3GPP TSG RAN WG2 Meeting #113-e R2-21xxxxx

Online, Jan 25 – Feb 5, 2021

**Agenda item: 6.5.3**

**Source: Samsung**

**Title: Report of Offline 023: IIOT User Plane I**

**WID/SID: NR\_IIOT-Core**

**Document for: Discussion and Decision**

# 1 Introduction

The document is a summary of the following offline discussion:

* [AT113-e][023][IIOT] User Plane I (Samsung)

Scope: Treat R2-2100026, R2-2100219, R2-2100889, R2-2100890, R2-2101004, R2-2101005, R2-2101511, R2-2100714

Phase 1, determine agreeable parts, Phase 2, for agreeable parts Work on CRs.

Intended outcome: Report and Agreed CRs if any is agreeable.

Deadline: Schedule A

Incoming LS etc.

[R2-2100026](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113-e\Docs\R2-2100026.zip) Reply LS on Intra UE Prioritization Scenario (R1-2009680; contact: vivo) RAN1 LS in Rel-16 NR\_IIOT-Core To:RAN2

User Plane I

[R2-2100219](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113-e\Docs\R2-2100219.zip) Explicit discard of UL grants colliding with UL grants in RAR, or to TC-RNTI, or of MSGA payload CATT CR Rel-16 38.321 16.3.0 1010 - F NR\_IIOT-Core

[R2-2100889](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113-e\Docs\R2-2100889.zip) Correction on ignored uplink grant associated to RACH procedure\_Alt1 OPPO CR Rel-16 38.321 16.3.0 1023 - F NR\_IIOT-Core

[R2-2100890](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113-e\Docs\R2-2100890.zip) Correction on ignored uplink grant associated to RACH procedure\_Alt2 OPPO CR Rel-16 38.321 16.3.0 1024 - F NR\_IIOT-Core

[R2-2101004](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113-e\Docs\R2-2101004.zip) Correction for Uplink Grant Received in RAR and Addressed to Temporary C-RNTI (Option 1) Samsung, Ericsson, ZTE, Nokia, Huawei, HiSilicon CR Rel-16 38.321 16.3.0 1025 - F NR\_IIOT-Core

[R2-2101005](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113-e\Docs\R2-2101005.zip) Correction for Uplink Grant Received in RAR and Addressed to Temporary C-RNTI (Option 2) Samsung, Ericsson, ZTE, Nokia, CATT, Huawei, HiSilicon CR Rel-16 38.321 16.3.0 1026 - F NR\_IIOT-Core

[R2-2101511](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113-e\Docs\R2-2101511.zip) UL transmission scheduled with temporary C-RNTI or RAR grant LG Electronics Inc. discussion Rel-16 NR\_IIOT-Core

[R2-2100714](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113-e\Docs\R2-2100714.zip) Consideration of an uplink grant for prioritization Nokia, Nokia Shanghai Bell CR Rel-16 38.321 16.3.0 1021 - F NR\_IIOT-Core

# 2 Phase-1 Discussion

## 2.1 Incoming LS

In an incoming LS R2-2100026 (R1-2009680), RAN1 sent their latest agreement and status as follows:

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| RAN1 had a discussion and made following agreements:  **Agreement**   * For the collision scenario between CG and DG with same/different PHY-priority index, if there is no collision between PUCCH and the CG and there is no collision between PUCCH and the DG, the behaviour mentioned in the LS is consistent with RAN1’s understanding if taking into account the TP to Rel-16 TS 38.214, i.e., revision CR in R1-2008655. * When the MAC entity is configured with *lch-basedPrioritization*, for the collision scenario between CG and DG with same/different PHY-priority index, and when there is collision between PUCCH and the CG with the same priority and/or there is collision between PUCCH and the DG with the same priority, RAN1 is still discussing the related PHY layer behaviour. |

The rapporteur’s view is that this is a reply to RAN2’s LS and RAN2’s action is not required for now.

