

3GPP TSG-RAN WG2 #63
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R2-084387

Agenda Item : 6.1.1.4
Source : LG Electronics Inc.
Title : Handling of Received UL Grant in RA procedure
Document for : Discussion and Decision

1 Discussion

Regarding handling of a received UL grant during a random access procedure, a couple of notes in the current specification [1] are inserted as follows.

- NOTE: When an uplink transmission is required, e.g., for contention resolution, the eNB should not provide a grant smaller than 80 bits in the Random Access Response.
- NOTE: If within a Random Access procedure, an uplink grant provided in the Random Access Response for the same group of Random Access Preambles has a different size than the first uplink grant allocated during that Random Access procedure, the UE behavior is not defined.
- NOTE: If the UE receives both a grant for its RA-RNTI and a grant for its C-RNTI, the UE may choose to continue with either the grant for its RA-RNTI or the grant for its C-RNTI.

And following text in [1] states the current UL HARQ operation.

At the given TTI, the HARQ entity shall:

- if an uplink grant indicating that the NDI has been incremented compared to the value in the previous transmission of this HARQ process is indicated for this TTI or if this is the very first transmission for this HARQ process (i.e. a new transmission takes place for this HARQ process):
 - if there is an ongoing Random Access procedure and there is a MAC PDU in the [Message3] buffer:
 - obtain the MAC PDU to transmit from the [Message3] buffer.
 - else, if the "uplink prioritisation" entity indicates the need for a new transmission:
 - obtain the MAC PDU to transmit from the "Multiplexing and assembly" entity;
 - instruct the HARQ process corresponding to this TTI to trigger a new transmission using the identified parameters.
 - else:
 - flush the HARQ buffer.
- else, if an uplink grant, indicating that the NDI is identical to the value in the previous transmission of this HARQ process (i.e. a retransmission takes place for this HARQ process), is indicated for this TTI:
 - instruct the HARQ process to generate an adaptive retransmission.

- else, if the HARQ buffer of the HARQ process corresponding to this TTI is not empty:
- instruct the HARQ process to generate a non-adaptive retransmission.

1.1 Selection between a grant for C-RNTI and a grant for RA-RNTI

It is our understanding that the above third note highlighted in yellow is relevant only before generating a MAC PDU for message 3 because the building the MAC PDU can be based on either a grant for a RA-RNTI or a grant for a C-RNTI. That is, the MAC PDU including BSR can be handled with either the grant for the RA-RNTI or the grant for the C-RNTI. However, once the MAC PDU is built and stored in [Message 3] buffer, it is not clear whether or not the UE can still choose between them when the UE is having the both grants. That is, while there is a MAC PDU in [Message 3] buffer, if a UE has a grant for its C-RNTI and a grant for its RA-RNTI, the current specification says that the UE can take one of them as the note highlighted in yellow. If the UE takes the grant for its C-RNTI, the current specification also says that the HARQ entity obtains the MAC PDU from the [Message 3] buffer and instructs the HARQ process to store it in HARQ buffer as the text highlighted in green. However, it is unlikely that the MAC PDU transmission is properly handled with the grant for the C-RNTI because the MAC PDU already was generated by not the grant for the C-RNTI but the grant for the RA-RNTI. Therefore, the selection should be allowed only before the building the MAC PDU for the message 3. Also, the MAC PDU in the [Message 3] buffer should be handled with only the grant for the RA-RNTI.

Proposal 1: It is proposed to modify the note like “if the UE receives both a grant for its RA-RNTI and a grant for its C-RNTI, and [Message 3] buffer is empty, the UE may choose to continue with either the grant for its RA-RNTI or the grant for its C-RNTI”.

Proposal 2: It is also proposed that only when an UL grant is indicated in a Random Access Response, the HARQ entity instructs the HARQ process to store a MAC PDU stored in [Message 3] buffer in HARQ buffer.

