3GPP TSG-RAN WG1 Meeting #101-e Tdoc R1-20xxxxx

e-Meeting, May 25th – June 5th, 2020

**Agenda Item: 8.3**

**Title: Email discussion summary #3 for Study on support of reduced capability NR devices (Step 2: Medium priority proposals)**

**Source: Rapporteur (Ericsson)**

**Document for: Discussion, Decision**

# 1 Introduction

This document captures the discussion in RAN1#101e post-meeting email discussion [101-e-Post-NR-RedCap], which follows an email discussion [101-e-NR-RedCap-01] held during RAN1#101e for the study item “Study on support of reduced capability NR devices” [1]. Both these email discussions focus on high-level topics and evaluation assumptions necessary to facilitate next step’s more concrete analysis and evaluations. For further background, see email discussion summary for the first email discussion in [3].

In this post-meeting email discussion [101-e-Post-NR-RedCap], the proposals are treated with the following priorities:

* High priority:
  + Proposals 7, 9, 22, 22a, 23, 26
* Medium priority:
  + Proposals 14, 14a, 15, 21, 28, 30
* Medium priority, to be discussed after sufficient progress has been reached on Cov. Enh. SI assumptions:
  + Proposals 16, 17, 18, 19, 20
* Low priority:
  + Proposals 0, 1, 3, 6, 12, 13, 24a, 25a, 27, 29, 32

This document deals with the Medium priority proposals, which have been updated to address the concerns expressed in Section 9 in [3]. The full list of proposals can be found in [3]. The fact that a proposal is listed with lower priority in this email discussion should not be interpreted as a suggestion that it will have lower priority in future meetings.

# 6 Evaluation methodology

## 6.2 Evaluation methodology for UE power saving

For Proposals 14 and 14a, two comments in Section 9 in [3] suggested that only one of the two proposals would be needed. Proposals 14 and 14a have been merged into a single new Proposal 14.

Proposal 14: For wearables, use the traffic models FTP model 3 and VoIP from TR 38.840 to characterize the RedCap service types including IM, VoIP, heartbeat, etc. with proper modification of at least packet size and mean inter-arrival time for RedCap use cases. Values are FFS.

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| **Company** | **Comments** |
| Qualcomm | We support the new Proposal 14 after merging. |
| Huawei, HiSilicon | Fine |
| vivo | Fine with the proposal |
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Proposal 15: For industrial wireless sensor use cases, use a traffic model based on the service performance requirements for the process monitoring use case in TS 22.104 Table 5.2-2. At least [64 bytes] message size and [100 ms] transfer interval should be considered (other values are not precluded).

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| **Company** | **Comments** |
| Qualcomm | We are fine with Proposal 15. |
| Huawei, HiSilicon | Fine |
| vivo | In general fine with reusing the traffic characteristic as in TS22.104 for wireless sensors. For details we have some comments below   1. Clarify the traffic model is only used for UL evaluation 2. Not sure why 64bytes is picked for message size as it is differrent from 20bytes in TS22.104 Table 5.2-2 |
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## 6.4 Evaluation methodology for other performance impacts

For Proposal 21, one comment proposes to include power consumption in the first sentence, another comment proposes to include spectral efficiency in the first sentence, and a third comment states that other system performance impacts shouldn’t be excluded, such as PDCCH blocking probability. The proposal has been updated accordingly.

Proposal 21: The evaluation of performance impacts includes at least peak data rate, latency, power consumption and spectral efficiency. Other performance metrics such as PDCCH blocking probability are not precluded.

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| **Company** | **Comments** |
| Qualcomm | For performance evaluation, we think it is well-justified to consider peak data rate, power consumption and PDCCH blocking probability for RedCap UE.  However, we are not sure about the definition and evaluation methodology for “spectral efficiency.” Clarification and justification are needed for invoking “spectral efficiency” in the performance evaluation of RedCap UE. |
| Huawei, HiSilicon | Fine with the proposal except for power consumption - which is already in the objective of SID for specific scenarios (e.g. delay tolerant) thus do not belong to “other performance impacts”.  In response to Qualcomm’s comments: the motivation is to look at the impact of (a large number of) RedCap UEs on network performance as it is well understood that the low capability UE could lower the system performance in e.g. spectral efficiency. We should not only focus on benefits that can be enabled to UE side by RedCap and thus the potential penalty on network/operator side should also be captured by e.g. widely used throughput analysis, so as to provide a complete technical report for all 3GPP players. |
| vivo | Fine with the proposal |
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# 7 UE complexity reduction features

