**3GPP TSG-RAN WG2 Meeting #112-e *R2-201xxxx***

**Online, 2–13 November 2020**

**Agenda item: 5.3.1**

**Source: Samsung**

**Title: Report of [AT112-e][003][NR15] MAC II (Samsung)**

**Document for: Discussion and Agreement**

# 1 Introduction

This is to report the result of the following email discussion in RAN2#112-e Meeting [1].

* [AT112-e][003][NR15] MAC II (Samsung)

 Treat R2-2008909, R2-2010622, R2-2010623, R2-2010624, R2-2010426, R2-2010318, R2-2009910, R2-2009911, R2-2010418, R2-2010164, R2-2009482

 Intended outcome: Intermediate: Determine agreeable parts. Final: For agreeable parts, agreed CRs.

 Deadline: Intermediate deadline(s) by Rapporteur, Final: Discussion stop at Wed Nov 11, 1200 UTC

# 2 Contact Information

|  |  |
| --- | --- |
| Company | Contact: Name (E-mail) |
| Samsung | Jaehyuk JANG (jack.jang@samsung.com) |
| Qualcomm | Linhai He (linhaihe@qti.qualcomm.com) |
| Huawei,HiSilicon | Chong Lou (louchong@huawei.com) |
| Lenovo | Joachim Löhr (jlohr@lenovo.com) |
| Ericsson | Mats Folke (mats.folke@ericsson.com) |
| LG | SeungJune Yi (seungjune.yi@lge.com) |
| CATT | Hao Xu(xuhao@catt.cn) |
| ASUSTeK | Erica Huang (Erica\_Huang@asus.com) |
| Apple | Sarma Vangala(svangala@apple.com) |
| vivo | Stephen (yitao.mo@vivo.com) |
| OPPO | Zhe Fu(fuzhe@oppo.com) |
|  |  |

# 3 Discussion

## 3.1 Fixing a CR implementation error of CR0767

R2-2008909 Fixing a CR implementation error of CR0767 Lenovo, Motorola Mobility, Samsung (Rapporteur) CR Rel-15 38.321 15.10.0 0899 - F NR\_newRAT-Core

|  |  |  |
| --- | --- | --- |
| Company | Agree as is (from which release);Agree with changes;Disagree | Detailed Comments |
| Samsung | Agree as is (Rel-15) | It is clearly an implementation error, and Rel-15 specification should be corrected (as proposed). |
| Qualcomm | Agree as is (Rel-15) |  |
| HW | Agree, but | Can be merged into a misc CR that can be provided by the MAC rapporteur as there are quite a few corrections with minor changes in both MAC I and MAC II email discussions. |
| ZTE | Agree as is (Rel-15) |  |
| Lenovo | Agree as is (Rel-15) |  |
| Ericsson | Agree as is (Rel-15) |  |
| LG | Agree as is (Rel-15) | We propose to have only one Rel-15 CR for all the changes related to Bundling. |
| CATT | Agree as is (Rel-15) |  |
| ASUSTeK | Agree as is (Rel-15) |  |
| Apple | Agree as is (Rel-15) | Agree to the proposals of having one Rel-15 CR for all changes related to bundling |
| vivo | Agree as is (Rel-15) |  |
| OPPO | Agree as is (Rel-15) |  |

**Conclusion:**

**TBD**

## 3.2 Stopping DRX retransmission timer when bundling is used

(The following five contributions are discussed together here.)

R2-2010622 Incorrectly stopping DRX retransmission timer when bundling is used Ericsson CR Rel-16 38.306 16.2.0 0468 - F NR\_newRAT-Core

R2-2010623 Incorrectly stopping DRX retransmission timer when bundling is used Ericsson CR Rel-16 38.321 16.2.0 0993 - F NR\_newRAT-Core

R2-2010624 Incorrectly stopping DRX retransmission timer when bundling is used Ericsson CR Rel-16 38.331 16.2.0 2263 - F NR\_newRAT-Core

R2-2010426 Correction on DRX with bundle transmission of configured uplink grant ASUSTeK CR Rel-16 38.321 16.2.1 0987 - F TEI16

