**3GPP TSG RAN WG1 #100bis-e R1-20xxxxx**

e-Meeting, April 20th – 30th, 2020

Source: NTT DOCOMO, INC.

Title: Summary on Email discussion [100b-e-NR-UEFeatures-URLLC/IIoT-03]

Agenda Item: 7.2.11.5

**Document for:** **Discussion and Decision**

# **Introduction**

This contribution summarizes the following email discussion in AI 7.2.11.5 regarding UE features for URLLC/IIoT.

[100b-e-NR-UEFeatures-URLLC/IIoT-03] Email discussion/approval on the feature groups structure related to enhanced UL configured grant transmission for URLLC (20th-24th April) – Hiroki (DCM)

* Confirm to keep 11-9/10
* Discuss whether or not to merge FG11-9a with FG12-2a
* Discuss whether or not to FG11-10 is merged with FG11-11
	+ Discuss whether or not to further merge FG11-10 with FG12-3

# **11-9: Multiple active configured grant configurations for a BWP of a serving cell**

In [1], FG11-9 is captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-9 | Multiple active configured grant configurations for a BWP of a serving cell | 1) Supports up to 12 configured/active configured grant configurations in a BWP of a serving cell.• Separate RRC parameters for different configured grant configurations• Separate activation for different configured grant Type 2 configurations• Separate release for different configured grant Type 2 configurations[2) Supported maximum number of configured grant configurations in a BWP of a serving cell][3) Supported maximum number of configured grant configurations across all serving cells]  |  | Yes | N/A |  | [Per UE]FFS: FSPC | [No] | [No] | [support mixture of FDD/TDD and/or FR1/FR2]  |  | Optional with capability signalling |

Following feedbacks are provided in contributions for the RAN1#100bis-e meeting.

|  |  |  |
| --- | --- | --- |
| [3] | vivo | We are basically fine with the current version of 11-9 including adding component 2 and 3. Regarding component 3, we think a clarification is needed for component 3 that the all serving cells here refers to the serving cell within a cell group or across cell groups in case of DC. Regarding the type, we prefer FSPC as UE may not be able to support the same number of configured grants across different CCs. **Proposal 11: For FG11-9*** **To clarify that the component 3 is about all serving cells within a cell group or across different cell groups**
* **The type should be FSPC**
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| [5] | Ericsson | For FG 11-9, there is a question if component 2) and 3) should be introduced. RAN1 has agreed that the maximum number of UL CG configurations per BWP of a serving cell is 12. Thus there is no clear need for the UE to additionally report components 2) and 3). If it’s proven that FG 11-9 requires components 2), then the set of possible values should be limited. For example, for 2), supported maximum number of configured grant configurations in a BWP of a serving cell can be selected from {1, 2, 4, 8, 12}.If it’s necessary to introduce component 3), it is reasonable to allow up to twice the number of UL CG configurations per cell group. This is similar to ‘***multipleConfiguredGrants***’ in Rel-15 (see Appendix). 1. Preferably component 2) and 3) of FG 11-9 are not introduced.
2. If component 2) of FG 11-9 is introduced, the supported maximum number of configured grant configurations in a BWP of a serving cell is selected from {1, 2, 4, 8, 12}.
3. If Component 3) of FG 11-9 is introduced, component 3) is updated to: “3) Supported maximum number of configured grant configurations across all serving cells in a cell group is 24.”
 |
| [7] | Media Tek Inc. | For FG11-9, we have the following suggestions:* Remove the brackets from component 2) and component 3).

“*[2) Supported maximum number of configured grant configurations in a BWP of a serving cell]*”“*[3) Supported maximum number of configured grant configurations across all serving cells]*”* Add a note to indicate that number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15.
 |
| [8] | LGE | On FG 11-9/9a, though we don’t have a strong view, we are fine to add both components 2 and 3. Regarding the number of PUSCHs for different TBs in a slot, we think that the total number of unicast PUSCH for different TB in a slot per configuration can re-use the capability of 11-5(if any. Otherwise, 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f can be re-used).  |
| [10] | CATT | We think it reasonable to include components 2 and 3 to report the maximum number of CG configurations supported for a CC/all CCs. Some tentative values are proposed. In addition, some alignments between FG 11-9 and FG 12-2 are proposed.

