, 1st - 12th June, 2020

Agenda Item: 6.20

Source: RAN2 Chairman

Title: Draft Report on Email [035] PART2 on TEI16 new proposals

Document for: Decision

# 1 Background

**This is the Report for the following email discussion.**

* [AT110-e][035][TEI16] New Proposals (R2 Chairman)

Scope: Treat R2-2005159, R2-2005175, R2-2004535, R2-2004536, R2-2004537, R2-2004538, R2-2004539, R2-2005121, R2-2005184, R2-2004618, R2-2004863, R2-2005662, R2-2004601 (proponents are responsible to explain and drive)

Part 1: Identify agreeable changes. Deadline: June 5, 0700 UTC.

Part 2: For agreeable parts, continuation to agree CRs (may split the email discussion). Deadline: EOM

Part 1 of this email discussion is reported in R2-2006106. This is Part 2. Note that individual CRs in Part 2 are updated separately. Here only the three below remaining discussions topics are discussed.

# 2 PART2 Proposals and Discussion

PART 2: Missing reportAddNeighMeas

* Support is added for reportAddNeighMeas in periodic measurement reporting. Continue discussion on how to support introduction of this change: mandatory R16/optional R16/need IOT-bit R16, and the related CR updates.

DISCUSSION POINT: Mandatory / Optional / IOT bit

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| Company | Comment |
| Nokia | *Should be mandatory, as this was a minor mistake in Rel-15, agreed to be corrected from Rel-16 onwards. The procedural text covers that reporting, just ASN.1 did not have corresponding changes. We believe we should avoid inserting capabilities for each and every small thing.* |
| LG | Mandatory. This CR doesn’t require any change of UE behaviour. |
| Qualcomm | Optional or IOT  We can’t accept Mandatory. Since this field is already missed in Rel-15, periodic reporting is not supported in Rel-15. And we tend to think this feature is not important given we have already event triggered measurement reporting. Then, how much additional system benefit it can achieve on top of event triggered reporting? |
| MediaTek | No strong view. We are fine to have this as mandatiry or adding an IOT bit for testing purpose. |
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PART1: Retransmission of an RLC SDU with a poll after discard

[R2-2005662](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_110-e\Docs\R2-2005662.zip) Retransmission of an RLC SDU with a poll after discard procedure LG Electronics Inc., Ericsson, NTT Docomo, LG Uplus, Sharp discussion Rel-16 TEI16 R2-2002998