R2-2010318 Further discussions on DRX with bundling operation Huawei, HiSilicon discussion Rel-16 TEI16

|  |  |  |
| --- | --- | --- |
| Company | Agree as is (which CR; from which release);Agree with changes;To capture it in the meeting minutes;Disagree | Detailed Comments |
| Samsung | Agree as is (ASUSTek or Ericsson (only MAC); Rel-16) | We understand that the proposed change to MAC (from both CRs) are the original intention, and thus support the change. As this is the intended behaviour, no additional capability would be needed as Ericsson proposed, and we are fine with either MAC CR. From the agreement from last meeting, we would need a Rel-16 CR only. |
| Qualcomm | Agree with Ericsson’s MAC CR as is; Rel-16  | We also think that UE capability and network configuration are not necessary, because most companies agreed in the last meeting that the proposed change to the MAC spec is the intended behavior, even for Rel-15. And since there is no UE capability for DG, it would be simpler/cleaner if we do not introduce UE capability just for CG, unless the proposed change is an NBC for some UE implementation. Between the two MAC CRs from Ericsson and Asustek, we think both are technically correct but have a slight preference for Ericsson’s version. [r1] As to the proposed clarification on DL reTx timer proposed by Huawei, we do not think it is needed. In our understanding, HARQ feedback for a DL transmission bundle is sent only after the last transmission in the bundle is complete. So there is no ambiguity when UE should stop/start DL HARQ RRT timer and reTx timer. The current spec text is clear enough for us on this behavior. |
| HW |  | 1. **UL DRX retx timer**

We can live without a CR to Rel-16 as it would cause exceptional case for CG bundling only from the spec. However, the sensible UE implementation should be consistent among CG/DG/SPS bundlings. But if majority thinks a CR is helpful indeed, we are fine with a CR without UE capability. Consider the consistent efforts of ASUSTek since last meeting, we slightly prefer to pick that CR. 1. **DL DRX retx timer**

Regarding the DL DRX retx timer, as we commented, if the intended UE behaviour is only to stop the timer once for the first transmission within a bundle for UL CG, it should also apply to SPS bundling. Otherwse, the UE has to check and to “stop” the DL DRX retx timer even it is not running from the current spec. We agree for DL, it has no functionality issue due to different start condition of HARQ RTT timer, but would cause even more ambiguity and redundancy.*1> if a MAC PDU is received in a configured downlink assignment:**2> start the drx-HARQ-RTT-TimerDL for the corresponding HARQ process in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback;**2> stop the drx-RetransmissionTimerDL for the corresponding HARQ process.* |
| ZTE |  |  |
| Lenovo | Agree MAC CR as is Rel-16 | We share the view from QC and Samsung that no additional UE capability is needed. We have no preference between Asustek and Ericsson CR.  |
| Ericsson | Agree as is (Ericsson) Rel-16 | We think a capability is needed, otherwise the network cannot be certain of the UE behaviour. Additionally with a capability (and magic sentence) the behaviour for Rel-15 UEs can also be resolved. |
| LG | Agree with Ericsson MAC CR (Rel-16) | - We think there is no issue in Rel-15. Thus, Rel-16 CR is enough.- We don’t think capability signalling is needed because it is the intended behaviour.- Between two CRs on MAC, we prefer Ericsson CR because “repetition” in AsusTek CR is not clear. We think “repetition” should be changed as in R2-2010164 (section 3.5). |
| CATT | Agree Rel-16 MAC CE | Either Ericssion or ASUSTeK’s CR is OK for us. |
| ASUSTeK | Agree as is / Agree with changes (ASUSTek; Rel-16) | Since the “first repetition of the corresponding PUSCH transmission” already exists in the spec for the timing to stop RTT timer, we think it’s better to align the text between “start RTT timer” and “stop retransmission timer”. In addition, if companies think the “transmission” is clearer than “repetition” as LG mentioned, we can modify the CR as below. The change is related to R2-2010164, and detail comments are provided in section 3.5.1> if a MAC PDU is transmitted in a configured uplink grant and LBT failure indication is not received from lower layers:2> start the *drx-HARQ-RTT-TimerUL* for the corresponding HARQ process in the first symbol after the end of the first transmission of the corresponding PUSCH transmission;2> stop the *drx-RetransmissionTimerUL* for the corresponding HARQ process at the first transmission of the corresponding PUSCH transmission.About the DL bundling, we agree the intent of Huawei. We are fine to clarify the ambiguity if majorities prefer to do so. |
| Apple | Agree as is with ASUSTek or Ericsson MAC CR (as is) for Rel -16 | We agree with others that no additional UE capability is needed as we are also worried about backward compatibility issues and maintenance of similar behavior for DG and CG as suggested by Qualcomm. Only a MAC CR is needed for Rel-16. |
| vivo | Agree as is (Either MAC CR is fine; Rel-16) | We don’t see the need to touch the UE capability. In any release, we think stopping the *drx-RetransmissionTimerUL* timer is a basic MAC procedure, it is not associated with any UE capability. Besides, for the Rel-16 spec, we just specify that the MAC only stops the *drx-RetransmissionTimerUL* timer at the first repetition, rather than stopping it after each repetition transmission. From the UE perspective, the new behavior is simpler than the legacy one. In this sense, there is no reason to introduce a new capability.  |
| OPPO | Agree MAC CR as is (Rel-16) | Agree with most companies, there is no need to introduce UE capability, since the behaviour for DG is already as it is. We have no preference between ASUSTek and Ericsson CR.For DL issue proposed by Huawei in R2-2010318, we think it may not be needed. As we understood, HARQ feedback for a DL transmission bundle is sent only after the last transmission in the bundle, and the RTT timer is started after the end of the corresponding DL HARQ feedback. The fundamental issue on PDCCH monitoring blocking is not existing in DL case.  |

