3GPP RAN WG2 Meeting #115e R2-2108896

eMeeting August 9th – 27th, 2021

Agenda Item: 8.10.2.2

Source: InterDigital (summary rapporteur)

Title: [DRAFT] Summary of [AT115-e][101][NTN] Other MAC aspects: Phase 2

Document for: Discussion, Decision

# Introduction

This document continues discussion on agenda item 8.10.2.2 – Other MAC aspects as per the following:

* [AT115-e][101][NTN] Other MAC aspects (InterDigital)

Updated Scope: Continue the discussion on p3 from R2-2108883 and to see if additional details based on company comments can be agreed:

* List of proposals for agreement (if any)
* List of proposals for further discussion
* List of proposals that should not be pursued (if any)

The following deadlines have been provided:

* Updated deadline (for companies' feedback): **Monday 2021-08-23 1600 UTC**
* Updated deadline (for rapporteur's summary in R2-2108896): **Monday 2021-08-23 2000 UTC**

The following guidance has been further provided by session chair:

*Proposals marked "for agreement" in R2-2108896 not challenged until Tuesday* ***2021-08-24 0800 UTC*** *will be declared as agreed via email by the session chair (for the rest the discussion might continue online during the CB session).*

A summary of phase 1 discussion may be found in [R2-2108883](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Inbox/R2-2108883.zip), and a summary of company contribution to RAN2#115e is provided in [R2-2109031](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Inbox/R2-2109031.zip). Companies are encouraged to review these document for relevant background.

# Continuation of P1A/P1B

## UL HARQ retransmission state: definition and indication

In Phase 1, the following was agreed regarding introduction/configuration of an UL HARQ retransmission state:

* For at least dynamic grants, the network may optionally configure an UL HARQ retransmission state per HARQ process. Two UL HARQ retransmission states are defined in NTN: HARQ state A and HARQ state B (FFS whether "HARQ state A" and "HARQ state B" should be renamed)
* HARQ state A/B are defined as follows:
* HARQ state A: length of drx-HARQ-RTT-TimerUL is extended by UE-gNB RTT (i.e. UE PDCCH monitoring is optimized to support UL retransmission grant based on UL decoding result).
* HARQ state B: drx-HARQ-RTT-TimerUL is not started.
* Configuration of UL HARQ retransmission state is semi-static, signalled via RRC, and the decision and criteria to configure UL HARQ retransmission state is under network control.
* If HARQ process has not been configured with an UL HARQ retransmission state, new LCH mapping rule has no effect (i.e. UE applies legacy behaviour).
* UE determines drx-HARQ-RTT-TimerUL behaviour per HARQ process based on configured UL HARQ retransmission state.
* For HARQ process(es) not configured with an UL HARQ retransmission state, drx-HARQ-RTT-TimerUL and drx-RetransmissionTimerUL behave as per legacy.

Although there was significant support for configuration of multiple UL HARQ retransmission states in Phase 1, there remains some divergence in the details of how each state should be defined. Due to this divergence, the following has been captured in chair notes:

* *Continue the discussion to see if additional details based on company comments can be agreed*

The following questions have been derived based on company comment to Phase 1:Q1 in an attempt to find further commonality in the definition of HARQ state A and HARQ state B.

**Question 1: What are the primary reasons for configuring an UL HARQ retransmission state? Companies may select one or more of the following:**

1. **Configure proper *drx-HARQ-RTT-TimerUL* behaviour.**
2. **Support new LCH mapping rule.**
3. **Restrict network scheduling behaviour (i.e. prevent network from scheduling according to one or more scheduling strategies).**
4. **Other, please describe.**

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| **Company** | **Supported Option(s)** | **Additional comments** |
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In Phase 1, it was proposed that HARQ state A and B be defined as “high reliability” and “low latency”. However, based on question response a majority of companies did not agree with this classification. Companies are therefore asked to identify the primary differentator of State A/B to help with definition/naming.

