**3GPP T****SG-RAN WG2 Meeting #112-electronic R2-200xxxx**

**Online, November 2nd - 13th, 2020**

**Agenda item: 6.1.3**

**Source: vivo**

**Title: Report of [AT112-e][016][NR16] Dyn UL skip and other**

**Document for: Discussion and Decision**

# 1 Introduction

This contribution is aimed at reporting the discussion and result of the following email discussion at RAN2#112-e Meeting [1]:

* [AT112-e][016][NR16] Dyn UL skip and other (vivo)

 Treat R2-2008711, R2-2009824, R2-2009484, R2-2010051, R2-2010317, R2-2009813, R2-2009485, R2-2009819, R2-2009487, R2-2009486, R2-2010565, R2-2010162

 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

According to Chairman’s indication, this discussion includes the following two parts with the corresponding contributions.

1. Dynamic UL skipping
* Treat: [R2-2008711](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2008711.zip), [R2-2009824](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009824.zip), [R2-2009484](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009484.zip), [R2-2010051](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010051.zip), [R2-2010317](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010317.zip), [R2-2009813](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009813.zip), [R2-2009485](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009485.zip), [R2-2009819](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009819.zip), [R2-2009487](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009487.zip), [R2-2009486](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009486.zip), [R2-2010565](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010565.zip)
1. MAC correction
* Treat: [R2-2010162](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010162.zip)

Besides, rapporteur would like to split this discussion into two phases as follows,

* In phase 1, companies are invited to provide their views by Nov. 6 (Friday), 2020, 12:00 UTC.
* In phase 2, rapporteur will provide the summary report, CRs, and draft reply LS based on the input collected in phase 1 by Nov. 9 (Monday), 2020,08:00 UTC. Further polish the related CRs and draft reply LS by Nov. 11 (Wednesday), 2020, 12:00 UTC.

*Note: The parallel discussion regarding UL skipping issues for the configured grant is still being discussed in RAN1, companies are kindly requested to focus on the dynamic UL skipping issues. We can further discuss the CG UL skipping in phase 2 as long as the new LS from RAN1 is received.*

# 2 Discussion

## 2.1 Dynamic UL skipping

Based on the below agreement quoted from the RAN1 LS [2], it can be concluded that a UL transmission on the dynamic scheduled PUSCH with overlapping CSI/HARQ-ACK on PUCCH cannot be skipped any more for Rel-16.

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| --- |
| **Agreement**For UL skipping of dynamic UL grant in non-CA and CA case, when there is PUCCH carrying UCI overlapping with a set of PUSCHs, the PUSCH with UCI multiplexing from the set cannot be skipped. MAC generates MAC PDU for the PUSCH and the UCI is multiplexed on the PUSCH. |

Consequently, given that the support of dynamic UL skipping requires capability signaling, whether a new UE capability should be introduced for Rel-16 dynamic UL skipping comes to the surface. In the RAN1 LS, the following two options for the capability signaling handling are listed and RAN2 is kindly requested to make the final decision for Rel-16 dynamic UL skipping capability.

* Option 1: introduce a new UE capability for Rel-16 dynamic UL skipping.
* Option 2: Reuse Rel-15 UE capability with the understanding that Rel-15 dynamic UL skipping is not implementable therefore UEs indicating this capability should implement Rel-16 behavior.

The related contributions [2]-[12] submitted to RAN2#112-e meeting are reviewed and proposals on Rel-16 dynamic UL skipping capability are summarized as follows,

|  |  |
| --- | --- |
| **Contribution Number** | **Proposals** |
| R2-2009824 | Proposal 1: Introduce a new UE capability for Rel-16 dynamic UL skipping (i.e. *skipUplinkTxDynamic-r16*). |
| R2-2009484 | Proposal 4: Introduce two new capabilities to indicate the support of the uplink skipping enhancement for CG and DG. Proposal 5: Define the new capabilities for the uplink skipping enhancement as per feature set capability. |
| R2-2010051 | Proposal 2 Introduce a new UE capability for Rel-16 dynamic UL skipping.  |
| R2-2010317 | Proposal 1: RAN2 to confirm Option 1 is preferred that a new UE capability can be introduced in Rel-16 for the updated UL skipping behavior. |

All the input contributions share a common understanding that a new UE capability should be introduced for Rel-16 dynamic UL skipping. Please companies to provide feedback on the introduction of a new UE capability.