## 7.5 Relaxed UE processing time

For Proposal 28, one comment in Section 9 in [3] proposes to indicate that it can be studied with *“low priority”*. It seems (at least to the Rapporteur) highly likely that the N1/N2 relaxation will, even without an indication that it has low priority, be studied with lower priority than e.g. reduced UE bandwidth and reduced number of UE antennas, so it does not seem necessary to explicitly state that it has lower priority.

Proposal 28: Study a more relaxed UE processing time in terms of N1/N2 compared to capability #1, including the impacts on cost/complexity, power saving, latency and scheduling flexibility (at least qualitatively).

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| **Company** | **Comments** |
| Qualcomm | We are ok with Proposal 28. |
| Huawei, HiSilicon | Although we did not object the other aspects in P28 in our previous response, our comments still hold that the other metrics other than cost/complexity may not fall into the scope of SID, i.e. relaxed UE processing time can be studied only for cost/complexity reduction purpose. Power saving is already in SID with specific candidate techniques to specific scenarios, so we propose to remove that. For latency and scheduling flexibility, they are generic requirements that could be kept in our view. However, to avoid unnecessary debate at this stage, we suggest to maintain the objective as is   * Study a ~~more~~ relaxed UE processing time in terms of N1/N2 compared to capability #1~~, including the impacts~~ on cost/complexity analysis~~, power saving, latency and scheduling flexibility (at least qualitatively)~~. |
| vivo | Fine in general, but would be good to clarify why scheduling flexibility is relevant here. Regarding Huawei’s revision, we would like to keep power saving as one metric to decide whether to introduced relaxed UE processing time. |
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## 7.6 Relaxed UE processing capability

For Proposal 30, two comments in Section 9 in [3] propose that reduced maximum UE bandwidth for data transmission and reception should be included in the bullet list, and one or two other comments propose that reduced number of HARQ processes should be included in the bullet list, whereas one comment states that nothing further is acceptable but can be discussed in the RAN plenary as needed. During the email discussion documented in [2] and [3], peak data rate relaxation related to reduced number of HARQ processes has seemed rather controversial whereas perhaps peak rate relaxation related to reduced UE bandwidth may be less controversial, and the proposal has been updated accordingly.

Proposal 30: Study peak data rate relaxation and focus at least on:

* Maximum modulation order restriction
* Reducing the maximum number of MIMO layers
* Reduced maximum UE bandwidth for data transmission and reception

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| **Company** | **Comments** |
| Qualcomm | Different from the NR reference UE discussed in Proposal 9, the restricted modulation order supported by RedCap UE is not necessarily the highest modulation order in NR Rel-15 MCS table(s). Therefore, it is necessary to clarify the impacts of maximum MCS. Meanwhile, the formula for max data rate calculation in TS 38.306 also needs to be revisited if necessary. |
| Huawei, HiSilicon | Fine. |
| vivo | According to the several rounds of feedback, we see many companies explicitly indicated the interest to study the reduced number of HARQ processes (Sony, Spreadtrum, DOCOMO, vivo, China Telecom, Apple) and there seems no objection to include it for study. Although currently the soft buffer size requirement is not explicitly defined according to the number of HARQ processes, but technically the buffer size should be able to reduce (thus reduced the cost/complexity) if the number of HARQ-processes is significantly reduced.  Therefore we believe reduced number of HARQ processes should be added. |
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# References

[1] [RP-193238](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_86/Docs/RP-193238.zip), ”New SID on support of reduced capability NR devices”

[2] [R1-2004731](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2004731.zip), “Email discussion for Study on support of reduced capability NR devices”, Rapporteur (Ericsson)

[3] [R1-2005048](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_101-e/Docs/R1-2005048.zip), “Email discussion summary #2 for Study on support of reduced capability NR devices”, Rapporteur (Ericsson)