**3GPP TSG RAN WG1 #102-e R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

Source: moderator (vivo)

Title: Feature lead summary on NRU configured grant enhancement #2

Agenda Item: 7.2.2.2.4

Document for: Discussion and Decision

1. Introduction

After the preparatory week, following issues are recommended for further discussion until 20th August.

1. Remaining issues
   1. Issue 1: RV ID

Option1:

-------------- TP for 38.214 6.1.2.3.1----------------------------------------------------------------------------------

<unchanged part omitted>

The procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant.

The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions. If *cg-RetransmissionTimer* is provided, the redundancy version for uplink transmission with a configured grant is determined by the UE~~[, except for the redundancy version of the first repetition that is set to 0]~~ . If the parameter *repK-RV* is not provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, the redundancy version for uplink transmissions with a configured grant shall be set to 0. If the parameter *repK-RV* is provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, for the *n*th transmission occasion among *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If a configured grant configuration is configured with *Configuredgrantconfig-StartingfromRV0* set to *‘off’*, the initial transmission of a transport block may only start at the first transmission occasion of the *K* repetitions.

<unchanged part omitted>

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Option2:

-----------------------------------TP2: Start of TP 38.214 section 6.1.2.3.1------------------------------------

6.1.2.3.1 Transport Block repetition for uplink transmissions of PUSCH repetition Type A with a configured grant

The procedures described in this clause apply to PUSCH transmissions of PUSCH repetition Type A with a Type 1 or Type 2 configured grant.

The higher layer parameter *repK-RV* defines the redundancy version pattern to be applied to the repetitions. If *cg-RetransmissionTimer* is provided, and if repK=1, the redundancy version for uplink retransmission with a configured grant is determined by the UE.~~, [except for the redundancy version of the first repetition that is set to 0]~~ If repK>1, the redundancy version is determined by the UE and the UE is not expected to select the redundancy version for all repetitions to 2 or 3. If the parameter *repK-RV* is not provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, the redundancy version for uplink transmissions with a configured grant shall be set to 0. If the parameter *repK-RV* is provided in the *configuredGrantConfig* and *cg-RetransmissionTimer* is not provided, for the *n*th transmission occasion among *K* repetitions, *n*=1, 2, …, *K*, it is associated with *(mod(n-1,4)+1)th* value in the configured RV sequence. If a configured grant configuration is configured with *Configuredgrantconfig-StartingfromRV0* set to *‘off’*, the initial transmission of a transport block may only start at the first transmission occasion of the *K* repetitions. Otherwise, the initial transmission of a transport block may start at

- the first transmission occasion of the *K* repetitions if the configured RV sequence is {0,2,3,1},

- any of the transmission occasions of the *K* repetitions that are associated with RV=0 if the configured RV sequence is {0,3,0,3},

- any of the transmission occasions of the *K* repetitions if the configured RV sequence is {0,0,0,0}, except the last transmission occasion when *K≥8*.

<Unchanged parts are omitted>

----------------------------------------End of TP 38.214 section 6.1.2.3.1------------------------------------------

|  |  |
| --- | --- |
| Company | Comments |
| Qualcomm | Support option 1. The proper RVID choice should be left to UE with and without repK configuration. No need to introduce different behavior |
| ASUSTeK | Support option 1. |
| LG | Support option 1. |
| Ericsson | Support option 1 |
| OPPO | We think that the error case should not be allowed in the specification. Thus, we propose to discuss and to avoid this error case. |
| Intel | Support option 1. |
| Huawei, HiSilicon | Support option 1 |
| ZTE | Support option 1 |
| Lenovo, Motorola Mobility | Support Option 1. |
| Samsung | Support Option 1 |
| vivo | Support Option 1 |

This issue has been discussed extensively since last meeting and given majority of companies support option1, following is proposed:

Proposal: TP in option 1 is supported

* 1. Issue 3: CG-PUSCH repetition

============= Start of TP for TS 38.214 =======================

6.1.2.3 Resource allocation for uplink transmission with configured grant

================ Unchanged Texts Omitted =================

A set of allowed periodicities *P* are defined in [12, TS 38.331]. The higher layer parameter *cg-nrofSlots-r16*, provides the number of consecutive slots allocated within a configured grant period. The higher layer parameter *cg-nrofPUSCH-InSlot-r16* provides the number of consecutive PUSCH allocations within a slot, where the first PUSCH allocation follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or *Time domain resource assignment* field in the activation DCI for Type 2 PUSCH transmission, and the remaining PUSCH allocations have the same length and PUSCH mapping type, and are appended following the previous allocations without any gaps. The same combination of start symbol and length and PUSCH mapping type repeats over the consecutively allocated slots.