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| 11-9 | Multiple active configured grant configurations for a BWP of a serving cell | 1) Supports up to 12 configured/active configured grant configurations in a BWP of a serving cell and up to 32 configured/active configured grant configurations per MAC entity.• Separate RRC parameters for different configured grant configurations• Separate activation for different configured grant Type 2 configurations• Separate release for different configured grant Type 2 configurations~~[~~2) Supported maximum number of configured/active grant configurations in a BWP of a serving cell~~]~~~~[~~3) Supported maximum number of configured/active grant configurations across all serving cells per MAC entity~~]~~  |  | Yes | N/A |  | [Per UE]FFS: FSPC | [No] | [No] | [support mixture of FDD/TDD and/or FR1/FR2]  | Candidate value for component 2):{2, 3, 4, 6, 8, 10, 12}Candidate value for component 3):{2, 3, 4, 6, 8, 10, 12, 16, 20, 24, 28, 32} | Optional with capability signalling |

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| [13] | Panasonic | Question 1: Whether to set separate UE capabilities for the number of configured grant configurations?It seems the majority view is to let UE to report the supported max number of configured grant configurations. Component 2) and component 3) are added for further discussion. We are ok with rapporteur's suggestion.Question 2: Whether the number of PUSCHs for different TBs in a slot is based on 5-12, 5-12a, 5-12b, 5-13d, 5-13e, 5-13f features from Rel-15? Details or examples can be seen in the comment from QualcommIt seems the majority view is yes. However, it seems if we add it corresponding FG 11-5, then we don't need to repeat it here.We are ok with rapporteur's suggestion. |
| [14] | Nokia, NSB | * We are fine with having UE capability for the new components 2 & 3, but we think the UE capability signaling should be on the number of **ACTIVE** CG configurations (and not the configured ones). Especially when operating with several UE BWPs, this will make a clear difference in operation.
 |
| [15] | Qualcomm | Following updates are proposed.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11-9 | Multiple active configured grant configurations for a BWP of a serving cell | 1) Supports up to 12 configured/active configured grant configurations in a BWP of a serving cell.• Separate RRC parameters for different configured grant configurations• Separate activation for different configured grant Type 2 configurations• Separate release for different configured grant Type 2 configurations2) Supported maximum number of configured grant configurations in a BWP of a serving cell3) Supported maximum number of configured grant configurations across all serving cells]  |  | Yes | N/A |  | Per UE |  Yes  | Yes |  | Component-2, candidate value set is {1, 2, …, 12}Component-3, candidate value set is {1, 2, …, [24]}Total number in FR1 is not greater than X value reported for FR1.Total number in FR2 is not greater than X value reported for FR2.Total number across FR1 and FR2 is not greater than the larger of the FR1 and FR2 values | Optional with capability signalling |

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| [16] | Huawei, HiSilicon | * + We would prefer to keep component 2) and component 3). UE complexity would be increased with the increase of the number of configured grant configurations. Therefore, UE should report the maximum number of configured grant configurations it can support within a BWP. The similar value of FG 12-2 can be used for the candidate value sets for the component 2) and 3).
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## 2.1 Discussion 1

**The proposal is to confirm that FG11-9 is kept.**

**Companies are encouraged to provide views if there is a concern or comment on the proposal.**

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| Company | Comment |
| Nokia, NSB | OK to keep it. |
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# **11-9a: Joint release in a DCI for two or more configured grant Type 2 configurations for a given BWP of a serving cell**

In [1], FG11-9a is captured as below.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-9a | Joint release in a DCI for two or more configured grant Type 2 configurations for a given BWP of a serving cell | M<=4 bits indication in the Release DCI is used for indicating which CG configuration(s) is/are released, where the association between each state indicated by the indication and the CG configuration(s) is• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple CG configurations to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the CG configuration index indicated by the indication | 11-9 | Yes | N/A |  | Per UE | [No] | [No] | [support mixture of FDD/TDD and/or FR1/FR2]  | FFS: A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1). A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2). | Optional with capability signalling |

Following feedbacks are provided in contributions for the RAN1#100bis-e meeting.

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| [2] | ZTE | Similar to the merge of a single release between type 2 CG and SPS, the feature groups of joint release for type 2 CG and SPS can also be merged. In addition, for a UE support of joint release, this UE should naturally also support a single release. Thus, we have the following suggested revisions.