**Q1) Do companies agree that R2-2100026 is noted? If your answer is “no”, please elaborate what RAN2 should do for this LS.**

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| **Company** | **Yes/No** | **Comment, if your answer is “No”** |
| Nokia | Yes |  |
| LG | Yes |  |
| ZTE | Yes |  |
| Ericsson | Yes |  |
| CATT | Yes |  |
| OPPO | Yes |  |
| Xiaomi | Yes |  |
| Lenovo | Yes |  |
| Samsung | Yes |  |
| MediaTek | Yes |  |
| Sony | Yes |  |
| Huawei | Yes |  |
| Futurewei | Yes |  |
| Sharp | Yes |  |
| Intel | Yes |  |
| Apple | Yes |  |
| Fujitsu | Yes |  |
| Qualcomm | Yes |  |
| Sequans | Yes |  |

## 2.2 Ignored Grant Issue

In this meeting, there are several proposals to resolve a trivial error of Rel-16 text in the current MAC specification that uplink grant received in RAR or addressed to Temporary C-RNTI may be ignored in HARQ operation when *lch-basedPrioritization* is configured.

**Option 1A (R2-2100889, OPPO): Consider uplink grant received in RAR or addressed to Temporary C-RNTI as a prioritized uplink grant + Consider other overlapping uplink grant as a de-prioritized uplink grant**

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| When the MAC entity is configured with *lch-basedPrioritization*, for each uplink grant whose associated PUSCH can be transmitted by lower layers, the MAC entity shall:  1> if this uplink grant is addressed to Temporary C-RNTI or received in a Random Access Response (i.e. in a MAC RAR or a fallback RAR) or is determined as specified in clause 5.1.2a for MSGA payload:  2> if there is no overlapping PUSCH duration of a dynamic uplink grant, which was not already de-prioritized and was chosen for transmission, in the same BWP:  3> consider this uplink grant as a prioritized uplink grant;  3> consider the other overlapping dynamic uplink grant(s), if any, as a de-prioritized uplink grant(s).  1> else if this uplink grant is addressed to CS-RNTI with NDI = 1 or C-RNTI:  2> if there is no overlapping PUSCH duration of a configured uplink grant which was not already de-prioritized, in the same BWP whose priority is higher than the priority of the uplink grant; and  2> if there is no overlapping PUCCH resource with an SR transmission which was not already de-prioritized and the priority of the logical channel that triggered the SR is higher than the priority of the uplink grant; and  2> if there is no overlapping PUSCH duration addressed to Temporary C-RNTI or received in a Random Access Response (i.e. in a MAC RAR or a fallback RAR) or is determined as specified in clause 5.1.2a for MSGA payload, which was not already de-prioritized and was chosen for transmission, in the same BWP:  3> consider this uplink grant as a prioritized uplink grant;  3> consider the other overlapping uplink grant(s), if any, as a de-prioritized uplink grant(s);  3> consider the other overlapping SR transmission(s), if any, as a de-prioritized SR transmission(s). |

**Option 1B (R2-2101005, Samsung, Ericsson, ZTE, Nokia, CATT, Huawei, HiSilicon): Consider uplink grant received in RAR or addressed to Temporary C-RNTI as a prioritized uplink grant.**

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| When the MAC entity is configured with *lch-basedPrioritization*, for each uplink grant whose associated PUSCH can be transmitted by lower layers, the MAC entity shall:  1> if this uplink grant is received in a Random Access Response (i.e. in a MAC RAR or fallback RAR), or addressed to Temporary C-RNTI, or is determined as specified in clause 5.1.2a for the transmission of the MSGA payload:  2> consider this uplink grant as a prioritized uplink grant.  1> else if this uplink grant is addressed to CS-RNTI with NDI = 1 or C-RNTI:  2> if there is no overlapping PUSCH duration of a configured uplink grant which was not already de-prioritized, in the same BWP whose priority is higher than the priority of the uplink grant; and  2> if there is no overlapping PUCCH resource with an SR transmission which was not already de-prioritized and the priority of the logical channel that triggered the SR is higher than the priority of the uplink grant:  3> consider this uplink grant as a prioritized uplink grant;  3> consider the other overlapping uplink grant(s), if any, as a de-prioritized uplink grant(s);  3> consider the other overlapping SR transmission(s), if any, as a de-prioritized SR transmission(s). |