### **Q1: Do companies agree to introduce a new UE capability for Rel-16 dynamic UL skipping?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Detailed comments** |
| vivo | Yes | Currently, the first version of Rel-16 RRC spec has been frozen. If the legacy “*skipUplinkTxDynamic*” capability is reused, the network cannot determine whether a Rel-16 UE is capable of new-defined dynamic UL skipping. This is because the network can't know whether this UE is manufactured based on the specs in the 2020 Dec version. To avoid the back-compatibility issue, it is necessary to introduce a new UE capability for Rel-16 dynamic UL skipping. |
| HW | Yes | Whether to have a separate UE capability for CG and DG can be discussed later based on additional RAN1 inputs. For now, we share the view as vivo that a new UE capability for Rel-16 should be introduced for dynamic grant, i.e. Option 1(indicated in the LS) is our preference. |
| Ericsson | Yes | This was discussed and agreed on Tuesday (2020-11-03) session. |
| Xiaomi | Yes | Already agreed during the online discussion. |
| Qualcomm | Yes | Agree with vivo |

**Conclusion:**

If the company’s answer to Q1 is Yes, the next coming questions are to determine the field name in TS 38.331, the field description in TS 38.306, and the attribute in TS 38.306 of the new UE capability for Rel-16 dynamic UL skipping (e.g. should it be per UE or BC?).

For the field name and the field description, according to R2-2009824, R2-2010051, R2-2010317, and R2-2009487, rapporteur thinks the following field name and the field description can be as used as the baseline.

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| ***skipUplinkTxDynamic-r16***Indicates whether the UE supports skipping of UL transmission for an uplink grant indicated on PDCCH if no data is available for transmission and no UCI to be multiplexed on the corresponding PUSCH of the uplink grant as specified in TS 38.321 [8]. |

Please share your view on Q2 and Q3.

### **Q2: Do companies agree to the above-mention field name and the field description for the new UE capability for Rel-16 dynamic UL skipping?**

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| --- | --- | --- |
| **Company** | **Yes/Yes with comments/No** | **Detailed comments** |
| vivo | Yes | We are fine with the proposed name and description. |
| HW | Yes |  |
| Ericsson | No | Depending on the conclusion of the Q4 below, if the legacy capability bit *skipUplinkTxDynamic* (without suffix)is not dummified, then we prefer another name to distinguish these two capability bits. One option is *skipUplinkTxDynamic****Enhanced****-r16*. If the legacy bit is dummified, then we are fine to use this one as there is no confusion.  |
| Xiaomi | Yes with comments | If RAN1 agreed to require the MAC to generate MAC PDU for the configured grant, we are wondering whether we would also need another capability bit for the configured grant. |
| Qualcomm | Yes with comments | We’d like to suggest a few minor changes to the proposed field description, because UE supporting only R15 dynamic UL skipping can also meet the two conditions in the proposed field description:Indicates whether the UE supports skipping UL transmission for a dynamic uplink grant indicated on PDCCH only if no data is available for transmission and no UCI to be multiplexed on the corresponding PUSCH of the uplink grant as specified in TS 38.321 [8]. |

**Conclusion:**

### **Q3: What are companies’ preferences on the attribute of the new UE capability for Rel-16 dynamic UL skipping (e.g. Per UE, M, FDD-TFF DIFF)?**

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| --- | --- | --- |
| **Company** | **Response** | **Detailed comments** |
| **Per** | **M** | **FDD-TDD DIFF** | **FR1-FR2****DIFF** |
| vivo | UE | Yes | Yes | No | Considering that the new-defined dynamic UL skipping feature is directly inherited from the Rel-15 feature, we can take the legacy feature as a reference, which is shown in the following, according to TR 38.822.  |
| HW | UE | No? | Yes | No | We are not sure whether the column “M” should be updated or not in Rel-16.  |
| Ericsson | UE | Yes | Yes | No | We don’t see any reasons to deviate from the legacy Rel-15 capability bit skipUplinkTxDynamic (without suffix). As also mentioned in Q5, it is concluded in RP-181397 that ”This feature is optional in rel 15 and mandatory with IoT bit starting from rel 16.” We are fine to follow this guideline and make the “intended/corrected” dynamic UL skipping feature mandatory with IoT bit from Rel-16. |
| Xiaomi | UE |  | Yes | No |  |
| Qualcomm | BC | No | Yes | Yes | We think the feature should be optional at least for DG.We think it is useful to have FRx differentiation, because FR2 tend to have more unused UL grants and no PUCCH configured.Once we have xDD and FRx differentiation, it makes more sense to make the feature per BC instead of per UE. |

**Conclusion:**

Next, as R2-2010051 [5] clarified, the Rel-15 dynamic UL skipping features cannot be implemented in the scenario in which there is PUCCH with CSI/HARQ-ACK that overlaps in time with the PUSCH. Thus, the functionality in Rel-15 capability is not useful in future releases and it is RAN1’s understanding that the dynamic UL skipping cannot be implemented based on the Rel-15 specification. In this regard, it is proposed that RAN2 may consider dummying the field in the Rel-16 spec to make it clear.

