3GPP TSG-RAN WG2 #112-e R2-2011039

Electronic, November 2nd – 13th, 2020

Agenda Item: 6.1.2

Source: Ericsson

Title: Summary on [AT112-e][046][NR16] Out-of-order CBG-based re-transmission

Document for: Discussion, Decision

# 1 Introduction

This document summarizes the following at-meeting email discussion after the 1st round online discussion:

**[AT112-e][046][NR16] Out-of-order CBG-based re-transmission (Ericsson)**

Scope: Treat incoming LS (when it arrives), R2 input (R2-2010049), and make and agree on related Draft CRs.

Intended outcome: Endorsed Draft CRs

Deadline: by the Rapporteur (dep on R1).

R2-2010049 Out-of-order CBG-based re-transmission(s) with cancelled initial PUSCH transmission Ericsson discussion Rel-16

1st DISCUSSION

- Intel think that once we have info from R1, this will need significant discussion.

- Chair: We wait for R1. Separate email discussion on this topic (Ericsson), to be kicked-off as soon as LS from R1 is available. Rapporteur creates a draft for how to capture in R2 TSs.

To leave time for further discussion (if needed), the deadline for inputs is Wed Nov 11, 2000 UTC.

**Contact**

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| **Company** | **Name** | **Email address** |
| Ericsson | Zhenhua Zou | Zhenhua.Zou@ericsson.com |
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# 2 Discussion

RAN1 has concluded the following, see the latest RAN1 chair notes [2]

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| **Agreements:**   * When UE reports 5-25, the UE supports both in-order and out-of-order CBG-based retransmission(s) (not requiring 11-12 as prerequisite even for Rel-16 UE) * For Rel-16, new FG for UE supporting only in-order CBG-based retransmission(s) (not requiring 5-25 as prerequisite) is introduced   + Whether/what TP for TS38.214 in Rel-16 is necessary should be discussed – Klaus (Nokia)   + Details of the new FG description should also be discussed |

The FG 5-25 [1] is the Rel-15 capability bit *cbg-TransIndication-UL*, see below in TS 38.306

| ***cbg-TransIndication-UL***  Indicates whether the UE supports CBG-based (re)transmission for UL using CBG transmission information (CBGTI) as specified in TS 38.214 [12]. | UE | No | No | No |
| --- | --- | --- | --- | --- |

Subsequently, RAN1 agrees to introduce the new FG 11-12 with details shown below

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11.  NR\_L1enh\_URLLC | 11-12 | CBG-based re-transmission for UL using CBGTI with only in-order CBG-based re-transmission(s) for cancelled initial PUSCH transmission | 1. Support of CBG-based PUSCH re-transmission(s) of a TB using CGBTI in case the initial PUSCH transmission was not cancelled due to gNB scheduling/indication/configuration.  2. Support of CBG-based PUSCH re-transmission(s) of a TB using CGBTI in case the initial PUSCH transmission was cancelled due to gNB scheduling/indication/configuration and the following condition is satisfied: the UE is scheduled for a re-transmission of a CBG #N in a given TB when CBG #N-1 has been transmitted before or is scheduled in the same UL grant that includes CBG#N. |  | Yes | N/A |  | Per UE | No | No |  |  | Optional with capability signaling |

The above RAN1 agreement is in align with the principle of the approach 2 in the paper R2-2010049 (copied in Annex 5 for easy reference), in which a new “slimmed-down” version of the legacy bit is introduced. The RAN1 FG 11-12 is more precise in the sense that it also includes the case when there is no cancellation from the gNB. Per Ran1 feedback, due to NBC concern, Rel-15 *cbg-TransIndication-UL* cannot have new FG 11-12 as prerequisite and it is unnecessary to do something different in Rel-16. Additionally, with this approach, the only change is to add a new capability in Rel-16 38.306 which also simplifies a lot the RAN2 signalling discussion. From the rapporteur point of view, this seems to be one way forward.

Question 1: Do you support adding a new capability bit for FG 11-12 and no other changes are needed?