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| --- |
| ***Suggested revision #6 on FG 11-9a for URLLC and FG 12-2a for IIoT*** |
| Index | Feature group | Components | **Prerequisite feature groups** | **Note** |
| 11-11~~9a~~ | Joint release in a DCI for two or more configured grant Type 2 configurations/SPS configurations for a given BWP of a serving cell | M<=4 bits indication in the Release DCI is used for indicating which CG configuration(s)/SPS configuration(s) is/are released, where the association between each state indicated by the indication and the CG configuration(s)/SPS configuration(s) is• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple CG configurations/SPS configuration(s) to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the CG configuration index/SPS configuration index indicated by the indication | 11-9 or 12-2 | A UE supporting this feature shall also support component 1) of 11-10.A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support component 2) of 11-10.~~FFS: A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1). A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2).~~ |
| ~~12-2a~~ | ~~Joint release in a DCI for two or more SPS configurations for a given BWP of a serving cell~~ | 1. ~~M<=4 bits indication in the Release DCI is used for indicating which SPS configuration(s) is/are released, where the association between each state indicated by the indication and the SPS configuration(s) is~~

~~• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple SPS configurations to be released~~~~• In case of no higher layer configured state(s), separate release is used where the release corresponds to the SPS configuration index indicated by the indication~~~~The related HARQ-ACK enhancements to support joint release~~ | ~~12-2~~ |  |

 |
| [3] | vivo | Regarding the above FFS, we think there is no need to make 11-10 or 11-11 as prerequisite as joint release can be achieved by fall back DCI as well.  |
| [10] | CATT | Remove the FFS “FFS: A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1). A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2).” |
| [11] | Samsung | It is not clear to make a restriction to the maximum number of configured grant per BWP per serving cell group because UE can choose one of multiple configured grants to send PUSCH if UE has limited PUSCH transmission capability.  |
| [14] | Nokia, NSB | We could be fine to request a UE supporting 11-9a to also need to indicate 11-10/11-11.  |
| [15] | Qualcomm | Following updates are proposed.

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| 11-9a | Joint release in a DCI for two or more configured grant Type 2 configurations for a given BWP of a serving cell | M<=4 bits indication in the Release DCI is used for indicating which CG configuration(s) is/are released, where the association between each state indicated by the indication and the CG configuration(s) is• Up to 2^M states are higher layer configurable, where each of the state can be mapped to a single or multiple CG configurations to be released• In case of no higher layer configured state(s), separate release is used where the release corresponds to the CG configuration index indicated by the indication | 11-9 | Yes | N/A |  | Per UE |  Yes | Yes | The differentiation is from the perspective of the cell with release DCI  | FFS: A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1). A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2). | Optional with capability signalling |

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## 3.1 Discussion 2

**The proposal is to confirm that FG11-9a is kept.**

**Companies are encouraged to provide views if there is a concern or comment on the proposal.**

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| Company | Comment |
| Nokia, NSB | It is Ok to keep it. |
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## 3.2 Discussion 3

**Companies are encouraged to provide views on whether or not to merge FG11-9a with FG12-2a.**

 **Merging them supported by:**

 **Objected (i.e., not merging them) by:**

|  |  |
| --- | --- |
| Company | Comment |
| Nokia, NSB | OK to merge them. |
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# **11-10: Type 2 configured grant release by DCI format 0\_1**

In [1], FG11-10 is captured as below.

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| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (V2X WI only)”. | **Consequence if the feature is not supported by the UE** | **Type****(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 11. NR\_L1enh\_URLLC | 11-10  | Type 2 configured grant release by DCI format 0\_1  | Support of type 2 configured grant release by DCI format 0\_1 |  | Yes | N/A |  | Per UE | [No] | [No] | [support mixture of FDD/TDD and/or FR1/FR2] FFS: The capability interpretation is from the perspective of a carrier on which the release DCI is received | [A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2).]FFS: Whether to merge with FG 11-11 | Optional with capability signalling |

Following feedbacks are provided in contributions for the RAN1#100bis-e meeting.

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| [2] | ZTE | Suggest merging FG 11-10 and FG 11-11. In addition, the special bit fields in a DCI format for releasing a Type 2 CG configuration and a SPS configuration is the same. We don’t see any difference in terms of UE complexity between support of CG release and SPS release. Therefore, we propose the following revisions.

|  |
| --- |
| ***Suggested revision #5 on FG 11-10/11-11 for URLLC and FG 12-3 for IIoT*** |
| Index | Feature group | Components | Prerequisite feature groups | Note |
| 11-10  | A single release in a DCI for one configured grant Type 2 configuration or one SPS configuration for a given BWP of a serving cell | 1. Support of type 2 configured grant release by DCI format 0\_1 and SPS release by DCI format 1\_1.