================== Unchanged Texts Omitted ================

====================== End of TP for TS 38.214 =======================

|  |  |
| --- | --- |
| Company | Comments |
| Qualcomm | Support the TP |
| ASUSTeK | Support the TP, and it’s good to clarify “*timeDomainAllocation*” |
| LG | Support the TP. |
| Ericsson | It is better to follow the same wording used in the same section to describe the time domain allocations  PUSCH allocation follows the higher layer parameter *timeDomainAllocation* for Type 1 PUSCH transmission or the higher layer configuration according to [10, TS 38.321], and UL grant received on the DCI for Type 2 PUSCH transmissions, |
| OPPO | Support the TP |
| Intel | We support the TP. |
| Huawei, HiSilicon | Support the TP |
| ZTE | Support the TP |
| Lenovo, Motorola Mobility | Support the TP. |
| Samsung | Support the TP |
| vivo | Support the TP, also fine with wording from Ericsson |

All companies agree with the proposed TP, and Ericsson proposed to revise the wording. So the question to the group is whether revised TP is agreeable?

* 1. Issue 4: TP for DFI related issues

TP#4 for TS 38.213

===================== Start of TP for TS 38.213 ==========================

10.5 HARQ-ACK information for PUSCH transmissions

================== Unchanged Texts Omitted ================

For an initial transmission by a UE of a transport block in a PUSCH configured by *ConfiguredGrantConfig*, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

(Option 1) For a PUSCH transmission scheduled by a DCI format, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

(Option 2) For a PUSCH transmission scheduled by a DCI format, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that at least one of CBG for the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

(Option 3) For a PUSCH transmission scheduled by a DCI format, if the UE receives a CG-DFI that provides information for the transport block, the UE sets CWp = CWmin,p for every priority class if the information value is 1; otherwise, the UE increases CWp for every priority class to the next higher allowed value.

(Option 4) For a PUSCH transmission scheduled for a slot by a DCI format, if a UE is provided *PUSCH-CodeBlockGroupTransmission* for a serving cell, a value of HARQ-ACK information for a transport block of a corresponding HARQ process number is ACK if at least 10% of all the CBGs of PUSCH(s) scheduled by any DCI format in the same slot was correctly decoded; otherwise, a value of HARQ-ACK information is NACK.

For a PUSCH transmission scheduled by a DCI format, HARQ-ACK information for a transport block of a corresponding HARQ process number is valid if a first symbol of the PDCCH reception is after a last symbol of the PUSCH transmission by a number of symbols provided by *cg-minDFIDelay-r16* or, if the PUSCH transmission is over multiple slots,

- after a last symbol of the PUSCH transmission in a first slot from the multiple slots by a number of symbols provided by *cg-minDFIDelay-r16*, if a value of the HARQ-ACK information is ACK.

- after a last symbol of the PUSCH transmission in a last slot from the multiple slots by a number of symbols provided by *cg-minDFIDelay-r16*, if a value of the HARQ-ACK information is NACK.