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| Company | Comment (support/other-opinion/not acceptable, reasons |
| Nokia | *We are not sure if this is a critical issue although we acknowledge such occasion is possible to happen:*  *- for the case the last RLC SDU becomes unavailable right before transmission due to PDCP discardTimer expiry seems a corner case;*  *- for the case of PDCP duplication deactivation, NW can proactively transmit a STATUS PDU for the secondary RLC entity after deactivating the duplication.* |
| vivo | *We think that this issue can be handled by the network implementation (e.g. by sending the STATUS PDU at the PDCP duplication deactivation).* |
| LG | *With PDCP duplication, the RLC SDU with a poll would be frequently discarded (e.g. when a PDCP PDU is successfully transmitted by one RLC entity, the PDCP indicates all other RLC entities to discard the duplicated PDCP PDU). If there is no RLC SDU in the UE buffer after the SDU discard, the RLC entity would be stuck because there is no RLC SDU to transmit a poll. In other words, the fail-safe mechanism which triggers the poll for the last RLC PDU in the buffer doesn't work when the last RLC SDU in the buffer is discarded.*  *Comment on Nokia and vivo’s answer above:*  *Even if the NW proactively transmits a STATUS PDU after PDCP duplication deactivation, if the receiving RLC entity at the NW fails to receive the last transmitted data from the transmitting RLC entity, the STATUS PDU cannot contain this missing data information and finally the problem cannot be solved.* |
| Samsung | We have some sympathy with this motivation. However, we think this issue is mainly about the second AM RLC entity. Regardless of activation or deactivation, we still have the primary AM RLC entity. Even if the secondary AM RLC entity is stuck and no new data comes, data transmission and reception would be still on-going via the primary AM RLC entity, e.g. PDCP SDU corresponding to last transmitted data(RLC PDU via the secondary RLC entity) will somehow arrive at the receiver via the primary AM RLC entity. Upon reactivation and the reception of new data, the secondary RLC entity gets free from being stuck. So no critical problem would be foreseen. |
| Qualcomm | Support |
| Futurewei | Not support  PDCP duplication is to provide reliability with minimum latency. Hence, it typically works with RLC UM mode. Therefore, we don’t see Rel-16 works introduce new issue to RLC polling in AM mode, and don’t think this change is needed. |
| Huawei | Technically we see some benefit. However, we understand the motivation is to poll the receiver in order to receive the status report quickly. But it can rely on the NW implementation, for instance, NW can freely trigger the status report along with the PDCP duplication deactivation command. So it can achieve the same effect without standard impact. Another way is to wait for the T-reassembly timer expires at the receiver side so that the status report will be triggered as well |
| OPPO | We are dont think this is a criticial issue since, we have sympathy on Nokia and Futurewei’s comments. |
| Intel | Agree with Nokia, vivo, and Samsung. There seems to be no critical issue. |
| MediaTek | Support |
| Ericsson | We support the CR. |
| Apple | Support |
| Interdigital | Support |
| Fujitsu | Need more analysis from the following perspective:  We appraciate to discuss this potential issue. We wonder if the potential issue occurs discussed in this tdoc typlicall ocurs in case of URLLC data with PDCP duplication. According to URLLC guidance, the data error rate is 10-5 and data can be sent within 1ms latency. Given that this is assumption, the 1st issue (the last RLC SDU waiting to be transmitted in one of the RLC entities is discarded by an indication from higher layers.) does not tipically occur because RLC SDUs can be transmitted within 1ms latency before PDCP SDU discard indication. Also, the 2nd issue (the secondary RLC entity cannot finalize its transmission and retransmission after PDCP duplication is deactivated) does not typlically occurs becaus of the same reason. |
| NTT DOCOMO | Support (as one of the proponents) |

**Retransmission of an RLC SDU with a poll after discard**

**DISCUSSION PART 1**

- Samsung think there is no critical issue. LG think the problem is that in current RLC there may be retransnmissions pending when RLC is reactivated.

- Huawei think this is a corner case and think network can resolve this. LG think proactive status reports can be lost, and think also the network may not know the last PDU, and think there is anyway remaining issues.

- LG request to discuss one more round by email.

**AGREEMENTS PART 1**

* Can have one more round of email discussion on the Retransmission of an RLC SDU with a poll after discard.

PART2: Retransmission of an RLC SDU with a poll after discard

QUESTIONS BY PROPONENT

Q1. Do you agree that if there is no RLC SDU in the UE buffer after the SDU discard, the RLC entity would be stuck because there is no RLC SDU to transmit a poll?

Q2. What is technical problems on the retransmission of an RLC SDU with a poll after discard?

Q3. Do you agree that even if the NW transmits a STATUS PDU after duplication deactivation, if the STATUS PDU is lost or the STATUS PDU contains no missing data information due to failing to receive the last transmitted data, the problem cannot be solved, i.e., network implementation may not fully resolve the issue?

Q1. Do you agree that if there is no RLC SDU in the UE buffer after the SDU discard, the RLC entity would be stuck because there is no RLC SDU to transmit a poll?