2)Support of type 2 configured grant release by DCI format 0\_2 and SPS release by DCI format 1\_2. | *downlinkSPS* *or* *configuredUL-GrantType2* | A UE supporting component 1) and 11-1 (DCI format 0\_2/1\_2) shall also support component 2) .A UE supporting component 2) shall also support component 1) . |
| ~~11-10~~  | ~~Type 2 configured grant release by DCI format 0\_1~~ | ~~Support of type 2 configured grant release by DCI format 0\_1~~ |  | ~~[A UE supporting this feature and 11-1 (DCI format 0\_2/1\_2) shall also support 11-11 (Type 2 configured grant release by DCI format 0\_2).]~~~~FFS: Whether to merge with FG 11-11~~ |
| ~~11-11~~  | ~~Type 2 configured grant release by DCI format 0\_2~~ | ~~Support of type 2 configured grant release by DCI format 0\_2~~ |  | ~~[A UE supporting this feature shall also support 11-10 (Type 2 configured grant release by DCI format 0\_1).]~~~~FFS: Whether to merge with FG 11-10~~ |
| ~~12-3~~ | ~~SPS release by DCI format 1\_1 and 1\_2~~ | ~~Support of SPS release by DCI format 1\_1~~~~Support of SPS release by DCI format 1\_2~~ |  | ~~A UE supporting component 1 and 11-1 (DCI format 0\_2/1\_2) shall also support component 2 (SPS release by DCI format 1\_2).~~ |

 |
| [3] | vivo | We are fine to merge 11-10 and 11-11 to reduce the number of feature groups. |
| [7] | Media Teck Inc. | Combine FG11-10 and FG11-11 into one feature group. |
| [8] | LGE | On FG11-10/11, we are fine to combine FG 11-10 and FG 11-11 as one feature group for simplicity. It may be necessary to add notes “Type 2 configured grant release by DCI format 0\_2 is subjected to the capability reported by FG 11-1”. |
| [10] | CATT | It was proposed to merge the two FGs as for SPS FG 12-3. |
| [14] | Nokia, NSB | Propose to merge in a single feature group. |
| [15] | Qualcomm | Following updates are proposed.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11-10  | Type 2 configured grant release by DCI format 0\_1 and 0\_2 | 1. Support of type 2 configured grant release by DCI format 0\_1
2. Support of type 2 configured grant release by DCI format 0\_2
 |  | Yes | N/A |  | Per UE |  Yes | Yes | The capability interpretation is from the perspective of a carrier on which the release DCI is received | [A UE supporting component 1 and 11-1 (DCI format 0\_2/1\_2) shall also support component 2 (Type 2 configured grant release by DCI format 0\_2).] | Optional with capability signalling |

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## 4.1 Discussion 4

**The proposal is to confirm that FG11-10 is kept.**

**Companies are encouraged to provide views if there is a concern or comment on the proposal.**

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| --- | --- |
| Company | Comment |
| Nokia, NSB | OK to keep it. |
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## 4.2 Discussion 5

**Companies are encouraged to provide views on whether or not to merge FG11-10 with FG11-11**

 **Merging them supported by:**

 **Objected (i.e., not merging them) by:**

|  |  |
| --- | --- |
| Company | Comment |
| Nokia, NSB | OK to merge them. |
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## 4.3 Discussion 6

**Companies are encouraged to provide views on whether or not to merge FG11-10 with FG12-3**

 **Merging them supported by:**

 **Objected (i.e., not merging them) by:**

|  |  |
| --- | --- |
| Company | Comment |
| Nokia, NSB | Ok to merge them |
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# **Conclusion**

TBD

# **References**

[1] R1-2001484 RAN1 UE features list for Rel-16 NR after RAN1#100-E Moderator (AT&T, NTT DOCOMO, INC.)

[2] R1-2001632 Discussion on UE feature for URLLC/IIoT ZTE

[3] R1-2001721 Discussion on Rel-16 URLLC/IIOT UE features vivo

[4] R1-2001782 Discussion on UE features for URLLC/IIoT OPPO

[5] R1-2001791 On UE Features for URLLC and IIoT Ericsson

[6] R1-2001795 UE features for URLLC China Unicom

[7] R1-2001828 Views on Rel-16 UE features for NR URLLC/IIoT MediaTek Inc.

[8] R1-2001927 Discussion on UE features for URLLC/IIoT LG Electronics

[9] R1-2002019 On UE features for Rel-16 eURLLC and IIoT Intel Corporation

[10] R1-2002070 Discussion of UE features for NR URLLC/IIoT CATT

[11] R1-2002154 UE features for URLLC/IIoT Samsung

[12] R1-2002352 Discussions on UE Features for URLLC/IIoT Apple

[13] R1-2002399 UE features for URLLC/IIoT Panasonic Corporation

[14] R1-2002482 On UE features for URLLC/IIOT Nokia, Nokia Shanghai Bell

[15] R1-2002566 Discussion on eURLLC and IIOT UE features Qualcomm Incorporated

[16] R1-2002591 Rel-16 UE features for URLLC Huawei, HiSilicon