3GPP TSG-RAN WG2 Meeting #109bis-e R2-20xxxxx

Electronic, 20-30 April 2020

**Agenda item: 6.7.3.1**

**Source: Nokia, Nokia Shanghai Bell**

**Title: Offline-028: Intra-UE prioritization and MAC, Part 1-A**

**WID/SID: NR\_IIOT - Release 16**

**Document for: Discussion and Decision**

# 1 Introduction

This document is for the following offline discussion, particularly for topics in 6.7.3.1:

* [AT109bis-e][028][IIOT] Intra-UE prioritization and MAC (Nokia, Samsung)

Scope: Treat topics in 6.7.3.1, based on [R2-2003226](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_109bis-e%5CDocs%5CR2-2003226.zip), started after on-line session April 21 (Nokia) and treat topics in 6.7.3.2 (that do not overlap with 6.7.1), based on [R2-2003124](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_109bis-e%5CDocs%5CR2-2003124.zip), and [R2-2002847](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_109bis-e%5CDocs%5CR2-2002847.zip), started immediately (Samsung).

Part 1: Determine which issues that need resolution, find agreeable proposals. Deadline: April 24 0700 UTC (Nokia, Samsung)

Part 2: Agreeable CR (Samsung)

In parallel, another discussion for 6.7.3.2 based on R2-2003124 and R2-2002847 is conducted separately. Hence, the scope of this discussion is focused on agreeable proposals listed in the email discussion summary prepared for *[Post109e#50][IIOT] Remaining issues intra-UE prioritization*, which is R2-2003226 [1]:

[R2-2003226](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_109bis-e%5CDocs%5CR2-2003226.zip) Summary of e-mail discussion: [Post109e#50][IIOT] Remaining issues intra-UE prioritization Nokia, Nokia Shanghai Bell discussion Rel-16 NR\_IIOT-Core

With a few proposals are already discussed/agreed during the online session, this document targets to address the remaining proposals of [1] that are not yet concluded.

# 2 Discussion

## 2.1 Proposal relating to Overlapping SPS prioritization

In [1], it has been discussed if any changed in MAC specification to reflect the PHY behavior of only decoding PDSCH with the lowest SPS index when multiple SPS overlap in time. The discussion shows that 17 companies think it is already clear in TS 38.214 that PHY does not need to decode all overlapping PDSCH and it does not contradict to MAC spec. as no TB of PDSCH that is not decoded by PHY will be delivered from PHY for further processing anyway, so no text change is needed; 1 company proposed an alternative text proposal; 2 companies does not have a strong view. It is clear that majority of companies do not think any change in MAC is needed, so we have the following proposal:

***Proposal 1: No text change in TS 38.321 to address the cases with multiple overlapping SPS PDSCH.***

**Question 1: Do you agree with Proposal 1 ?**

|  |  |  |
| --- | --- | --- |
| **Company** | **YES/NO** | **Comment (if any)** |
| Qualcomm | Yes |  |
| ZTE | Yes |  |
| LG | Yes |  |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| vivo | Yes |  |
| CMCC | Yes |  |
| Nokia | Yes |  |
| Huawei, Hisilicon | Yes |  |
| Ericsson | Yes |  |
| Sony | Yes |  |
| CATT | Yes |  |
| Spreadtrum | Yes |  |
| Intel | Yes |  |
| Sharp | Yes |  |
| Fujitsu | Yes |  |
| III | Yes |  |

**Conclusion:**

All companies agreed Proposal 1, so we can have the following agreement:

* **No text change in TS 38.321 to address the cases with multiple overlapping SPS PDSCH.**

## 2.2 Proposal relating to HARQ buffer flushing for consecutive de-prioritizations

This issue is relating to the situation where the configured grant for autonomous (re)transmission is once again deprioritized, which cannot be considered as a prioritized grant according to current spec. text. Thus, the uplink grant neither obtains the existing MAC PDU from the HARQ buffer, nor obtains a new MAC PDU from the Multiplexing and Assembly Entity. Eventually the HARQ buffer of the identified HARQ process is flushed, which is not desirable result as the UE can no longer attempt autonomous transmission of this MAC PDU.