============ Unchanged Texts Omitted ================

=============== End of TP for TS 38.213 ============================

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| --- | --- |
| Company | Comments |
| Qualcomm | We prefer option 4 or option 2. The A/N in DFI for scheduled PUSCH was introduced for contention window update. Option 4 provides the most accurate information for that purpose. On the other hand, option 2 is simpler to implement. Option 3 may have the problem if the associated PUSCH is not in reference duration. |
| Huawei, HiSilicon | Between Option 1 and Option 2, we prefer Option 1 for the following reasons:   1. Aligning the determination of HARQ-ACK value in the CG-DFI with that agreed for initial transmission of a CBG-based CG-PUSCH. 2. In terms of accuracy, it was agreed that only the CBGs overlapping with the channel subject to the CWS adjustment are considered. While this can be achieved through UE selecting the appropriate bits from the CBG-level feedback, e.g., CBGTI in the UL grant, it may not be achieved with the TB-level feedback in the CG-DFI. This is because in Option 2, the ‘at least one CBG that is ACK’ may not be overlapping with the LBT subband in consideration for CWS adjustment, and even with Option 1, the status of all CBGs including the non-overlapping CBGs is considered. 3. We understand that the UE can choose to use the CBG-level feedback via CBGTI for only the CBGs partially/fully overlapping with the LBT sub-band, or chooses to use the TB-level only feedback provided in the CG-DFI while potentially incurring a penalty in terms of the conservative CWS adjustment   Option 4 seems to have the same accuracy issue in (2.) since the ‘at least 10% of all the CBGs of PUSCH(s) scheduled’ may also include non-overlapping CBGs. Note that the gNB may not necessarily know the LBT subband for which the UE is maintaining the CWS.  Option 3 does not address the issue of how the gNB generates the TB-level HARQ-ACK. It also seems to be inconsistent with the content and style of 38.213.  Agreement:  For CWS adjustment for an LBT sub-band when a single contention window is maintained per LBT subband, all CBGs (if any are present) and TBs that partially or fully overlap with that LBT sub-band are taken into account.   * CW is reset if “ACK” is received for at least 10 % of the CBGs or for at least one TB in the reference duration * Note: Other procedures for contention window adjustment within an LBT subband are also applicable * A UE can choose to apply feedback only based on TBs for CW adjustment |
| LG | We prefer Option 4 for the following reasons:   1. The CWS may increase excessively if the A/N of DG-PUSCH is configured with the same way as in CG-PUSCH. 2. According to CWS adjustment procedures for UL transmission scheduled/configured by gNB in Section 4.2.2.2 of 37.213, the CWS is reset if at least 10% of HARQ-ACK feedbacks is ‘ACK’ for PUSCH(s) with CBG based transmissions. 3. “At least 10% of HARQ-ACK feedback is ACK” referred in the specification is evaluated by accounting for the all the CBGs of PUSCH(s) in the same slot, and not over a single PUSCH transmission. |
| ZTE | We prefer option 1, and we share the similar view with Huawei that it would be better to align the same TB-level HARQ-ACK determination between CG and DG in CG-DFI. |
| Lenovo, Motorola Mobility | We support Option 1 as we understand the agreement for CG-DFI is the HARQ-ACK feedback in CG-DFI is used for indicating the HARQ-ACK corresponding to the PUSCH regardless of TB-based retransmission or CBG-based retransmission.  For Option 4, it is not reasonable to us since Option 4 defines how ACK or NACK in CG-DFI is generated from the gNB’s perspective. |
| Ericsson | In terms of accuracy both option 1 and 2 can not differentiate between used LBT sub-band and all scheduled sub-band. Also to clarify, both option 1 and 2 do not specify how the gNB generates the feedback, it only covers UE interpretation of the feedback.  There is minimal difference between option 1 and 2. In fact, if we assume a single PUSCH in the reference slot, even when counting all the sub-bands and with the largest number of CBGs, having only one successful CBG is already more than 10%.  In our view, option 1 seems enough. |
| Samsung | Although Option 2 is more aligned with CWS adaptation, it may cause incorrect CG operation (e.g., restart of CG timer). Therefore, Option 1 is preferred for more robust operation. |
| vivo | Option1 is preferred |
| Intel | We prefer option 1, and we have the same understanding as Huawei. |
| Qualcomm2 | Don’t understand the 2nd comment from HW on CBG partially overlapping with subband issue. Given freq first rate matching of PUSCH, we don’t think there is a case that a PUSCH with multiple CBGs will have a CBG mapped to a subset of subband only. Then as long as UE knows which set of subbands was used for the PUSCH transmission, it can use the A/N feedback in DFI to update the contention window of those subbands.  Also for HW comment 1, for CG-PUSCH, the DFI A/N is used for retransmission, but for scheduled PUSCH, the A/N is not needed at all other than contention window adjustment. We don’t see why we need to align the design. The design was not aligned for LTE-feLAA. |

Given majority for companies prefer option 1, following is proposed:

Proposal: agree on following TP

===================== Start of TP for TS 38.213 ==========================

10.5 HARQ-ACK information for PUSCH transmissions

================== Unchanged Texts Omitted ================

For an initial transmission by a UE of a transport block in a PUSCH configured by *ConfiguredGrantConfig*, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

(Option 1) For a PUSCH transmission scheduled by a DCI format, if the UE receives a CG-DFI that provides HARQ-ACK information for the transport block, the UE assumes that the transport block was correctly decoded if the HARQ-ACK information value is ACK; otherwise, the UE assumes that the transport block was not correctly decoded.