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| Company | Yes/No | Comment |
| Samsung | Yes | Note that we assume it will not happen frequently and we have the same issue in LTE, which inherited from LTE. We think that RLC specification is quite stable and we don’t want to modify anything otherwise a critical issue is found.  We discussed similar issue several times even in the early/late stage of NR. RAN2 concluded not to have this kind of thing. |
| Nokia | Yes | Same view with Samsung, this is already there in LTE and has been discussed for NR as well. |
| LG | Yes | It is clear that there is a case, which makes the RLC entity stuck after discarding an RLC SDU. We think that considering that Rel-16 IIoT WI introduces a PDCP duplication up to 4 RLC entity to increase reliability, this RLC stuck problem would frequently happen.  For example, as shown below figure, when RLC entity 1~3 receive RLC SDU 5~8 from PDCP, if the RLC entity 1 receives a STATUS PDU after transmitting all RLC PDUs including a poll in RLC PDU 8 which is the last data, the RLC entity 2 and 3 will receive discard indication for RLC SDU 5~8. In this situation, RLC entity 2 and 3 would be stuck because there is no running poll retransmission timer and the last RLC SDU, i.e., RLC SDU 8, is already discarded. We think that considering each RLC entity may have different data transmission rate, it would be a typical scenario in Rel-16.    In above scenario, if RLC entity 2 and 3 cannot finalize ongoing transmission, these stuck RLC PDUs should be stored in the memory and should wait long time unnecessarily without any action until all RLC PDUs acknowledged. Given that 8 duplication bearer and up to 4 RLC entity for each duplication bearer can be used with high data rate in Rel-16, the amount of these stuck RLC PDUs may not be negligible and would requires lots of unnecessary memory waste in the UE.  We think the above-explained situation is definitely a problem and the proposal is a correction to resolve this RLC stuck problem. |
| Qualcomm | Yes |  |
| HW | Yes | If there is no further data from PDCP for a period, it seems the issue is already there in LTE. For IIOT, we don‘t think the issue becomes worse due to the always-on primary path and possibly activeted other secondary paths to ensure the QoS. |
| MediaTek | Yes |  |
| DOCOMO | Yes |  |
| Fujitsu | Yes, but | Same view with Samsung, this has been discussed from LTE and has been discussed for NR as well. |

Q2. is there technical problems on the retransmission of an RLC SDU with a poll after discard and if so, what are they?

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| Company | Yes/No | Comment |
| Samsung | Yes | Technically, there may be no problem. However, we have concern about unnecessary UE implementation change, given that the current RLC specification has no critical problem. |
| Nokia |  | As Samsung pointed out, this will affect UE implementation, however, from NW point of view there is no issues. |
| LG | No |  |
| Qualcomm |  | It is not a critical issue but it may impact UE implementation. |
| HW | Yes | Same view as Samsung. If we really have to fix ths issue in the spec, there an be alternatives but simpler, which was already discussed in NR R15, e.g. to trigger RLC re-establishment when deactivated. |
| MediaTek |  | Agree with Qualcomm |
| DOCOMO | No |  |
| Fujitsu | No |  |

Q3. Do you agree that even if the NW transmits a STATUS PDU after duplication deactivation, if the STATUS PDU is lost or the STATUS PDU contains no missing data information due to failing to receive the last transmitted data, the problem cannot be solved, i.e., network implementation may not fully resolve the issue?

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| Company | Yes/No | Comment (support/other-opinion/not acceptable, reasons) |
| Samsung | No | We have the primary RLC entity always and additionally another secondary RLC entities. If the concerned scenario is about AM RLC entity, the last transmitted data would already arrive at receiver via the primary RLC entity or another secondary RLC entities even when the concerned secondary RLC entity is stuck. That’s how the packet duplication works. We don’t understand what the critical problem is.  During online discussion, we didn’t still get a point for a critical issue. As we mentioned, regarding the concerned scenario, we think that data loss will not happen and there seems no clear argument for latency.  If one secondary RLC entity is stuck and then reactivated later, the last RLC PDU may be retransmitted and it may cause delay for URLLC traffic. However, we need to note that we still have the primary RLC entity and we can have another secondary RLC entities and thus we cannot say that the last RLC PDU can cause delay since the new data can arrive from the primary RLC entity or another secondary RLC entities without delay.  We still think that this CR is not needed. |
| Nokia |  | We share the views by Samsung. |
| LG | Yes | If the receiving RLC entity at the NW fails to receive the last transmitted data from the transmitting RLC entity, the STATUS PDU cannot contain this missing data information and at least RLC stuck problem cannot be solved by network implementation. |
| Qualcomm | Yes |  |
| HW | No | Same view as Samsung. Regarding LG’s concern of missing data info in the proactive RLC STATUS PDU, upon new data is available, UE will include the polling bit, then NW is aware of the missing data. Normally the amount of missing data is quite limited, we don’t think it is a critical issue. If we really agree to fix this issue, we tend to believe RLC-restablishment when deactivated has the least standard impact. |
| MediaTek | Yes | If STATUS PDU is lost, then network implementation can not fully resolve this problem. |
| DOCOMO | Yes | Agree with LG.  Due to this problem, I think HFN mismatch(PDCP window mismatch) will happen during duplication is re-activated.  When duplication is re-activated and PDCP SN has been wrap around, can HFN mismatch(PDCP window mismatch) happen since RLC entity which is re-activated sends old RLC PDUs which are stuck? If the SN of receiving RLC PDUs is upper side of the PDCP window, PDCP window is updated to the SN. This issue is raised from NR since RLC pre-processing is introduced from NR.  In addition, since at least we have same view that if there is no RLC SDU in the UE buffer after the SDU discard, the RLC entity would be stuck because there is no RLC SDU to transmit a poll, is it better to solve by standard specifications rather than solving individually by implementation? |
| Fujitsu | No | If the assumption of this discussion is URLLC, then the aumout of missing data is very limited due to highly reliable PHY channel quality. In case when STATUS PDU contains no missing data information, next URLLC data can include the poll bit. |

