**3GPP TSG-RAN WG1 Meeting #101 R1-200xxxx**

**e-meeting, May 25th – June 5th, 2020**

**Agenda Item: 7.2.1**

**Source: Moderator (ZTE)**

**Title: Text proposal on the alignment of RAR terminology**

**Document for: Discussion**

# Introduction

The following has been agreed by the first phase email discussion.

**Conclusion:**

* Separate the terminologies for RAR UL grant and fallbackRAR/successRAR UL grant in 38.213.
* Continue the discussion on the detailed TP based on TP#1c, to check if there are other places in 38.213 mentioning the RAR UL grant need to be modified.

TP for the above conclusion till 6/3

Apart from the original TP#1c in R1-2004836, two more places of “RAR UL grant” in section 4.2 and section 8 of 38.213 has been revised.

In addition, it seems there is no need to mention fallbackRAR in section 8.3 and 8.4, given the clarification in section 8.2A as follows:

- an uplink grant if the RAR message(s) is for fallbackRAR and a random access preamble identity (RAPID) associated with the PRACH transmission is identified, and the UE procedure continues as described in Clause 8.2 when the UE detects a RAR UL grant, or

- transmission of a PUCCH with HARQ-ACK information having ACK value if the RAR message(s) is for successRAR, where

…

# TP for the terminology of RAR UL grant

## Information for the cover page

**Reasons for change**

To align the terminologies for RAR UL grant and fallbackRAR/successRAR UL grant.

**Summary of changes**

Implement the above updates

**Specs/Sections impacted**

TS 38.213, Section 4.2, Section 8, and Section 11.1.