For a PUSCH transmission scheduled by a DCI format, HARQ-ACK information for a transport block of a corresponding HARQ process number is valid if a first symbol of the PDCCH reception is after a last symbol of the PUSCH transmission by a number of symbols provided by *cg-minDFIDelay-r16* or, if the PUSCH transmission is over multiple slots,

- after a last symbol of the PUSCH transmission in a first slot from the multiple slots by a number of symbols provided by *cg-minDFIDelay-r16*, if a value of the HARQ-ACK information is ACK.

- after a last symbol of the PUSCH transmission in a last slot from the multiple slots by a number of symbols provided by *cg-minDFIDelay-r16*, if a value of the HARQ-ACK information is NACK.

============ Unchanged Texts Omitted ================

=============== End of TP for TS 38.213 ============================

* 1. Issue 6: NDI field for validation activation/release

TP #1:

----------------------------------------- TP #2 for 38.214 6.1.2.1.1------------------------------------------------------

Table 6.1.2.1.1-1A Applicable PUSCH time domain resource allocation for DCI format 0\_1 in UE specific search space scrambled with C-RNTI, MCS-C-RNTI, CS-RNTI or SP-CSI-RNTI

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *pusch-ConfigCommon* includes *pusch-TimeDomainAllocationList* | *pusch-Config* includes *pusch-TimeDomainAllocationList* | *pusch-Config* includes *pusch-TimeDomainAllocationList* *-ForDCIformat0\_1* | *pusch-Config includes pusch-TimeDomainAllocationList –ForMultiPUSCH* | PUSCH time domain resource allocation to apply |
| No | No | No | No | Default A |
| Yes | No | No | No | *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon* |
| No/Yes | Yes | No | No | *pusch-TimeDomainAllocationList* provided in *pusch-Config* |
| No/Yes | No/Yes | Yes | *-* | *pusch-TimeDomainAllocationList-ForDCIformat0\_1* provided in *pusch-Config* |
| No/Yes | No/Yes | - | Yes | *pusch-TimeDomainAllocationList –ForMultiPUSCH provided in pusch-Config* |

-------------------------------------------------END OF TP #2--------------------------------------------------------------

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| --- | --- |
| Company | Comments |
| Qualcomm | Support the TP |
| Huawei, HiSilicon | We support the TP, however, there seems to be overlap with the email discussion [102-e-NR-unlic-NRU-HARQ-02] TPs for the following from R1-2006983 until 8/19; if necessary, endorse associated TPs by 8/25 – David (Huawei)   * Correction on multi-PUSCH scheduling (issue D1): correct ambiguity on TDRA table for DCI format 0\_1 when multiple PUSCH scheduling is configured to the UE. Correction to include pusch-TimeDomainAllocationListForMultiPUSCH-r16 in TS38.214 Table 6.1.2.1.1-1A, and potentially also a TP for 38.212 clause 7.3.1.1.2. |
| LG | Support the TP. |
| ZTE | Support the TP. Note that this is also included in HARQ session. Better to choose one AI to make the conclusion. |
| Lenovo, Motorola Mobility | Support. |
| Ericsson | Same comment as Hauwei. Wasn’t the proposal to discuss if a DCI scheduling multiple PUSCHs can be used to activate/deactivate/or trigger retransmission for configured CG? this does not seem to be included in both summaries. |
| Samsung | Support the TP |
| vivo | Support the TP |
| Intel | We support the TP. |

Given majority of companies support the TP, and has been coordinated with HARQ FL (David), thus it is proposed to agree on the TP

1. Conclusion

# References

[1] R1-2005337, “Feature lead summary on NRU configured grant enhancement”, vivo, RAN1#102-e, 17th – 28th Aug, 2020