1.2 Handling of an UL grant addressed to a C-RNTI during RA

With proposal 1 and 2, during a RA procedure, when the UE receives a grant for its C-RNTI except for a purpose of contention resolution, we assume that the HARQ entity obtains a new MAC PDU from “Multiplexing and assembly” entity and the HARQ process starts to transmit it. However, the concern is whether or not we can allow to take an UL HARQ not related to the ongoing RA procedure and a Random Access procedure in parallel.

If taking both in parallel, there is a possibility that the time of the transmission upon the received grant is collided with the time of RA preamble transmission as depicted in figure 1. Although it is a rare case, we should not allow to happen it because such happening breaks a single carrier property of an uplink transmission. Then, we end up with falling in selection between the UL HARQ transmission and a RA preamble transmission. It would be complicated to implement it in MAC.

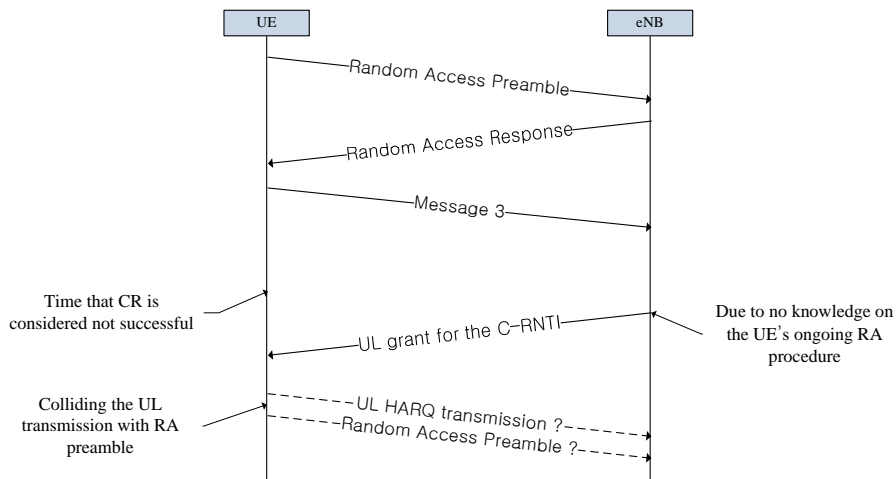


Figure 1

If we take only UL HARQ, it would mean that the ongoing RA procedure is cancelled. Then, the BSR in the MAC PDU in the [Message 3] buffer is lost. So, as long as a new BSR is not triggered, the UE would be stalling. Furthermore, currently, an endless RA attempt is supervised by RRC. So, if the ongoing RA procedure is cancelled by MAC itself, it would be complicated to implement it in both MAC and RRC.

Therefore, for simplicity, it is proposed to keep the ongoing RA procedure and ignore the received uplink grant for the C-RNTI. That is,

- If there is an ongoing RA procedure and there is a MAC PDU in [Message 3 buffer]; and
- If the Contention Resolution Timer is not running
 - When receiving a grant for its C-RNTI, the UE ignores the received UL grant for its C-RNTI.

Proposal 3: It is proposed that if there is an ongoing RA procedure, there is a MAC PDU in [Message 3 buffer] and the Contention Resolution Timer is not running, when receiving a grant for its C-RNTI, the UE ignores the received UL grant for its C-RNTI.

2 Conclusion

Proposal 1: It is proposed to modify the note like “if the UE receives both a grant for its RA-RNTI and a grant for its C-RNTI, and [Message 3] buffer is empty, the UE may choose to continue with either the grant for its RA-RNTI or the grant for its C-RNTI”.

Proposal 2: It is proposed that only when a new UL grant is indicated in a Random Access Response, the HARQ entity instructs the HARQ process to store a MAC PDU stored in [Message 3] buffer in HARQ buffer.

Proposal 3: It is proposed that if there is an ongoing RA procedure, there is a MAC PDU in [Message 3 buffer] and the Contention Resolution Timer is not running, when receiving a grant for its C-RNTI, the UE ignores the received UL grant for its C-RNTI.

The associated CR is provided in [2].

3 Reference

[1] 3GPP TS 36.321 V8.2.0

[2] R2-084388 Handling of Received UL Grant in RA procedure, LG Electronics Inc.