TS 38.214, Section 6.1.2.1

## Text proposal

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| ------------------------------------------**Text proposal starts for TS 38.213**----------------------------------------4.2 Transmission timing adjustments<Unchanged Text Omitted>For a timing advance command received on uplink slot  and for a transmission other than a PUSCH scheduled by a RAR UL grant or a fallbackRAR UL grant as described in Clause 8.2A or 8.3, or a PUCCH with HARQ-ACK information in response to a successRAR as described in Clause 8.2A, the corresponding adjustment of the uplink transmission timing applies from the beginning of uplink slot  where ,  is a time duration in msec of  symbols corresponding to a PDSCH processing time for UE processing capability 1 when additional PDSCH DM-RS is configured,  is a time duration in msec of  symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214],  is the maximum timing advance value in msec that can be provided by a TA command field of 12 bits,  is the number of slots per subframe, and  is the subframe duration of 1 msec.  and  are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG and of all configured DL BWPs for the corresponding downlink carriers. For , the UE assumes  [6, TS 38.214]. Slot  and  are determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG.  is determined with respect to the minimum SCS among the SCSs of all configured UL BWPs for all uplink carriers in the TAG and for all configured initial UL BWPs provided by *initialUplinkBWP*. The uplink slot  is the last slot among uplink slot(s) overlapping with the slot(s) of PDSCH reception assuming $T\_{TA}=0$, where the PDSCH provides the timing advance command and $T\_{TA}$ is defined in [4, TS 38.211].<Unchanged Text Omitted>8 Random access procedure<Unchanged Text Omitted>From the physical layer perspective, the Type-1 L1 random access procedure includes the transmission of random access preamble (Msg1) in a PRACH, random access response (RAR) message with a PDCCH/PDSCH (Msg2), and when applicable, the transmission of a PUSCH scheduled by a RAR UL grant, and PDSCH for contention resolution.From the physical layer perspective, the Type-2 L1 random access procedure includes the transmission of random access preamble in a PRACH and of a PUSCH (MsgA) and the reception of a RAR message with a PDCCH/PDSCH (MsgB), and when applicable, the transmission of a PUSCH scheduled by a fallbackRAR~~RAR~~ UL grant, and PDSCH for contention resolution.<Unchanged Text Omitted>8.2A Random access response – Type-2 random access procedure<Unchanged Text Omitted>If the UE detects the DCI format 1\_0, with CRC scrambled by the corresponding MsgB-RNTI, and a transport block in a corresponding PDSCH within the window, the UE passes the transport block to higher layers. The higher layers indicate to the physical layer- an uplink grant if the RAR message(s) is for fallbackRAR and a random access preamble identity (RAPID) associated with the PRACH transmission is identified, and the UE procedure continues as described in Clause 8.2, 8.3 and 8.4 when the UE detects a RAR UL grant, or<Unchanged Text Omitted>11.1 Slot configuration<Unchanged Text Omitted>If a UE is not configured to monitor PDCCH for DCI format 2\_0, for a set of symbols of a slot that are indicated as flexible by *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated* if provided, or when *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated* are not provided to the UE- the UE receives PDSCH or CSI-RS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format- the UE transmits PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format, ~~or~~ a RAR UL grant, fallbackRAR UL grant, or successRAR<Unchanged Text Omitted>11.1.1 UE procedure for determining slot format<Unchanged Text Omitted>For a set of symbols of a slot, a UE does not expect to detect a DCI format 2\_0 with an SFI-index field value indicating the set of symbols in the slot as downlink and to detect a DCI format 0\_0, DCI format 0\_1, DCI format 1\_0, DCI format 1\_1, DCI format 2\_3, ~~or~~ a RAR UL grant, fallbackRAR UL grant, or successRAR indicating to the UE to transmit PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot. <Unchanged Text Omitted>For a set of symbols of a slot indicated to a UE as flexible by *tdd-UL-DL-ConfigurationCommon* and *tdd-UL-DL-ConfigurationDedicated* if provided, or when *tdd-UL-DL-ConfigurationCommon* and *tdd-UL-DL-ConfigurationDedicated* are not provided to the UE, and if the UE detects a DCI format 2\_0 providing a format for the slot using a slot format value other than 255- if one or more symbols from the set of symbols are symbols in a CORESET configured to the UE for PDCCH monitoring, the UE receives PDCCH in the CORESET only if an SFI-index field value in DCI format 2\_0 indicates that the one or more symbols are downlink symbols- if an SFI-index field value in DCI format 2\_0 indicates the set of symbols of the slot as flexible and the UE detects a DCI format indicating to the UE to receive PDSCH or CSI-RS in the set of symbols of the slot, the UE receives PDSCH or CSI-RS in the set of symbols of the slot- if an SFI-index field value in DCI format 2\_0 indicates the set of symbols of the slot as flexible and the UE detects a DCI format , ~~or~~ a RAR UL grant, fallbackRAR UL grant, or successRAR indicating to the UE to transmit PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot the UE transmits the PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot- if an SFI-index field value in DCI format 2\_0 indicates the set of symbols of the slot as flexible, and the UE does not detect a DCI format indicating to the UE to receive PDSCH or CSI-RS, or the UE does not detect a DCI format, ~~or~~ a RAR UL grant, fallbackRAR UL grant, or successRAR indicating to the UE to transmit PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot, the UE does not transmit or receive in the set of symbols of the slot- if the UE is configured by higher layers to receive PDSCH or CSI-RS in the set of symbols of the slot, the UE receives the PDSCH or the CSI-RS in the set of symbols of the slot only if an SFI-index field value in DCI format 2\_0 indicates the set of symbols of the slot as downlink- if the UE is configured by higher layers to receive DL PRS in the set of symbols of the slot, the UE receives the DL PRS in the set of symbols of the slot only if an SFI-index field value in DCI format 2\_0 indicates the set of symbols of the slot as downlink or flexible.- if the UE is configured by higher layers to transmit PUCCH, or PUSCH, or PRACH in the set of symbols of the slot, the UE transmits the PUCCH, or the PUSCH, or the PRACH in the slot only if an SFI-index field value in DCI format 2\_0 indicates the set of symbols of the slot as uplink- if the UE is configured by higher layers to transmit SRS in the set of symbols of the slot, the UE transmits the SRS only in a subset of symbols from the set of symbols of the slot indicated as uplink symbols by an SFI-index field value in DCI format 2\_0- a UE does not expect to detect an SFI-index field value in DCI format 2\_0 indicating the set of symbols of the slot as downlink and also detect a DCI format, ~~or~~ a RAR UL grant, fallbackRAR UL grant, or successRAR indicating to the UE to transmit SRS, PUSCH, PUCCH, or PRACH, in one or more symbols from the set of symbols of the slot<Unchanged Text Omitted>For a set of symbols of a slot that are indicated as flexible by *tdd-UL-DL-ConfigurationCommon*, and *tdd-UL-DL-ConfigurationDedicated* if provided, or when *tdd-UL-DL-ConfigurationCommon*, and *tdd-UL-DL-ConfigurationDedicated* are not provided to the UE, and if the UE does not detect a DCI format 2\_0 providing a slot format for the slot- the UE receives PDSCH or CSI-RS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format- the UE transmits PUSCH, PUCCH, PRACH, or SRS in the set of symbols of the slot if the UE receives a corresponding indication by a DCI format, ~~or~~ a RAR UL grant, fallbackRAR UL grant, or successRAR- the UE receives PDCCH as described in Clause 10.1<Unchanged Text Omitted>------------------------------------------**Text proposal ends for TS 38.213**---------------------------------------- |