**Option 2A (R2-2100890, OPPO): Not ignore the uplink grant received in RAR or addressed to Temporary C-RNTI or MSGA payload**

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| 3> else if the MAC entity is not configured with *lch-basedPrioritization*; or  3> if this uplink grant is a prioritized uplink grant; or  3> if this uplink grant is received in a Random Access Response (i.e. in a MAC RAR or a fallback RAR); or  3> if this uplink grant is determined as specified in clause 5.1.2a for the transmission of the MSGA payload:  4> obtain the MAC PDU to transmit from the Multiplexing and assembly entity, if any;  **…**  3> if the MAC entity is configured with *lch-basedPrioritization* and this uplink grant is neither addressed to Temporary C-RNTI nor a prioritized uplink grant:  4> ignore the uplink grant. |

**Option 2B (R2-2101004, Samsung, Ericsson, ZTE, Nokia, Huawei, HiSilicon): Not ignore the uplink grant received in RAR or addressed to Temporary C-RNTI**

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| 3> else if the MAC entity is not configured with *lch-basedPrioritization*; or  3> if this uplink grant is received in a Random Access Response; or  3> if this uplink grant is determined as specified in clause 5.1.2a for the transmission of the MSGA payload; or  3> if this uplink grant is a prioritized uplink grant:  4> obtain the MAC PDU to transmit from the Multiplexing and assembly entity, if any;  **…**  3> if the MAC entity is configured with *lch-basedPrioritization* and this uplink grant is not addressed to Temporary C-RNTI and this uplink grant is not a prioritized uplink grant:  4> ignore the uplink grant. |

**Option 3 (R2-2101511, LG): Specify that the UL grant not de-prioritized by the *lch-basedPrioritization* is considered to be prioritized UL grant.**

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| For the MAC entity configured with *lch-basedPrioritization*, priority of an uplink grant is determined by the highest priority among priorities of the logical channels that are multiplexed (i.e. the MAC PDU to transmit is already stored in the HARQ buffer) or have data available that can be multiplexed (i.e. the MAC PDU to transmit is not stored in the HARQ buffer) in the MAC PDU, according to the mapping restrictions as described in clause 5.4.3.1.2. The priority of an uplink grant for which no data for logical channels is multiplexed or can be multiplexed in the MAC PDU is lower than either the priority of an uplink grant for which data for any logical channels is multiplexed or can be multiplexed in the MAC PDU or the priority of the logical channel triggering an SR.  For the MAC entity configured with *lch-basedPrioritization*, the UE shall consider an uplink grant as a prioritized uplink grant, unless otherwise specified.  For the MAC entity configured with *lch-basedPrioritization*, if the corresponding PUSCH transmission of a configured uplink grant is cancelled by CI-RNTI as specified in clause 11.2A of TS 38.213 [6] or cancelled by a high PHY-priority PUCCH transmission as specified in clause 9 of TS 38.213 [6], this configured uplink grant is considered as a de-prioritized uplink grant. If this deprioritized uplink grant is configured with *autonomousTx*, the *configuredGrantTimer* for the corresponding HARQ process of this de-prioritized uplink grant shall be stopped if it is running. |

**Q2) Which options do companies agree/prefer to resolve the issue?** Note that the exact TP can be further discussed after we agree the direction of change.