BFR PART1: CFRA resource handling for BFR upon TAT expiry

[R2-2004601](file:///C:\evutukuri\work\5G\RAN2\docs\R2-2004601.zip) CFRA resource handling for BFR upon TAT expiry Nokia, Nokia Shanghai Bell, Apple, ASUSTek discussion Rel-16 TEI16

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| Company | Comment (support/other-opinion/not acceptable, reasons |
| Nokia | *Support.* |
| Vivo | *In the Rel-16 2-step RACH WI, we have already introduced a new 12 bit TAC MAC CE (i.e.* Absolute Timing Advance Command MAC CE*) which could be used in this case.* |
| LG | *We think it would be better to reuse already defined MAC CE, i.e. Absolute Timing Advance MAC CE, in this case. We understand that this MAC CE is currently limited to 2-step RA case, but we don’t see any problem to use this MAC CE for other cases. Thus, we propose to remove the restriction in section 5.2. as follows.*   1. when an Absolute Timing Advance Commandis received:   2> apply the Timing Advance Command for PTAG;  2> start or restart the *timeAlignmentTimer* associated with PTAG. |
| NEC | *support to solve the issue. For the way of solving, it seems the alternative proposal from LG, if applicable, looks better (but no strong view for solution).* |
| Samsung | We do not see any issue here, and thus no changes are needed. First of all, the case itself is a corner case: BFR happens and TAT expires at the same time. As in the contribution, even if it happens, network can send PDCCH order after completion of CFRA for BFR, so nothing is broken. Furthermore, network can also respond with PDCCH order—which is also addressed to C-RNTI—in response to CFRA BFR preamble, which will also complete the CFRA BFR and network can provide proper TA value after receiving another preamble. To release the dedicated resources upon expiry of TAT which requires reconfiguration seems a bit overengineering and unnecessary. |
| Qualcomm | The issue described in the paper was valid in R15. But in R16, 12-bit absolute timing advance command MAC CE was introduced. And there is no restriction on which type of RNTI (C-RNTI or RA-RNTI) this new TAC MAC CE has to be scheduled with. Therefore, this new absolute TAC MAC CE can be sent in the msg2 for CFRA based BFR, and CFRA resources for BFR do not have to be released upon TAT expiry. |
| Futurewei | Agree with Vivo, LG, and Qualcomm. |
| Huawei | Discussed in Rel-15, but not agreed. It is rare case that TAC MAC CE is not sufficient to compensate the UL timing shift, which is expected to be adjusted by the NW. |
| BT | As others have noted, re-use what is defined for 2-step RACH should be sufficient. |
| OPPO | We also think it’s not criticial issue anyway network can trigger PDCCH order based CFRA for uplink synchronization. We also think R16 12 bit absolute timing advance command MAC CE can be used here. |
| Intel | We share the same view with Samsung that the issue might be a corner case, and currently gNB has tools to handle this. If RAN2 agrees to solve the issue, we’re OK with the proposed solution by LG (using 12 bit TAC MAC CE). |
| ASUSTeK | Support as one of the proponent companies. Since Absolute Timing Advance MAC CE is not introduced for this situation, we prefer a simpler approach as proposed in the Tdoc. |
| MediaTek | Not essential. Without it, there will be no impact to UE performance. |
| Ericsson | Solution 2 is already available. Is there really a problem anymore? |
| Apple | Support. The proposal is simple and can improve the BFR dedicated resource efficiency. |
| CATT | We do not see any issue here, and thus no change is needed. |
| Fujitsu | Not essential.  We appreciate to discuss the potential issue. The assumption of the CFRA-BFR is that UE gets UL timing alighment. Therefore, the NW can carefuly configure the value of TAT e.g. large value it the NW wishes to use CFRA-BFR. |
| NTT DOCOMO | Incline to the view from Samsung that NW can trigger PDCCH ordered RA after CFRA for BFR, though it incur the delay of whole procedure. On the other hand, We also agree that the new TAC MAC CE introduce for 2-step RACH could be used for this purpose. |