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| ------------------------------------------**Text proposal starts for TS 38.214**----------------------------------------6.1.2.1 Resource allocation in time domain<Unchanged Text Omitted>When the UE configured with [*minimumSchedulingOffset*] in active UL BWP it applies a minimum scheduling offset restriction indicated by the ['Minimum applicable scheduling offset indicator'] field in DCI format 0\_1 or 1\_1. When the UE configured with [*minimumSchedulingOffset*] in active UL BWP and it has not received ['Minimum applicable scheduling offset indicator'] field in DCI format 0\_1 or 1\_1, the UE shall apply a minimum scheduling offset restriction indicated based on ['Minimum applicable scheduling offset indicator'] value '0'. When the *minimum scheduling offset restriction* is applied the UE is not expected to be scheduled with a DCI in slot *n* to transmit a PUSCH scheduled with C-RNTI, CS-RNTI or MCS-C-RNTI with *K*2 smaller than the applicable minimum scheduling offset restriction *K*2min in slot *n*. The minimum scheduling restriction is not applied when PUSCH transmission is scheduled by RAR UL grant or falbbackRAR UL grant for RACH procedure, or when PUSCH is scheduled with TC-RNTI. The application delay of the change of the minimum scheduling offset restriction is determined in Clause 5.3.1.<Unchanged Text Omitted>------------------------------------------**Text proposal ends for TS 38.214**---------------------------------------- |

Any comments?

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| Company | Comment |
| CATT | For 38.213, we need consider below sections should be changed.1. 8.2ARandom access response - Type-2 random access procedure

an uplink grant if the RAR message(s) is for fallbackRAR and a random access preamble identity (RAPID) associated with the PRACH transmission is identified, and the UE procedure continues as described in Clause 8.2 when the UE detects a RAR UL grant, orWe need have common understanding on that fallbackRAR and RAR UL grant are equivalent in section 8.2, 8.3 &8.41. 7.1.1 UE behaviour

If a UE established dedicated RRC connection using a Type-1 random access procedure, as described in Clause 8, and is not provided *P0-PUSCH-AlphaSet* or for a PUSCH transmission scheduled by a RAR UL grant as described in Clause 8.3,1. 9.2.1 PUCCH Resource Sets

The UE transmits the PUCCH using the same spatial domain transmission filter as for a PUSCH transmission scheduled by a RAR UL grant as described in Clause 8.3.For 38.214, only 1 place need be considered for changing.1. 6.1.2.1 Resource allocation in time domain

The minimum scheduling restriction is not applied when PUSCH transmission is scheduled by RAR UL grant for RACH procedure, or when PUSCH is scheduled with TC-RNTI. |
| Moderator (ZTE) | To address CATT’s comment 1~3, I think we can do the following in section 8.2A, and leave 8.3 and 8.4 unchanged.an uplink grant if the RAR message(s) is for fallbackRAR and a random access preamble identity (RAPID) associated with the PRACH transmission is identified, and the UE procedure continues as described in Clause 8.2, 8.3 and 8.4 when the UE detects a RAR UL grant, orOne TP for 38.214 is added according to comment 4. |

# Appendix

Companies’ views for the issue in the first phase email discussion.