### **Q4: Do companies agree to dummify the legacy dynamic UL skipping capability (i.e. *skipUplinkTxDynamic*)?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Detailed comments** |
| vivo | No | We prefer to keep the existing text for the legacy dynamic UL skipping feature, considering the network might configure *skipUplinkTxDynamic* with *true* only when it can guarantee PUSCH will not be overlapping with PUCCH or supports blind detection. |
| HW | No | It seems feasible that some Rel-16 UE only support the existing dynamic UL skipping for dynamic grant, but not the updated UE behaviour as discussed, and therefore NW can be still allowed to enable the existing dynamic skipping in some cases. |
| Ericsson | Preferably, yes. If the intended UE behaviours are clarified, we can accept not to dummify. | The UE behaviour is not clear if the legacy dynamic UL skipping capability is kept and a Rel-16 UE indicates the support. Firstly, it is our understanding that Rel-15 UE follows Rel-15 spec and Rel-16 follows Rel-16 spec. The issue now is that UE behaviours in PHY specs are different in Rel-15 and Rel-16. If the exsiting capability *skipUplinkTxDynamic*(without suffix) is kept, the RAN1 LS (with the agreed CRs) means that * If Rel-15 UE indicates the support *skipUplinkTxDynamic*(without suffix) and network configures it
	+ MAC (38.321 v15): PUSCH is skipped even if there is UCI that would be multiplexed on it
	+ PHY (38.214 v15): **UE behaviour is undefined** if there is UCI that would be multiplexed on the PUSCH but there is no TB generated by MAC.
* If Rel-16 UE indicates the support *skipUplinkTxDynamic*(without suffix) and network configures it
	+ MAC (38.321 v16): PUSCH is skipped even if there is UCI that would be multiplexed on it
	+ PHY (38.214 v16): **UE behaviour is defined:** UE does not transmit on the PUSCH if there is no TB generarted by MAC. The UCI that would be multiplexed on the PUSCH will either be transmitted as PUCCH or multiplexed on the PUSCH in other carriers according to PHY specs.

It is a bad precedence if the same capability bit means different UE behaviours depending on the release number. More importantly, we are not sure if the above UE behaviour with a Rel-16 UE indicating the support of *skipUplinkTxDynamic*(without suffix) is the RAN1 intention.We would like to get a clarification, from the companies who support keeping this capability, the intended UE behaviors if Rel-16 and future releases UEs indicate the support of the legacy *skipUplinkTxDynamic*(without suffix). |
| Xiaomi | No | We think that some Rel-16 UE may also only support the legacy uplink skipping. The Rel-16 new feature should not impact the legacy behaviour. |
| Qualcomm | No | We share the same view with vivo |

**Conclusion:**

In addition, R2-2009819 raised that the achieved agreement in the RAN#80 meeting (i.e. skipping UL transmission for dynamic UL grant is mandatory with capability signaling from Rel-16) has not been captured in the lastest Rel-16 38.306 spec. Thus, it is needed to align Rel-16 38.306 spec with the NR UE feature list [13]. If the company’s answer to Q4 is No, please share your view on Q5.

### **Q5: Do companies agree the change in Rel-16 CR (R2-2009819) (i.e. make the legacy capability *skipUplinkTxDynamic* mandatory)?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Detailed comments** |
| vivo | Yes | The legacy feature might be useful in some cases. Thus, the previous agreement for it should be explicitly captured in the spec. |
| HW |  | As commented to Q3, unclear why it is not implemented in the current 38.306 spec. |
| Ericsson |  | As commented in Q4, we would like to first get a clarification on the UE behaviours if Rel-16 UE indicating the support of this feature. |
| xiaomi |  | Not sure about the final decision on the uplink skipping in Rel-15. The UE implementation would anyway follow the specification, not the intermediate meeting agreement. We still prefer to have this capability optional as it is. |
| Qualcomm | Yes |  |

**Conclusion:**

Further, we have to look after the MAC behavior. According to R2-2009484 and R2-2010317, it is proposed that a new RRC switch parameter (e.g. *skipUplinkTxDynamic1*) should be introduced along with the newly introduced UE capability for Rel-16 dynamic UL skipping. Basically, if the legacy dynamic UL skipping feature is kept, the existing text for the legacy feature in the MAC spec shall be not changed, in order to facilitate the protocol development. As a result, it is natural to draft additional MAC text for the new dynamic UL skipping feature with a new RRC switch parameter. Besides, the UE and NW behavior have to be aligned in the case when both capability signaling bits are reported from one UE. For example, from the NW point of view, with the new RRC switch parameter, it can select the expected Rel-15 or Rel-16 MAC behavior by configuring the corresponding legacy or new RRC switch parameter.