**Conclusion:**

**TBD**

## 3.3 HARQ process handling of retransmission within a bundle

R2-2009910 CR on 38.321 for HARQ process handling of retransmission within a bundle-R15 ZTE Corporation, Sanechips CR Rel-15 38.321 15.10.0 0951 - F NR\_newRAT-Core

R2-2009911 CR on 38.321 for HARQ process handling of retransmission within a bundle-R16 ZTE Corporation, Sanechips CR Rel-16 38.321 16.2.1 0952 - F NR\_newRAT-Core

|  |  |  |
| --- | --- | --- |
| Company | Agree as is (from which release);Agree with changes;Disagree | Detailed Comments |
| Samsung | Disagree | The change seems not needed as the text is interpreted as 'same (frequency) resources'. There would be no room to misinterpret the existing text. |
| Qualcomm | Disagree | We have the same understanding as Samsung. |
| HW | Disagree | This text intends to inherit the wording of non-adaptive HARQ and TTI bundling in LTE to some extent, so the “same” should have no risk of ambiguity.  |
| ZTE | Agree with change(R-15 and R-16) | Regarding the comments from Samsung and Qualcomm, It maybe **NOT** the same frequency resources for the bundling transmission if the frequencyhopping is enabled, please refer to the below specification:=========== From 38.214 ==========================For PUSCH repetition Type A (as determined according to procedures defined in Clause 6.1.2.1 for scheduled PUSCH, or Clause 6.1.2.3 for configured PUSCH), a UE is configured for frequency hopping by the higher layer parameter *frequencyHoppingForDCI-Format0-2-r16* in *pusch-Config* for PUSCH transmission scheduled by DCI format 0\_2, and by *frequencyHopping* provided in *pusch-Config* for PUSCH transmission scheduled by a DCI format other than 0\_2*,* and by *frequencyHopping* provided in *configuredGrantConfig* for configured PUSCH transmission. One of two frequency hopping modes can be configured:- Intra-slot frequency hopping, applicable to single slot and multi-slot PUSCH transmission.- Inter-slot frequency hopping, applicable to multi-slot PUSCH transmission.<Omit for short>In case of intra-slot frequency hopping, the starting RB in each hop is given by:,<Omit for short>In case of inter-slot frequency hopping, the starting RB during slot  is given by:,<omit for short>6.3.2 Frequency hopping for PUSCH repetition Type BFor PUSCH repetition Type B (as determined according to procedures defined in Clause 6.1.2.1 for scheduled PUSCH, or Clause 6.1.2.3 for configured PUSCH), a UE is configured for frequency hopping by the higher layer parameter *frequencyHoppingForDCI-Format0-2-r16* in *pusch-Config* for PUSCH transmission scheduled by DCI format 0\_2, by *frequencyHoppingForDCI-Format0-1-r16* provided in *pusch-Config* for PUSCH transmission scheduled by DCI format 0\_1, and by *frequencyHoppingPUSCH-RepTypeB-r16* provided in *rrc-ConfiguredUplinkGrant* for Type 1 configured PUSCH transmission. The frequency hopping mode for Type 2 configured PUSCH transmission follows the configuration of the activating DCI format. One of two frequency hopping modes can be configured:- Inter-repetition frequency hopping- Inter-slot frequency hopping.. <omit for short>================= From 38.214 ========================= |
| Lenovo | Disagree | We see no need for further clarification |
| Ericsson | Disagree | Similar to Samsung we think there is very little room for misinterpretation. |
| LG | Disagree | The text is inherited from LTE, and there is no point of misunderstandings. |
| CATT | Disagree | We think that the current description is clear enough and no further clarification is needed. |
| ASUSTeK | Disagree |  |
| Apple | Disagree | Same understanding as others and feel there is no misinterpretation here with existing text. |
| vivo | Agree with changes | We are okay with the intention. But the word ‘pre-defined” in ZTE’s CR might lead to more misunderstandings. So, we propose to just add a reference to PHY spec. |
| OPPO | Disagree | Current text is clear. |

