3GPP TSG RAN WG1 #103-e R1-20xxxxx

**e-Meeting, October 26th – November 13th, 2020**

**Title: LS on PUSCH skipping with UCI in Rel-16**

**Release: Rel-16**

**Work Item: NR\_newRAT-Core, TEI16**

**Source:** RAN1

**To:** RAN2

**Cc:**

**Attachments:**  R1-200xxxx

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**1. Overall Description:**

In RAN1 #103-e meeting, RAN1 discussed the PUSCH skipping with UCI for dynamic grant and configured grant. On the case of dynamic grant, RAN1 agreed a new CR (R1-200xxxx) with correct spec version, which is a revision of the CR (R1-2007337) endorsed in RAN1 #102-e meeting. RAN1 expects RAN2 to agree the corresponding RAN2 CR so that both the RAN1 and RAN2 CRs can be submitted to RAN plenary together for final approval.

The discussions on PUSCH skipping with UCI in RAN1 were based on the assumptions where LCH based prioritization is not configured and there is a single PHY priority for overlapped UL transmission.

RAN1 discussed the following cases considering both PUSCH skipping with UCI for dynamic grant and configured grant.

* Case 1-2: only one or more CG PUSCHs overlapping with PUCCH
* Case 1-3: DG PUSCH and CG PUSCH are overlapping and both DG/CG PUSCH are overlapping with PUCCH
* Case 1-4: DG PUSCH and CG PUSCH are overlapping and DG PUSCH is overlapping with PUCCH, and CG PUSCH is non-overlapping with the PUCCH
* Case 1-5: DG PUSCH and CG PUSCH are non-overlapping and both DG/CG PUSCH are overlapping with PUCCH
* Case 1-6: DG PUSCH and CG PUSCH are overlapping and CG PUSCH is overlapping with PUCCH, and DG PUSCH is non-overlapping with the PUCCH

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| **Case 1-2** | **Case 1-3** |
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| **Case 1-4** | **Case 1-5** |
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| **Case 1-6** | |

For Case 1-2 of only one or more CG PUSCHs overlapping with PUCCH, RAN1 discussed the behavior of PUSCH skipping with UCI for configured grant in Rel-16 and made the following agreement.

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| **Possible agreement**  **xxx** |

For Case 1-3/1-4/1-5, RAN1 has common understading and following conclusion is drawn in RAN1

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| **Possible conclusion**  **For following cases, when DG PUSCH skipping is configured and Rel-16 LCH based prioritization is not configured and there is a single PHY priority for UL transmissions, MAC generates MAC PDU for the DG PUSCH and the UCI is multiplexed on the DG PUSCH.**   * **Case 1-3:DG PUSCH and CG PUSCH are overlapping and both DG/CG PUSCH are overlapping with PUCCH** * **Case 1-4:DG PUSCH and CG PUSCH are overlapping and DG PUSCH is overlapping with PUCCH** **and CG PUSCH is non-overlapping with the PUCCH** * **Case 1-5:DG PUSCH and CG PUSCH are non-overlapping and both DG/CG PUSCH are overlapping with PUCCH** |

For Case 1-6, RAN1 identified the following options of expected behavior from RAN1 understanding, depending how to determine the priority between rule for DG PUSCH prioritization over CG PUSCH and the rule for UL skipping for DG or CG. For these options, RAN1 observes that there could be benefits that the blind detection for gNB can be reduced. For option 1, it has MAC impact, while for option 2/3, there is difference on UCI multiplexing behavior in PHY.

* When DG PUSCH skipping is configured and Rel-16 LCH based prioritization is not configured and there is a single PHY priority for UL transmissions
  + Option -1:
    - MAC generates PDU for CG PUSCH.
      * UCI is multiplexed on CG PUSCH
  + Option -2:
    - If there is data for DG, MAC generates PDU for DG PUSCH
      * UCI is transmitted on PUCCH.
    - If there is no data for DG, MAC does not generate PDU for DG or CG PUSCH.
      * UCI is transmitted on PUCCH.
  + Option -3:
    - If there is data for DG, MAC generates PDU for DG PUSCH
      * UCI is dropped together with CG PUSCH.
    - If there is no data for DG, MAC does not generate PDU for DG or CG PUSCH.
      * UCI is dropped together with CG PUSCH.



In addition, RAN1 noticed that in legacy Rel-15 and Rel.16, for configured grant, skipping UL configured grant if no data to transmit is conditionally mandatory feature. It is RAN1’s understanding that the agreement in RAN1 will change the UE behavior for CG PUSCH. RAN1 considers it may be necessary to introduce new capability/signalling to differentiate the new UE behaviour and the legacy UE behaviour. However, the final decision on the capability/signalling design for Rel-16 CG PUSCH skipping should be decided by RAN2.

**2. Actions:**

RAN1 respectfully asks RAN2 to

* Take into account the above agreements and update Rel-16 TS 38.321 to support Rel-16 PUSCH skipping
* Resolve the capabability signaling issue for Rel-16 CG PUSCH skipping

**3. Date of Next RAN1 Meetings:**

TSG-RAN WG1 Meeting #104-e 25th January – 5th February 2021 E-meeting.

TSG-RAN WG1 Meeting #104bis-e 12th April – 20th April 2021 E-meeting.