According to the discussions in [1], all companies think this is an issue that has to be resolved. Moreover, 18 out of the 20 companies think they can accept the text proposed by MAC rapporteur during [AT109e][029][IIOT] to resolve this issue. The first TP in R2-2003226 [1] (for Section 5.4.2.1 of TS38.321) also captures the text proposed by the MAC rapporteur. In light of this, we have the following proposal:

***Proposal 2: Adopt the first TP in R2-2003226 (the one targets at Section 5.4.2.1. of TS38.321) to address the issue of HARQ buffer flushing when the grant for autonomous retransmission is again de-prioritized.***

**Question 2: Do you agree with Proposal 2 ?**

|  |  |  |
| --- | --- | --- |
| **Company** | **YES/NO** | **Comment (if any)** |
| Qualcomm | Yes |  |
| ZTE | Yes |  |
| LG | Yes |  |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| vivo | Yes |  |
| CMCC | Yes |  |
| Nokia | Yes |  |
| Huawei, Hisilicon | Yes |  |
| Ericsson | Yes |  |
| Sony | Yes |  |
| CATT | Yes |  |
| Spreadtrum | Yes |  |
| Intel | Yes |  |
| Sharp | Yes |  |
| Fujitsu | Yes |  |
| III | Yes |  |

**Conclusion:**

All companies agreed Proposal 2, so we can have the following agreement:

* **Adopt the first TP in R2-2003226 (the one targets at Section 5.4.2.1. of TS38.321) to address the issue of HARQ buffer flushing when the grant for autonomous retransmission is again de-prioritized.**

## 2.3 Proposal relating to Configurability of data vs. data and SR vs. data prioritization

The aspect of whether data vs. data prioritization and SR vs. data prioritization can be configured separately was discussed in [1], and 14 companies think a single configuration for both features should be sufficient, while 5 companies prefer to have separate configurations. Although there is some support for separate configuration, it seems joint configuration is a more favorable option in RAN2. Hence we have the proposal:

***Proposal 3: Data/Data and Data/SR prioritization should be configured as a single configuration***

**Question 3: Do you agree with Proposal 3 ?**

|  |  |  |
| --- | --- | --- |
| **Company** | **YES/NO** | **Comment (if any)** |
| Qualcomm | No | Though majority favors unified configuration, we believe Qualcomm and Ericsson have raised valid points in the email discussi(R2-2003226), and the proponents of unified configuration should present technical arguments. |
| ZTE | Yes | For this capability ,there is no any technology gap to realize them. |
| LG | Yes | We are still not sure that there are technical issues with a single configuration for data vs. data and SR vs. data prioritization. |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes | No critical issue is found even if a single configuration is used. |
| vivo | Yes |  |
| CMCC | Yes  | To avoid the unnecessary complexity in UE capability design and UE capability choosing during implementation, and considering the similarities of the functionalities and applied use cases, we support the proposal. |
| Nokia | No | We think it is better to separate configurability of these two prioritization cases to enable more flexible operation for different use cases. |
| Huawei, Hisilicon | Yes | Separate configuration would make the procedure which is already complicated even more complicated, and no obvious gain is foreseen. |
| Ericsson | No | For gNB, the data/data prioritization feature would come with the burden of decoding according to multiple hypotheses of which grant the UE may choose, which should be avoided if not needed/wanted. On the other hand, there can be use cases when only SR/data prioritization is needed, such as serving sporadic URLLC traffic using dynamic grant and the arrival of the traffic is indicated by SR.We have provided a TP in R2-2002710 with an additional configurable parameter sr-DataPrioritization. |
| Sony | Yes |  |
| CATT | Yes |   |
| Spreadtrum | Yes | There seems no technical issue in using a single configuration. |
| Intel | Yes |  |
| Sharp | Yes |  |
| Fujitsu | Yes |  |

**Conclusion:**

14 companies agree with Proposal 3, but 3 companies disagree. We can have the following agreement that requires a 24 hours grace period for approval:

* **Data/Data and Data/SR prioritization should be configured as a single configuration**

## 2.4 Proposal relating to Enhancement of SR Counter and *sr-ProhibitTimer*

One open issue that has been identified is whether RAN2 should enhance SR counter and sr-ProhibitTimer, considering that MAC may increment SR counter and starts the prohibit timer once the SR is delivered to PHY, while consequently the PHY may not transmit the SR actually. Therefore, companies are requested to provide their views on whether enhancements are needed, i.e. SR counter is incremented and sr-ProhibitTimer is started only if the SR is actually transmitted by PHY. Based on the discussions in [1], 13 companies think there is no need to enhance SR counter and SR Prohibit Timer in Rel-16, 3 companies think enhancement is needed, or at least some clarification on PUCCH validity is needed in the specification, and 3 companies do not have a strong view.It is quite clear that most companies do not think the enhancement is needed, so we have the proposal:

***Proposal 4: For Rel-16, no enhancement is introduced for SR counter and SR Prohibit Timer.***

**Question 4: Do you agree with Proposal 4 ?**

|  |  |  |
| --- | --- | --- |
| **Company** | **YES/NO** | **Comment (if any)** |
| Qualcomm | Yes |  |
| ZTE | Yes |  |
| LG | Yes | We agree with P4. However, One may argue that if dropped PUCCH resource (i.e., due to overlapping HARQ feedback) is considered as non-valid, the UE may trigger the RA procedure.However, we have a different understanding. The case where the PUCCH resource is dropped due to other overlapping resource is only when the PUCCH resource is configured. On the other hand, the case where the UE triggers the RA procedure is only when the PUCCH resource is NOT configured. Thus, nothing needs to be changed in the MAC specification.  |
| Samsung | Yes |  |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| vivo | Yes |  |
| CMCC | Yes  |  |
| Nokia | Yes |  |
| Huawei, Hisilicon | Yes |  |
| Ericsson | Yes |  |
| CATT | Yes | We would recommend though that it is captured in Chairman’s notes that it is RAN2’s common understanding that a PUCCH resource where the SR would be dropped by PHY is not considered a valid PUCCH resource for SR by MAC.  |
| Spreadtrum | Yes |  |
| Intel | Yes |  |
| Sharp | Yes |  |
| Fujitsu | Yes |  |
| III | Yes |  |

**Conclusion:**

All companies agreed Proposal 4, so we can have the following agreement:

* **For Rel-16, no enhancement is introduced for SR counter and SR Prohibit Timer.**

## 2.5 Proposal relating to LCID set Assignment of MAC CE

In RAN2 #109e, RAN2 has agreed to extend LCID to increase the space for MAC CE, and it is up to every WI to decide whether each new MAC CE should be assigned to LCID Set1 or LCID Set2 of MAC CE. We have discussed this in [1] to see how the MAC CEs introduced in NR IIOT, namely *Multiple Entry Configured Grant Confirmation MAC CE* and *Duplication RLC Activation/Deactivation MAC CE* should be assigned to LCID set1 and LCID set2. The discussions in [1] show that 19 companies think Option 4 is acceptable (i.e. Both MAC Ces in Set2), and 1 company prefers Option 3 (i.e. Both MAC Ces in Set1). It is clear majority of companies prefer to assign both of these MAC Ces to Set2, hence we have the following proposals:

***Proposal 5: Both Multiple Entry Configured Grant Confirmation MAC CE and Duplication RLC Activation/Deactivation MAC CE are assigned to LCID Set2.***

**Question 5: Do you agree with Proposal 5 ?**

|  |  |  |
| --- | --- | --- |
| **Company** | **YES/NO** | **Comment (if any)** |
| Qualcomm | No | We understand the majority view, but want to reiterate that the features of interest relate to ultra-reliability and would benefit from more optimization that Set1 can provide. |
| ZTE | Yes | Actually ,we have no strong point view on this issue, we can following the majorities. |
| LG | Yes | We do not think that these MAC Ces are used very frequently. |
| Samsung | Yes | No strong view, but we think decision can be done quickly based on majority view. |
| Lenovo | Yes |  |
| OPPO | Yes |  |
| vivo | Yes |  |
| CMCC | Yes  | No strong view |
| Nokia | Yes |  |
| Huawei, Hisilicon | Yes |  |
| Ericsson | Yes |  |
| Sony | Yes |  |
| CATT | Yes |  |
| Spreadtrum | Yes | No strong view |
| Intel | Yes |  |
| Sharp | Yes |  |
| Fujitsu |  |  |
| III | Yes |  |

**Conclusion:**

16 companies agree with Proposal 5, and 1 company disagree. We can have the following agreement that requires a 24 hours grace period for approval:

* **Both Multiple Entry Configured Grant Confirmation MAC CE and Duplication RLC Activation/Deactivation MAC CE are assigned to LCID Set2.**

## 2.6 Proposal relating to Autonomous transmission when type-2 CG’s configuration changes

In RAN2#109e, it was agreed that we should address the issue of autonomous transmission for a Type-2 CG whose configuration can be dynamically changed. However, RAN2 has not yet decided how the UE should handle this situation and/or what the conditions that the UE should check are, in order to decide if it should continue autonomous transmission even if the configuration of such CG has been modified. Based on discussion in [1], it seems a larger portion of companies think that whether the autonomous transmission can be continued is hinged on if the TBS after reactivation is still the same. Besides, one company has pointed out that if we simply flush the HARQ buffer upon CG reactivation, there could be some issues if the related HARQ process is already reserved by a dynamic grant, and this argument is supported by several other companies. Hence, we have the following proposal:

***Proposal 6: Autonomous retransmission should be continued upon reactivation of Type-2 CG if and only if the TBS remains the same.***

**Question 6: Do you agree with Proposal 6 ?**

|  |  |  |
| --- | --- | --- |
| **Company** | **YES/NO** | **Comment (if any)** |
| Qualcomm | Yes | We are okay with the understanding that the specification language targeted is “should”. If “shall” is desired, we are okay with “shall .. only if”, but not okay with “shall” in the other direction.  |
| ZTE | Partly yes | Actually, Regarding the “reactivation”, there are two interpretations for this:* Alt 1: A DCI indicates to activate an activated configured grant configuration.
* Alt 2: A DCI indicates to activate a deactivate configured grant configuration which used to be activated.

