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

e-Meeting, April 20th – 30th, 2020

Agenda Item: 6.2.1.3

Source: Moderator (Ericsson)

Title: Feature lead summary #2 for Multi-TB scheduling for LTE-MTC

Document for: Discussion, Decision

# Introduction

In the Rel-16 work item on “Additional MTC enhancements for LTE” [1], one of the objectives is to specify support for scheduling of multiple DL/UL transport blocks.

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| The objective is to specify the following set of improvements for machine-type communications for BL/CE UEs.  [...]  **Scheduling enhancement:**   * Specify scheduling multiple DL/UL transport blocks with single DCI for SC-PTM and unicast [RAN1, RAN2] |

RAN1 agreements made until RAN1#99 are summarized in [2] and RAN1 agreements made in RAN1#100e are listed below. RAN2 agreements are summarized in [3]. The endorsed L1 configuration parameter list can be found in [4], the initial RAN1 UE feature list in [5], and the endorsed RAN1 CRs in [6] – [16].

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| [**R1-2001056**](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001056.zip) Feature lead summary for Multi-TB scheduling for LTE-MTC Ericsson  [**R1-2001185**](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001185.zip) Feature lead summary#2 for Multi-TB scheduling for LTE-MTC Ericsson  [**R1-2001220**](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001220.zip) Feature lead summary#3 for Multi-TB scheduling for LTE-MTC Ericsson  [100e-LTE-eMTC5-Multi-TB-01] – Johan (Ericsson)  Email discussion/approval onHARQ/NDI/RV/FH encoding for both FDD and TDDby 2/27; if there is a spec impact, followed by endorsing the corresponding TP by 3/2  **Conclusion**  For FDD case:   * For 36.212, use Futurewei’s TP in [R1-2001086](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001086.zip) as a basis, possibly with the clarification “From MSB to LSB” in each section. * For 36.211 and 36.213, take the provided comments and proposals into account in contributions to the next meeting.   For TDD case:   * There is no consensus in RAN1#100e for optimization (or elimination) of the TDD HARQ process grouping. The 36.212 seems adequate and potential corresponding 36.213 text can be added in the next meeting.   As per email decision posted on Mar. 4th, two companies prefer not to add “From MSB to LSB”, so:  Agreement: The text proposal in [R1-2001086](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001086.zip) is endorsed for inclusion into TS36.212 editor’s CR.  [100e-LTE-eMTC5-Multi-TB-02] – Johan (Ericsson)  Email discussion/approval onHARQ-ACK bundling for both FDD and TDDby 2/27; if there is a spec impact, followed by endorsing the corresponding TP by 3/2  As per email decision posted on Mar. 5th,:  Agreement: The TP provided in [R1-2001214](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100_e/Docs/R1-2001214.zip) for TS36.213 section 10.2 is endorsed. To be included as part of the editor’s CR for TS36.213.  [100e-LTE-eMTC5-Multi-TB-03] – Johan (Ericsson)  Email discussion/approval onscheduling gaps for both unicast and multicastby 2/27; if there is a spec impact, followed by endorsing the corresponding TP by 3/2  **Conclusion**  For the unicast case   * There is no consensus in RAN1#100e for the proposal to specify explicit unicast scheduling gaps. * Since unicast scheduling gaps are included in the draft RAN1 UE feature list, there may be a need to update the feature list, and this is something that can be brought up in the email discussion for the feature list.   For the multicast case   * There is no consensus in RAN1#100e for the proposal to insert the scheduling gaps before each TB instead of after each TB. |

This document provides a prioritized list of issues and proposals based on the contributions in [17] – [23].

# Issue #5: TDD HARQ-ACK bundling mechanism

ZTE’s contribution [18] proposes that the TDD HARQ-ACK bundling should be based on legacy TDD bundling mechanism, whereas Qualcomm’s contribution [20] proposes to disallow bundling spanning different multi-TB PDSCHs (see Section 2.3.3 in ZTE’s contribution and Issue #3 in Qualcomm’s contribution for further discussion).

Proposal 5-1: Discuss and decide on potential changes to allow TDD HARQ-ACK bundling.

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| **Company** | **Comments on Proposal 5-1** |
| Qualcomm | In the TP that was agreed in RAN1 100-e (and endorsed in clause 10.2 of the latest version of the specification -g10), **HARQ-ACK bundling „within the TBs of a multi-TB transmission“ was enabled for TDD**—in a similar manner to the FDD agreements.  However, the „TDD-specific“ bundling (what exist today when number of repetitions is 1) is more complex for this setup—e.g., interpreting DAI fields, etc. There were no agreements made on how to address this type of bundling for multi-TB scheduling in RAN1 100-e.  Since with the current „within one multi-TB transmission“ bundling, we are already recovering the throughput loss vis-a-vis not doing „any bundling“, we propose to **disable TDD-specific bundling—much like what is done for legacy single-TB scheduling when the number of repetitions is greater than 1**.  Our **TPs in Section 3 of** [**R1-2002174**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002174.zip) **implement such a disabling**—by essentially constraining valid scheduling to the case that **in any given ACK-ing opportunity, the UE shall not expect multiple multi-TB transmissions corresponding to which it must send an ACK**. Such scheduling **eliminates bundling „across different multi-TB transmissions“**, while still retaining the throughput benefits from bundling via the „within one multi-TB transmission“ bundling.  As a result, we propose to **endorse the** **TPs 5, 6 and 7 in Section 3 of** [**R1-2002174**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002174.zip)**.**  ***Response to ZTE’s comment on our approved TP in RAN1 100-e:***  *We are not sure we fully understand the concern. The way the approved TP is written, there is never the scope for one bundle’s ACKs starting before the previous bundle’s ACKs have completely finished. Since the maximum bundle size is 4, we do not see how more than 4 TBs can get ACK-ed in any given subframe.*  *Please note that* ***the TP doesn’t have any correspondence to the „legacy k-table“*** *with regards to deciding which subframes need to be ACK-ed at subframe n. As a result****, there is no mention of „k“ for multi-TB TDD timeline determination****. By removing the dependence on „k“, the timeline for ACKs essentially becomes* *sequential—i.e., bundle-by-bundle, at the earliest transmission opportunity* ***when the last bundle’s ACKs (max bundlesize 4) have completely finished and the current bundle is ready for ACK-ing****.*  *Please let us know if we are missing something.* |
| Ericsson | We are fine with Qualcomm’s approach in principle. If the approach can be agreed in principle, we will in the next step take a closer look at the TPs in Section 3 in Qualcomm’s contribution [R1-2002174](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002174.zip). |
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# References

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