### **Q6: Do companies agree to introduce a new RRC parameter to enable the new dynamic UL skipping feature?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Detailed comments** |
| vivo | Yes | In our understanding, if both legacy and new dynamic UL skipping features are kept, the UE behavior related to both features should be explicitly captured in the MAC spec. Thus, we have to add a new text for the new feature. As a result, a new RRC parameter is needed to indicate whether the new dynamic UL skipping feature can be implemented. Otherwise, it is hard to distinguish the corresponding MAC behavior associated with a given dynamic UL skipping feature in the MAC spec. |
| HW  | Yes | The new UE behaviour of dynamic skipping should not impact the existing Rel-16 UEs who only support the existing scheme. From this perspective, with the new UE capability, it is more reasonable to set different RRC switch parameters by the NW to indicate the intended UE behaviour for alignment between UE and NW.  |
| Ericsson | Yes, if the legacy dynamic UL skipping capability is kept.  |  |
| Xiaomi | Yes |  |
| Qualcomm | Yes | We share the same view as vivo |

**Conclusion:**

Last but not least, companies can provide their comments on the dynamic UL skipping capability issue if they are not covered by the discussions.

### **Q7: Are there any additional comments on the dynamic UL skipping capability?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Detailed comments** |
| Ericsson | Yes | This was already mentioned in our answer to Q4, but we would like to highlight here to hear more views. Basically, we would like to get a clarification, from the companies who support keeping the legacy capability *skipUplinkTxDynamic* (without suffix), the intended UE behaviors if Rel-16 and future releases UEs indicate the support. For a Rel-16 UE supporting *skipUplinkTxDynamic* (without suffix). Suppose there is a PUCCH carrying UCI overlapping with a set of PUSCHs and the PUSCH with UCI multiplexing from the set is called *PUSCH\_A*. According to the legacy *skipUplinkTxDynamic* feature, MAC may not generate the MAC PDU for this *PUSCH\_A* (i.e., there is no TB for this PUSCH), the question is which one of the two is the correct understanding for Rel-16 UE? 1. As in TS 38.214 v15.10.0, UE behavior is undefined;
2. As intended to be implemented in TS 38.214 V16.x.0, UE skips the transmission on the *PUSCH\_A* and transmits the UCI by other means specified in the PHY specs.

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## 2.2 Alignment of SR clause

According to the MAC CR R2-2010162 [14], the reason for the change is:

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| Three WIs have introduced new type of SRs, and the text in the SR section is becoming less understandable and less maintainable. Aligning the new Rel-16 parts of SR cancelling into a list and add some editorial corrections for incerased readability and maintainability. |

### **Q7: Do companies agree the change in Rel-16 CR (R2-2010162)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree as is;Agree with changes;Disagree** | **Detailed comments** |
| vivo | Agree with changes | In our understanding, TEI16 should be added to the WI code in the coversheet since the BSR related text is modified as well. |
| HW | Agree with the intention | Note that this discussion has been postponed for several times. As discussed in the last meeting, not sure if there is a possibility to simplify the text related to stopping on-going RA procedures so that we don't need to repeatedly indicate it for each event. |
| Ericsson | Agree as it is  | The changes are non-technical and only to increase readability and maintainability.  |
| Xiaomi | Agree as it is |  |
|  |  |  |

**Conclusion:**

# 3 Conclusion

The proposals captured are the following:

# 4 References

[1] RAN2 112-e Chairman Notes 2020-11-02 1600 UTC.

[2] R2-2008711, LS on PUSCH with UL skipping, RAN1.

[3] R2-2009824, Discussion on new UE capability of dynamic UL skipping in Rel-16, vivo, Nokia, Nokia Shanghai Bell, Xiaomi.

[4] R2-2009484, RAN2 Impact on UL skipping enhancement, Apple.

[5] R2-2010051, PUSCH with UL skipping, Ericsson.

[6] R2-2010317, Discussions on the remaining issues on PUSCH with UL skipping, Huawei, HiSilicon.

[7] R2-2009813, Correction to UL skipping of dynamic UL grant, vivo, Nokia, Nokia Shanghai Bell, Xiaomi.

[8] R2-2009485, MAC CR on UL skipping enhancement, Apple.

[9] R2-2009819, Correction to skipUplinkTxDynamic, vivo.

[10] R2-2009487, UE capability on UL skipping enhancement, Apple.

[11] R2-2009486, RRC CR on UL skipping enhancement, Apple.

[12] R2-2010565, Draft reply LS on PUSCH with UL skipping, vivo.

[13] 3GPP TS 38.822, User Equipment (UE) feature list, V15.0.1.

[14] [R2-2010162](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_112-e%5CDocs%5CR2-2010162.zip), Alignment of SR clause, Ericsson, Samsung, LG Electronics.

# 5 Participants

|  |  |
| --- | --- |
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