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| **Company** | **Options** | **Comment, if any** |
| Nokia | 1B or 2B | Option 1B/2B seem to be simpler and more clear. |
| LG | 3 (first) or 1B (second) | Option 3 is simplest and more future proof.  Option 1B is similar to Option 3, the difference being explicit list of UL grant related to Random Access. Thus, our second preference is Option 1B. |
| ZTE | 2B | Option 2B is clear and fine to us. |
| Ericsson | 1B or 2B | Both Option 1B and 2B are fine. Slightly prefer 1B, as logically it is easier to follow: for any grant de-prioritized or has no status on whether prioritized or de-prioritized (e.g., grant cannot be transmitted by lower layers), no data is multiplexed on that grant. 2B would introduce an exception rule for the RAR |
| CATT | 1B | We don’t like 2B because it treats the TC-RNTI and RAR grants as special cases in 5.4.2.1 because they are neither tagged in 5.4.1 as prioritized or deprioritized, although it is the common understanding that they are prioritized, hence it is much clearer to capture it explicitly. |
| OPPO | 1A or 2A | Regarding 1A and 1B, the gap is that 1A also considers to avoid the case that both RA grant and DG are considered in grant prioritization procedure. In our understanding, for DG vs. RA grant, it is not clear or no strict restriction whether only one grant is valid and chosen in the procedure of grant prioritization, since Note3 is just the high-level instruction. Without the explicit restriction as we do in 1A, it might exist that both collided grants are flagged as prioritized ones, and/or, another MAC PDU is redundantly generated. To be known that, the restriction is explicitly specified for CG vs. RA grant case. So, we prefer to explicit clarify that only one grant is chosen and valid in the procedure of MAC PDU generation or grant prioritization, when facing the collision between DG and RA grant.  Regarding 2A and 2B, there is no much difference. |
| Xiaomi | 1B | 1B and 2B are both acceptable to us. However 1B seems to be clearer as it is still not clearer whether the TC-RNTI or RAR grant is prioritized in 2B. |
| Lenovo | 1B/2B | Slight preference for 1B |
| Samsung | 1B/2B | Slight preference for 1B. |
| MediaTek | 1B | Prefer option 1B for the same reasons as Ericsson, i.e. that it is logically easier to follow. |
| Sony | 1B | Preference for 1B |
| Huawei | 1B or 2B | We support 1B and 2B, slightly prefer 2B as it only deals with the issue directly without introducing a new prioritization rule regarding RAR, which has been outside of “lch-basedPrioritization” from the beginning. |
| Futurewei | 1B or 2B | Both are fine to us. |
| Sharp | 1B | We slightly prefer 1B. |
| Intel | 1B | We think 1B is clearer. |
| Apple | 1B | It’s simple and clear to indicate that the UL grant from RAR or addressed by T-C-RNTI should be prioritized.  But we have one **question** for clarification:  For the CFRA, the UL grant from RAR can be regarded as the dedicated UL grant. And do we still need to prioritize this UL grant? |
| Fujitsu | 1B | 1B is clear among all options |
| Qualcomm | 1B | 1B is the most direct way to address the spec gap. |
| Sequans | 1B | It seems the clearest option |

## 2.3 Explicit discard of UL grants colliding with UL grants in RAR

Any CG overlapping with uplink grant received in a RAR or addressed to TC-RNTI or with a MSGA is expected to be discarded by filtering out the CG. A DG verlapping with uplink grant received in a RAR or addressed to TC-RNTI or with a MSGA may be discarded or chosen for transmission by UE implementation. In Rel-16, this procedure makes the MAC entity not participate in LCH-based prioritization for those discarded (i.e. not chosen, ignored) uplink grant. R2-2100219 (CATT) pointed out that it is not clear if and how UL grants filtered in the legacy procedure text of the UL Grant reception procedure do or do not participate to the later prioritization procedure text, and proposed to clarify as follows:

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| For each Serving Cell and each configured uplink grant, if configured and activated, the MAC entity shall:  1> if the MAC entity is configured with *lch-basedPrioritization*, and the PUSCH duration of the configured uplink grant does not overlap with the PUSCH duration of an uplink grant received in a Random Access Response or with the PUSCH duration of an uplink grant addressed to Temporary C-RNTI or the PUSCH duration of a MSGA payload for this Serving Cell; or  1> if the MAC entity is not configured with *lch-basedPrioritization*, and the PUSCH duration of the configured uplink grant does not overlap with the PUSCH duration of an uplink grant received on the PDCCH or in a Random Access Response or the PUSCH duration of a MSGA payload for this Serving Cell:  2> set the HARQ Process ID to the HARQ Process ID associated with this PUSCH duration;  2> if, for the corresponding HARQ process, the *configuredGrantTimer* is not running and *cg-RetransmissionTimer* is not configured (i.e. new transmission):  …  1> else:  2> ignore the uplink grant; |
| NOTE 3: If the MAC entity receives a grant in a Random Access Response (i.e. MAC RAR or fallbackRAR) or determines a grant as specified in clause 5.1.2a for MSGA payload and if the MAC entity also receives an overlapping grant for its C-RNTI or CS-RNTI, requiring concurrent transmissions on the SpCell, the MAC entity may choose to continue with either the grant for its RA-RNTI/MSGB-RNTI/the MSGA payload transmission or the grant for its C-RNTI or CS-RNTI. The chosen uplink grant and the associated HARQ information are delivered to the HARQ entity and the other uplink grant is ignored. |

R2-2100890 (OPPO) proposed similar proposal for NOTE 3 as follows:

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| NOTE 3: If the MAC entity receives a grant in a Random Access Response (i.e. MAC RAR or fallbackRAR) or determines a grant as specified in clause 5.1.2a for MSGA payload and if the MAC entity also receives an overlapping grant for its C-RNTI or CS-RNTI, requiring concurrent transmissions on the SpCell, the MAC entity may choose to continue with either the grant for its RA-RNTI/MSGB-RNTI/the MSGA payload transmission or the grant for its C-RNTI or CS-RNTI. The not chosen uplink grant and the associated HARQ information are not delivered to the HARQ entity. |

**Q3) Do companies agree the proposed change of CR R2-2100219 (both ignoring uplink grant and NOTE3) and R2-2100890 (NOTE3)?** Note that the exact TP can be further discussed after we agree the reason for the change.

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| **Company** | **Yes/No** | **Comment, if any** |
| Nokia | No | We don’t think further clarification is needed for this issue. |
| LG | No | Once we agree on solution for Q2, further clarification is not needed. |
| ZTE | No | There is no need to have a further clarification |
| Ericsson | No strong view | It seems that there is a risk of misunderstanding for others who do not follow this discussion closely. There was also a concern that the change is more related with the Rel-15 legacy text. Ericsson has another candidate proposal and wonder if would be an okay compromise.  When the MAC entity is configured with *lch-basedPrioritization*, for each uplink grant whose associated PUSCH can be transmitted by lower layers and that is delivered to the HARQ entity, the MAC entity shall: |
| CATT | Yes | We think it is worth clarifying that the CGs filtered out in the upper part of 5.4.1 due to overlap with RAR grant/TC-RNTI grant/MSGA do not participate to the intra-UE prioritization procedure in the lower part of 5.4.1. The Ericsson’s alternate proposal is more generic and covers any grant that would be filtered before the intra-UE prioritization procedure. It may need some careful checking but could actually do the job properly. |
| OPPO | Yes | As we understood and commented for Q2, the clarification is needed, otherwise misunderstanding or redundant behaviour will exist. Regarding Ericsson’s proposal, we think it might be too generic to reflect our intention. |
| Xiaomi |  | We have no strong preference. It seems very obvious that the grant which is not chosen is not delivered to the HARQ entity. |
| Lenovo | NO strong view | In our understanding there is little chance of misunderstanding. However if majority prefers to further clarify this would be OK with us. |
| Samsung | NO strong view | Agree with Lenovo |
| MediaTek | No | Once we’ve chosen a solution for Q2, there is little chance of misunderstanding expected UE behaviour. |
| Sony | No | Agree with MediaTek. |
| Huawei | Maybe | Clarification on Note 3 could be useful to avoid confusion in the future. Don’t think changes on procedural texts are needed, considering we can agree on something for Q2. |
| Futurewei |  | no strong preference. |
| Sharp | No | We do not think a further clarification is needed. |
| Intel | No | No need for further clarification. |
| Apple | No | We donot think the further clarification is needed. |
| Fujitsu | No | Text for Q2 is enough. |
| Qualcomm | No | Current spec is clear enough. |
| Sequans | Yes | We are ok to clarify given the complexity of this topic. |