**Conclusion:**

**TBD**

## 3.4 Clarification for bundling transmission

R2-2010418 Clarification for bundling transmission ASUSTeK CR Rel-15 38.321 15.10.0 0983 - F NR\_newRAT-Core

|  |  |  |
| --- | --- | --- |
| Company | Agree as is (from which release);Agree with changes;Disagree | Detailed Comments |
| Samsung | Agree as is (Rel-15) | We are fine with the change which is more accurate. In addition, we recognize that separate CRs (with some additioinal changes) for Rel-16 were submitted this meeting, so Rel-16 can be discussed separately (i.e. not in this thread). |
| Qualcomm | Agree as is (Rel-15) | We think the reason for change is valid and the proposed change is a good clarification to the current text.  |
| HW | Disagree | We discussed the issues for both CG and DG bundling and the reason why different texts are put is that, “flexible start” can be only applicable to the CG repetition, i,e, the actual starting point can be at any occasion with RV = 0 in some cases, e.g. RV seq = 0303/0000 (as described in RAN1 TS)，while it is not applicable to DG. So in this paragraph, the actual number of HARQ retx within a bundle is not indicated for CG repetition but it is for DG slot aggregation as shown below. From this point, we don't think this CR is correct. *For CG repetition: After the initial transmission, HARQ retransmissions follow within a bundle.**For DG slot aggregation: If the MAC entity is configured with pusch-AggregationFactor > 1, and the initial transmission is performed within a bundle, pusch-AggregationFactor – 1 HARQ retransmissions follow within the bundle after the initial transmission.* |
| ZTE | Agree as is |  |
| Lenovo | Agree as is (Rel-15) |  |
| Ericsson | Merge with 8909 including changes in comments (Rel-15) | We think the change is ok, but it could be merged with Samsung's rapp CR in 8909. Additionally, the following changes should be made. They are aligning to R2-2009297 which is a Rel-16 contribution. This way the differences between Rel-15 version and Rel-16 version are reduced.When the MAC entity is configured with *pusch-AggregationFactor* > 1, the parameter *pusch-AggregationFactor* provides the maximum number of transmissions of a TB within a bundle of the dynamic grant. If the MAC entity is configured with *pusch-AggregationFactor* > 1, and the initial transmission is performed within a bundle, at most *pusch-AggregationFactor* – 1 HARQ retransmissions follow within the bundle after the initial transmission. If the MAC entity is configured with *pusch-AggregationFactor* > 1, and the entire bundle is used for HARQ retransmissions (i.e. a bundle of dynamic UL grants for retransmission), maximum *pusch-AggregationFactor* HARQ retransmissions are performed within the bundle. When the MAC entity is configured with *repK* > 1, the parameter *repK* provides the number of transmissions of a TB within a bundle of the configured uplink grant. After the initial transmission, HARQ retransmissions follow within a bundle. For both dynamic grant and configured uplink grant, bundling operation relies on the HARQ entity for invoking the same HARQ process for each transmission that is part of the same bundle. Within a bundle, HARQ retransmissions are triggered without waiting for feedback from previous transmissions. Each transmission within a bundle is a separate uplink grant. When the first initial uplink grant within a bundle is delivered to the HARQ entity, all the subsequent uplink grants within the bundle for HARQ retransmissions are delivered to the HARQ entity. |
| LG | Agree as is (Rel-15) | We propose to have only one Rel-15 CR for all the changes related to Bundling. |
| CATT | Agree the intention but | The revision is only for PDCCH indicating initial transmission. Note the number of transmissions in a bundle can be less than the RRC configured parameters for PDCCH indicating retransmission and CG too. We prefer adopt the sentence in Rel-16 with below revision:

|  |
| --- |
| The number of transmissions of a TB within a bundle of the dynamic grant or configured grant is given by *REPETITION\_NUMBER* as follows:- For a dynamic grant, *REPETITION\_NUMBER* is set to a value provided by lower layers, as specified in clause 6.1.2.1 of TS 38.214 [7];- For a configured grant, *REPETITION\_NUMBER* is set to a value provided by lower layers, as specified in clause 6.1.2.3 of TS 38.214 [7].If *REPETITION\_NUMBER* > 1, after the first transmission within a bundle, HARQ retransmissions follow within the bundle as specified in TS 38.214 [7]. For both dynamic grant and configured uplink grant, bundling operation relies on the HARQ entity for invoking the same HARQ process for each transmission that is part of the same bundle. 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. Each transmission within a bundle is a separate uplink grant delivered to the HARQ entity.… |

We find Rel-16 CR is submitted in NR-U WID and not treated. We prefer to discuss it with Rel-16 CR and adopt consistent description. |
| ASUSTeK | Agree as is (Rel-15) | This change is beneficial for clarification and alignment with Rel-16 changes in NR-U, and we are also ok to have a merge CR for Rel-15 changes for bundling. From our understanding, a similar change for Rel-16 (in R2-2009297) will be handled in email discussion [509] in NR-U, so we can focus on the changes in Rel-15 here. |
| Apple | Agree as is (Rel -15) | Agree that only one Rel-15 CR for all the changes related to bundling would be good.  |
| vivo | Disagree | Note that the *pusch-AggregationFactor* is configured for the PUSCH transmission scheduled by DG. In this case, the subsequent HARQ retransmission cannot be terminated until transmitting *pusch-AggregationFactor* PUSCHs.Considering that LBT failure will never happen in Rel-15, we are wondering why we should make this change? We cannot find out any use cases. Sorry if we misunderstand something. In our understanding, the existing Rel-15 text is scientific and aligned with the following text from 38.214 spec: ***The UE shall repeat the TB across the pusch-AggregationFactor consecutive slots applying the same symbol allocation in each slot.*** |
| OPPO | Agree as is (Rel-15) |  |

**Conclusion:**

**TBD**

## 3.5 Consistent use of terminology for bundling in MAC

R2-2010164 Consistent use of terminology for bundling in MAC Ericsson, Samsung CR Rel-16 38.321 16.2.1 0967 - F NR\_newRAT-Core

|  |  |  |
| --- | --- | --- |
| Company | Agree as is (from which release);Agree with changes;Disagree | Detailed Comments |
| Samsung | Agree as is (Rel-15) | We are fine with the changes, and it would be good to correct them from Rel-15.Another terminology issue: the term "RACH procedure" in subclause 5.12 can be fixed to "Random Access procedure", and can be added to the CR. |
| Qualcomm | Agree as is (Rel-15) | We are fine with the changes.  |
| HW | Not needed | The changes are not essential, and the terminology of repetition is already used in RAN1 spec, so the intention is to align between MAC and RAN1 spec, so it is not necessary to be consistent in the MAC spec as they are indeed different operations from RAN1 point. |
| ZTE | No strong point of view | Can follow the majorities |
| Lenovo | Agree as is (Rel-15) |  |
| Ericsson | Agree as is (Rel-15) | We agree with Samsung's proposed addition. |
| LG | Agree as is (Rel-15) | We propose to have only one Rel-15 CR for all the changes related to Bundling. |
| CATT | Agree as is (Rel-15) |  |
| ASUSTeK | Agree with change (Rel-15) | About section 5.7 in MAC spec, the original text “first repetition of the corresponding PUSCH transmission” covers both bundle and non-bundle cases. We think the TP should also consider the non-bundle case, so we propose to either remove “within a bundle” or add brackets as below:…of the first transmission (within a bundle) of the corresponding PUSCH transmission. |
| Apple | Agree as is (Rel-15) |  |
| vivo | Agree as is (Rel-15) | Agree with Samsung. |
| OPPO | Agree as is (Rel-15) |  |