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| **Company** | **Support (y/n)** | **Additional comments** |
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The TPs can be as below

#### 4.2.7.10 *Phy-Parameters*

| Definitions for parameters | Per | M | FDD-TDD  DIFF | FR1-FR2  DIFF |
| --- | --- | --- | --- | --- |
| ***cbg-TransCancelledPUSCH-UL-r16***  Indicates whether the UE supports CBG-based re-transmission(s) of a TB using CBG transmission information (CBGTI) as specified in TS 38.214 [12] in the following two cases:   1. if the initial PUSCH transmission was not cancelled due to gNB scheduling/indication/configuration; and 2. if the initial PUSCH transmission was cancelled due to gNB scheduling/indication/configuration and the following condition is satisfied: the UE is scheduled for a re-transmission of a CBG #N in a given TB when CBG #N-1 has been transmitted before or is scheduled in the same UL grant that includes CBG#N. | UE | No | No | No |
| ***cbg-TransIndication-UL***  Indicates whether the UE supports CBG-based (re)transmission for UL using CBG transmission information (CBGTI) as specified in TS 38.214 [12]. | UE | No | No | No |

The parameter is added in the RRC IE Phy-ParametersCommon

Phy-ParametersCommon ::= SEQUENCE {

[[

cbg-TransCancelledPUSCH-UL-r16 ENUMERATED {supported} OPTIONAL

]]

}

Question 2: Do you agree with the above TP to capture the FG 11-12?

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| **Company** | **Support (y/n)** | **Additional comments** |
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Lastly, please fill in the below table if there are any other issues that need to be discussed in the email.

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| --- | --- |
| **Company** | **Additional issues** |
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# 3 Conclusion

TBC

4. References

1. TR 38.822, User Equipment (UE) feature list, Rel-15
2. Session Notes for NR UE Features, AI 7.2.11, 3GPP TSG RAN WG1 #103-e, October 26th – November 13th, 2020, NTT DoCoMo, Inc.

<https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_103-e/Inbox/Hiroki_sessions/Session%20Notes_Hiroki_NR_UEFeatures_v009.zip>

5. Annex - Approach 2 of paper R2-2010049

**Approach 2 for Rel-15:**

No change to Rel-15. Rel-15 FG would hence only have the legacy bit with the legacy meaning, i.e. it would indicate that the UE supports both in-order and out-of-order CBG retransmissions.

| ***cbg-TransIndication-UL***  Indicates whether the UE supports CBG-based (re)transmission for UL using CBG transmission information (CBGTI) as specified in TS 38.214 [12]. | UE | No | No | No |
| --- | --- | --- | --- | --- |

**Approach 2 for Rel-16:**

Add a new bit for the in-order scheduling alternative. Basically a slimmed down version of the legacy bit.

| ***cbg-TransCancelledPUSCH-UL-r16***  Indicates whether the UE supports CBG-based retransmission for UL using CBG transmission information (CBGTI) in case the initial PUSCH transmission was cancelled and the following condition is satisfied: the UE is scheduled for a re-transmission of a CBG #N in a given TB when CBG #(N-1) has been scheduled before or CBG #(N-1) is scheduled in the same UL grant that includes CBG#N.  The UE indicating support of cbg-TransIndication-UL also supports this feature. | UE | No | No | No |
| --- | --- | --- | --- | --- |
| ***cbg-TransIndication-UL***  Indicates whether the UE supports CBG-based (re)transmission for UL using CBG transmission information (CBGTI) as specified in TS 38.214 [12]. | UE | No | No | No |

UE signalling:

* A Rel-15 UE can indicate that it supports CBG retransmission by indicating that it supports *cbg-TransIndication-UL*. Both in-order and out-of-order CBG retransmission are supported.
* A Rel-16 can indicate that
  + it supports in-order CBG retransmission, and does not support out-of-order CBG retransmission, when initial PUSCH transmission is cancelled, by indicating that it does not support *cbg-TransIndication-UL* and support *cbg-TransCancelledPUSCH-UL*.
  + it supports both in-order and out-of-order CBG retransmission regardless of cancellation of initial PUSCH transmission, by indicating that it supports *cbg-TransIndication-UL*. In this case, the UE has to indicate support of *cbg-TransCancelledPUSCH-UL*.

This approach has the advantage that it is backwards compatible.

A drawback is a Rel-15 UE cannot indicate that it supports only in-order CBG retransmission. Since the understanding is that out-of-order is more difficult to implement, the entire feature of CBG-based retransmissions has a risk of not being implementable as there is no Rel-15 UE reporting the support of both out-of-order and in-order.