For Alt.1, since the configured grant is still proceeding continuously without any interruption , it can be supported the autonomous retransmission is still available if TB size remains the same.For Alt.2, this is a different story. If a configured grant is deactivated for a long time, there is some non-transmitted data corresponding to a HARQ process ID. Maybe these non-transmitted data was already sent to NW via RLC retransmission, there seems no need for UE to perform the automatic transmission for these overdue data as a default behavior when this configured grant is activated again . Therefore, for Alt.2, we suggest not to support the automatic retransmission in the new round for the overdue data from the previous round of the configured grant. |
| LG | Yes | Proposal 6 is needed to avoid deprioritized grant’s PDU rebuilding, as well as to guarantee autonomous transmission opportunities.We think that the text proposal by Samsung in R2-2003226 [1] (for Section 5.4.2.1 of TS38.321) can be a baseline |
| Samsung | Yes | For simplicity, we prefer a solution to compare only TBS, irrespective of type of activation or configuration change. As we discussed during the email discussion, the change for P6 will be adding one condition for autonomous retransmission. Regarding QC’s comment, “should” means that UE can optionally perform the autonomous (re-)transmission. It means that we have to specify something about the UE behavior when UE does not perform the autonomous transmission. |
| Lenovo | Yes | We consider the text proposal by Samsung as a good starting point.  |
| OPPO | Yes | We also consider the text proposal by Samsung in R2-2003226 [1] can be a baseline. |
| Vivo | Leave to UE implementation | If the UE receives two reactivation DCI(s), the TBS of the first DCI causes the TBS change, and the second DCI changes the TBS back. Then the UE could still send the pending TB.Maybe the UE behaviors on the TBS change caused by DCI reactivation can be left to the UE implementation  |
| CMCC | Yes  | We think we can go in this way at least in Rel-16. |
| Nokia | Yes |  |
| Huawei, Hisilicon | Yes |  |
| Ericsson | No | From the email discussion, this solution is mainly to solve the problem in which related HARQ process is already reserved by a dynamic grant. We think this can be resolved by the network implementation. In addition, there is an issue related with confirmation MAC CE. Suppose the configured grant configuration has only one HARQ process. After reactivation, UE can only autonomously re-transmit the previously built MAC PDU and it cannot multiplex confirmation MAC CE on the MAC PDU. Thus, this complicates the scheduler implementation at gNB which expects the confirmation MAC CE. |
| CATT | Yes |  |
| Spreadtrum | Yes | We agree with Proposal 6 to guarantee autonomous transmission opportunities for the deprioritized grant’s PDU. |
| Intel | Yes |  |
| Sharp | Yes |  |
| Fujitsu | Yes | We accept the TP by Samsung in R2-2003226 [1]. |
| III | Yes |  |

**Conclusion:**

15 companies agree with Proposal 6, and 1 company disagree. We can have the following agreement that requires a 24 hours grace period for approval:

* **Autonomous retransmission should be continued upon reactivation of Type-2 CG if and only if the TBS remains the same.**

# 3 Conclusion

The discussion concludes that the following agreements can be reached:

* **No text change in TS 38.321 to address the cases with multiple overlapping SPS PDSCH.**
* **Adopt the first TP in R2-2003226 (the one targets at Section 5.4.2.1. of TS38.321) to address the issue of HARQ buffer flushing when the grant for autonomous retransmission is again de-prioritized.**
* **For Rel-16, no enhancement is introduced for SR counter and SR Prohibit Timer.**

On the other hand, the following agreements are subject to the grace period:

* **Data/Data and Data/SR prioritization should be configured as a single configuration**
* **Both Multiple Entry Configured Grant Confirmation MAC CE and Duplication RLC Activation/Deactivation MAC CE are assigned to LCID Set2.**
* **Autonomous retransmission should be continued upon reactivation of Type-2 CG if and only if the TBS remains the same.**

# References

[1] R2-2003226, *Summary of e-mail discussion: [Post109e#50][IIOT] Remaining issues intra-UE prioritization,* Nokia, Nokia Shanghai Bell, RAN2 #109bis-e, Online, Apr. 2020.