**Question 2: The primary differentiator of UL HARQ retransmission state A and B is:**

1. **Possible delay associated with UL retransmission grant reception.**
2. **Reliability.**
3. **Other, please describe.**

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| **Company** | **Supported Option(s)** | **Additional comments** |
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From response to Phase 1 Q3 there appears to be general understanding that UE shall always act as indicated in a grant/assignment regardless of whether an UL HARQ retransmission state is configured or not. However, an UL HARQ retransmission state may be better suited to support a subset of UL HARQ retransmission types, for example, by optimizing when UE is monitoring PDCCH.

Note: Q3/Q4 does NOT intend to restrict network scheduling strategy. It is only meant to clarify whether based on existing definitions of HARQ state A/B (i.e. differentiated HARQ RTT Timer behaviour) UE behaviour is better suited to receive an UL retransmission grant according one possible strategy vs another.

**Question 3: HARQ state A (i.e. extending the *drx-HARQ-RTT-TimerUL* by UE-gNB RTT) best supports which UL HARQ retransmission type(s)?**

1. **UL retransmission based on UL decoding result.**
2. **Blind UL retransmission.**
3. **No UL retransmission.**

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| **Company** | **Supported Option(s)** | **Additional comments** |
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**Question 4: HARQ state B (i.e. not starting the *drx-HARQ-RTT-TimerUL*) best supports which UL HARQ retransmission type(s)?**

1. **UL retransmission based on UL decoding result.**
2. **Blind UL retransmission.**
3. **No UL retransmission.**

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| **Company** | **Supported Option(s)** | **Additional comments** |
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Based on the above questions, companies are asked to provide initial naming suggestions to facilitate stage 3 discussions.

**Question 5: How should HARQ state A/B be named? Companies are invited to provide suggestions below:**

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| **Company** | **Suggested naming for HARQ state A/B** |
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# Continuation of P3

In Phase 1 of discussion, based on large majority support for Q3/Q4, the following was proposed:

Proposal 3: UE shall always act as indicated in a grant/assignment regardless of whether an UL HARQ retransmission state is configured or not (as in legacy). (18/20)

In subsequent discussion one company had concerns with grant assignment while the *drx-HARQ-RTT-TimerUL* is running, stating that network should not try to assign a grant for the same HARQ process for which the *drx-HARQ-RTT-TimerUL* citing the following text from MAC specification:

“drx-HARQ-RTT-TimerUL (per UL HARQ process): the minimum duration before a UL HARQ retransmission grant is expected by the MAC entity”

Companies which did not agree with this interpretation note that text states “expected” which does not necessary imply a restriction. Apart from RAN1 timing restrictions there is no explicit text which prevents network scheduling a HARQ retransmission for a HARQ process while drx-HARQ-RTT-TimerUL is running.

Rapporteur would like to note the following:

1. The issue is UE behaviour while drx-HARQ-RTT-TimerUL is running, so there should be no concerns for when UE is configured with HARQ state B (i.e. timer is not started).
2. It has already been confirmed by RAN2 in RAN2#113bise that in NTN if the UE is in DRX Active Time for any reason, the UE should monitor the PDCCH regardless of whether *drx-HARQ-RTT-TimerUL* is running or not.
3. Under NTN, considering that in HARQ state A the drx-HARQ-RTT-TimerUL is extended by UE-gNB RTT, if network is prevented from assigning a grant to a HARQ process while timer is running the HARQ process can be locked up for a significant duration and could result in HARQ stalling state.
4. If an UL HARQ retransmission state is not configured the duration of drx-HARQ-RTT-TimerUL can only be up to a maximum 56 symbols. If no UL HARQ retransmission state is configured this issue may be considered unlikely (at least compared to HARQ processes configured with HARQ state A).

Given the above points, Rapporteur would like to focus discussion on the primary issue: expected UE behaviour for HARQ processes configured with HARQ state A.

**Question 6: Do you agree for HARQ process(es) configured with HARQ state A, UE in DRX active time may receive a grant/assignment while *drx-HARQ-RTT-TimerUL* is running and UE will act as indicated in grant/assignment?**

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| **Company** | **Agree/Disagree** | **Additional comments** |
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# Conclusion

<To be generated pending company input>

# References

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5. [R2-2107450](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_115-e/Docs/R2-2107450.zip) Impact on LCP with disabled UL HARQ retransmission in NTN – vivo
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