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| Company | Alt.1 or Alt.2? And which TP is preferred? | Comments |
| Samsung | Alt.1TP#1c | It is true that the structure of RAR and fallback RAR is the same, however, since the concept of fallback RAR and successful RAR is new to 2step RACH, which is not multiplexed with RAR (in 4step RACH); we think it’s better the keep them separately.And TP#1c is preferred. |
| CATT | Alt.2 TP#1b | Because Alt.2 TP#1b can resolve misalignment of terminology for RAR between TS 38.213 and TS 38.214 and spec change for Alt. TP#1b is less than that for Alt.1.In addition, we suggest adding the word “success RAR” to section 11.1 in 38.213 in order to make spec more complete in Alt.2 TP#1b.Regarding TP#1b in 7.1.1.1, 38.213, we add “type-2 random access procedure” to judgment condition in order to apply PUSCH power control methodology related to TP in 7.1.1.1 for fallback case of 2-step RACH. |
| Ericsson | Alt.2 | No strong view, but since RAR UL grant is the same in msg2 and MsgB for fallback for scheduling msg3 which may be more reasonable to not separate them. Success RAR should be treated separately which only schedules PUCCH for MsgB ACK feedback. So, we slightly prefer alt2. |
| Intel | Alt. 1 TP#1c | In our view, it would be good to follow 214 for RAR terminology to make the spec clear. In this case, “RAR UL grant” can be updated to “RAR UL grant, fallbackRAR UL grant, or successRAR” |
| Spreadtrum | Alt. 1 TP#1c | Shared view as Samsung. In 38.321, it is described that Random Access Response (i.e. MAC RAR or fallbackRAR), it is better to keep them seperately. |
| OPPO | TP#1b | 1b is more concise. All these RARs including legacy RAR, fallback RAR, successful RAR are RAR. |
| NTT DOCOMO | Alt. 2 TP#1d | In 38.321, it is described that “if the uplink grant was received in a Random Access Response (i.e. in a MAC RAR or a fallback RAR)”. In our understanding, this means “RAR UL grant” includes both RAR UL grant for Type-1 random access procedure and fallback RAR UL grant for Type-2 random access procedure. On the other hand, success RAR does not have UL grant, and it is not included. We think that it would be good to have this clarification for the terminology of “RAR UL grant” in the spec. Thus, we prefer Alt. 2 TP#1d. |
| Nokia | Alt 1, TP#1c | It is more clear to have explicit mentioning of the two new response messages for the cases/situations where they are needed. This would leave no room for misunderstanding. |
| Apple | Alt1, TP#1c | Separating the UL grant and fallback RAR UL grant is clearer and no confusion, and it’s aligned with the spec 38.214 and 38.321. |
| Qualcomm | Alt 2 | RAN2 has decided to use the same RAR grant format for msg2 and fallback scenario of 2-step RACH. There is no need to introduce extra terminology to serve the same purpose. |
| Moderator(ZTE) |  | Alt.1 is supported by 5 companies, and all supporting companies prefer TP#1c;Alt.2 is supported by 5 companies, 2 companies prefer TP#1b, 1 company prefers TP#1d, and 2 companies did not mention the preference on the TPs.To my understanding, this is an editorial issue to make the terminology consistent among different RAN1 specs, and thus adopting either alternative will not have fundamental changes on the specification.So maybe we can collect views on the other way, i.e. is there any strong objection to either of the alternatives?If not, my preference is to adopt Alt.1, as it seems easier to converge on TP#1c. |
| CATT |  | In principal, we are fine with these two alternatives. But we need completed proposal on changing all of places on The terminology “RAR UL grant” for both alternatives.If we go to Alt1 with TP#1c, only section 11.1 in 38.213 is changed.Regarding Alt.1, TP#1c is incomplete proposal because total 28 places in the whole spec 38213 address ‘RAR UL grant’. Some places on ‘‘RAR UL grant’ in 38.213 need also be modified because RAR UL grant can’t include fallback RAR based on Alt.1For example:1. For Section 8.3 and section 8.4, fallback RAR procedure on 2s RACH will use these 2 sections, whether we need add fallback RAR to the corresponding places with RAR UL grant section 8.3 and section 8.4 or not?
2. Regarding 2sRACH general description in section 8 as below

From the physical layer perspective, the Type-2 L1 random access procedure includes the transmission of random access preamble in a PRACH and of a PUSCH (MsgA) and the reception of a RAR message with a PDCCH/PDSCH (MsgB), and when applicable, the transmission of a PUSCH scheduled by a RAR UL grant, and PDSCH for contention resolution From the physical layer perspective, the Type-2 L1 random access procedure includes the transmission of random access preamble in a PRACH and of a PUSCH (MsgA) and the reception of a RAR message with a PDCCH/PDSCH (MsgB), and when applicable, the transmission of a PUSCH scheduled by a RAR UL grant, and PDSCH for contention resolution. Whether we need change a RAR UL grant to fallback RAR?1. For 4.2 Transmission timing adjustments in 38.213,

For a timing advance command received on uplink slot  and for a transmission other than a PUSCH scheduled by a RAR UL grant as described in Clause 8.2A or 8.3, or a PUCCH with HARQ-ACK information in response to a successRAR as described in Clause 8.2A,7.1.1 UE behavior, If a UE established dedicated RRC connection using a Type-1 random access procedure, as described in Clause 8, and is not provided *P0-PUSCH-AlphaSet* or for a PUSCH transmission scheduled by a RAR UL grant as described in Clause 8.3,….For Alt.1, if a complete proposal is offered and both spec 38.213 and 38.214 can be considered, we agree with it.Regarding TP#1b in Alt2, we offer to complete proposal on RAR UL grant for both 38.213 and 38.214. |
| Intel |  | We support Alt. 1 and TP#1c. To CATT, we also think different alternatives would work, as it is for the RAR terminology alignment. But looking at TP#1b, it seems the updates are not trivial as this also tries to remove the all the fallbackRAR UL grant in 214. In our view, this makes the spec at least in 214 less readable. In addition, we noticed that some texts in 4.2 and 7.1.1 are also updated, which needs more careful assessment and more discussion. For the text in Section 8 as you mentioned, we are open to discuss whether we also need to include fallbackRAR UL grant. Again, we’d like to make the spec more clear and less confusion for the support of 2-step RACH. We do not think it is a good practice to simply remove fallbackRAR in all places.  |
| Samsung  |  | Agree with moderator’s proposal.And in response to comments from CATT, yes, if there is other place to check the need of adding fallbackRAR, we can do it. The critia is easy, if that part is for 4step RACH only, we don’t need to add; otherwise, we can add. We can figure out TP in next step (week), I think. |