## 2.4 Note on “PUSCH can be transmitted by lower layers”

R2-2100714 (Nokia, Nokia Shanghai Bell) pointed out that a condition “PUSCH can be transmitted by lower layers” is unclear, specifically how MAC can evaluate whether PUSCH of a grant can be transmitted or not. This requires some interaction with PHY, but it may not be clearly written. Thus the following note is proposed.

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| NOTE 8: The MAC entity determines whether PUSCH associated to an uplink grant can be transmitted by lower layers or not based on interactions with the lower layers. |

**Q4) Do companies agree CR R2-2100714 to add a NOTE?** Note that the exact TP can be further discussed after we agree the reason for the change.

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| **Company** | **Yes/No** | **Comment, if any** |
| Nokia | Yes | We don’t have a strong view about the exact wording, but we just want to clarify that it is up to UE implementation for the MAC to know whether PUSCH of a grant can be transmitted or not.  Determining whether a PUSCH can be transmitted by PHY is a crucial step at MAC to proceed LCH-based prioritization, but the essence of this step is quite vague in current specifications. Hence we think we can have a NOTE to at least provide some hints about how this can be done. |
| LG | No | MAC has to interact closely with PHY, not only for LCH-based prioritization but also for all MAC procedures. It is clear even without the NOTE that MAC should interact with PHY. |
| ZTE | No | Capture a note which is to regulate the UE inside behavior seems not regular manner in MAC spec. |
| Ericsson | No | The reason to answer “no” is that it is not easy to formulate a precise clarification.  It is my understanding that for CG/DG case, once a transmission is started, then it is not possible to cancel. For these, there might be cancellation timelines discussed and defined in RAN1. For CG/CG case, it is up-to UE implementation.  The ideal change would be to add the reference to RAN1 specs in which there are clearer rules, and with the understanding that for other cases, it is up to UE implementation. |
| CATT | No | We don’t think this NOTE is useful. There are many other such PHY/MAC interactions in 38.321 and they are implicitly left to UE implementation. |
| OPPO | No | Usually, there is no need to mention UE inside behavior in MAC spec. |
| Xiaomi | No | We don’t usually capture the interaction between MAC and PHY. |
| Lenovo | No |  |
| Samsung | No | It’s still unclear how and which interaction is needed. We think it would be better to leave as it is, instead of specifying the detail. |
| MediaTek | No | We do not need to specify anything here as this internal signalling within the UE. |
| Sony | No | No need for a note. |
| Huawei | No | Don’t think a Note will bring clarification for this matter. |
| Futurewei | No | It is self-evident that interactions with lower layers are required to determine whether something “can be transmitted by lower layers”. But, if we don’t plan to specify those interactions, then this note doesn’t add much clarity. |
| Sharp | No | We think the condition “PUSCH can be transmitted by lower layers” already hints that MAC should interact with PHY. |
| Intel | No | MAC layer needs to closely interact with PHY for many functionalities and we don’t think clarification is needed. |
| Apple | No | It’s up to UE implementation and we donot need to indicate it in the spec. |
| Fujitsu | No | It is so called primitive, which should not be mentioned in general. |
| Qualcomm | No | UE internal modelling need not be over-specified. |
| Sequans | Yes | We agree with the intention as the condition “PUSCH can be transmitted by lower layers” is indeed not very clear even though crucial for correct implementation. |

# 3 Phase-1 Conclusion

# 4 Phase-2