**Conclusion:**

**TBD**

## 3.6 PHR reporting for PUSCH skipping

R2-2009482 Clarification on PHR reporting for PUSCH skipping Apple CR Rel-16 38.321 16.2.1 0929 - F NR\_newRAT-Core, TEI16

|  |  |  |
| --- | --- | --- |
| Company | Agree as is (from which release);Agree with changes;Disagree | Detailed Comments |
| Samsung | Agree as is (Rel-16) | The changes are correct, as it cannot set PCMAX value in such scenario. Since the skipping behaviour will be clarified from Rel-16, Rel-16 CR would be sufficient. |
| Qualcomm | Disagree | The proposed change is against an existing RAN2 agreement (RAN2#103bis). If companies want to revert this agreement, it probably is better to have it first discussed and agreed in RAN1, as they have been discussing the impact of UL skipping. And there can be alternative solutions, which in our view are better. For example, as UE has to wait until Tproc,2 before PUSCH transmission to determine UL skipping, UE does not determine PH type (real vs virtual) until the moment when it determines whether to skip. |
| HW  | Disagree | Not aligned with the past discussions and LTE, the sensible UE implementation will take both of procedural text and MAC CE format into account. So we are not in favour of this CR which may bring NBC risk. |
| Zte | Disagree | I think this was discussed for a long time. And no conclusion is made, we think the UE itself can handle it. |
| Lenovo | Disagree | We agree with QC that this issue has been discussed before. Agreement was that UE will report real PHR even for case of that UL grant is skipped later. RAN1 is currently PHR reporting in the contect of pre-emption.  |
| Ericsson | Disagree | In RAN2#103bis the following agreement was made:1. At the time of determination of PH value for a serving cell, the UE MAC assumes real transmissions for all cells with grants even if any grant is skipped.We think this agreement clarifies and resolves the issue raised in the CR. |
| LG | Disagree | The MAC entity does not decider whether the transmission is Actual or Virtual. The decision is made by PHY, and the MAC just sets the field according to the indication received by PHY. What is important in MAC is the resource allocation for PHR MAC CE (for LCP). That was discussed in RAN2#103bis, and RAN2 agreed "1. At the time of determination of PH value for a serving cell, the UE MAC assumes real transmissions for all cells with grants even if any grant is skipped".  |
| CATT | Disagree | When the PHR is triggered, it is hard to decide if the transmission can be real because of many issues. We prefer to keep current specification. |
| ASUSTeK | Disagree |  |
| Apple | Agree as is (Rel-16)(proponent) | 1. We donot want to revert the previous RAN2 agreement.

 We donot intend to mandate UE to report the virtual PH in case of UL skpping. 1. What we try to clarify is to align the presence of the Pcmax.f.c and the virtual/real type-2 PH.

 In current spec, the procedural text (section 5.4.6) mentions the condition for UE to acquire the Pcmax.f.c, but not mentions when to acquire type-2 PH. Type-2 PH description is only in the MAC CE format part (section 6.1.3.9), and the condition description is different from the procedural part.  The different condition description may lead to the wrong PHR MAC CE (i.e. virtual PH with Pcmax.f.c ) format. We can see companies’ concern, to keep align with the previous RAN2 agreement and to avoid the ambiguity, we propose to consider the change as below.   |
| vivo | Disagree | Agree with Ericsson. We don’t want to revert the previous achieved agreement. |
| OPPO | Disagree | We prefer to follow the previous RAN2 agreement. In addition, we think no clarification is needed. |

**Conclusion:**

**TBD**

# 4 Conclusion

**TBD**

# 5 References

[1] RAN2 112-e Chairman Notes 2020-11-02 0800 UTC.docx