**CFRA resource handling for BFR upon TAT expiry**

**DISCUSSION PART 1**

Samsung don’t want to mix the 2step RACH and BFR. LG think the new MAC CE is only fo r2step RACH and think we need to think more. Samsung think nothing is broken in the current spec, and think there is no need. ZTE think that introduction of a new UE cap is ok.

- Vivo think a new UE cap is possible.

- Nokia still think there is an issue with the R15 command and would be happy to consider the new MAC CE. Apple agrees that we should consider the new MAC CE.

**AGREEMENTS PART 1**

* The proposal on CFRA resource handling for BFR upon TAT expiry is not pursued.
* Can discuss whether anything is needed in order to apply the new R16 TAC MAC CE in this case (e.g. which UE capability is this MAC CE related to?)

BFR PART2, Applicability of the new R16 TAC MAC CE for BFR

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| Company | Comment (support/other-opinion/not acceptable, reasons) |
| Samsung | Not acceptable: As we commented earlier, the case is a corner case, and it can be handled by the existing mechanism. We do not want to extend the usage of this 2-step-RACH-specific feature to all Rel-16 UEs to solve the corner case merely for the optimization. |
| Nokia | *Support*  We are not sure how TAT expiry is a corner case and the probability to end up performing BFR when TAT has expired should not be any more infrequent as usually.  Since the NW needs to trigger PDCCH order first to complete the RA procedure for the UE and then after the UE can be brought up in sync with RAR, the NW can complete the BFR from PHY point of view to get an ACK for the DL transmission.  Clearly, the easiest solution is to release the CFRA BFR resources upon TAT expiry but the applying the Absolute TAC MAC CE is fine for us not to require the dual RA always when BFR is performed upon TAT expiry.  We are OK to restrict the usage of Absolute TAC MAC CE for the CFRA BFR on top of the agreed 2-step RA usage if the TP proposed by LG above is a concern (ie., apply without restrictions). |
| LG | We don’t think this is needed, but if RAN2 want to use Rel-16 TAC MAC CE, the spec change is needed as shown below. This is because the TAC MAC CE is currently limited to 2-step RA case.  when an Absolute Timing Advance Commandis received:  2> apply the Timing Advance Command for PTAG;  2> start or restart the *timeAlignmentTimer* associated with PTAG. |
| Qualcomm | Support.  Although in priniciple nothing is broken with the current procedure, allowing the use of 12-bit TAC MAC CE for BFR can eliminate the need for PDCCH order after CFRA BFR, which can cut the total delay by about half. And this performance improvement can be obtained without much additional work, other than the spec change shown by LG. |
| ZTE | Okay to support (if majority prefer this)  Seems the solution for this already exists in the MAC spec; so, it is fine to use it for this purpose (even if it is a corner case). However, this means that all the Rel-16 UEs have to support the new Absolute TAC MAC CE (currently only 2-step RACH UEs need to support it). We think that this will not need any changes other than those shown by LG above (i.e. no separate capability needed). With this understanding, we are okay to support this. |
| HW | This is corner case, we can have without it. We are not in favor of mix 2-step RA which will result in more standard impacts. Can be postphoned to future release. |
| MediaTek | Can support.  We agree this is a corner case, but we can accept the majority view to use the Absolute TAC MAC CE, which has limited spec impact and can reduce the latency coming from PDCCH triggered CFRA before CFRA BFR. |
| Fujitsu | This is not our assumption on BFR. We have assume that the TAT would not be expired during CFRA based BFR, meaning that the UE would be UL time aligned. As such, network would carefully configured the value of TAT. |