

94e-07-R18-RedCapEvo - Version 0.0.8
RAN

3GPP TSG-RAN Meeting #94-e

Tdoc RP-213581

Electronic Meeting, December 6 - 17, 2021

Agenda Item: 8A.1

Source: Ericsson

Title: Moderator's summary of discussion [94e-07-R18-RedCapEvo]

Document for: Information

1 Introduction

This contribution is the moderator summary of the discussion of the potential Rel-18 SI and WI scopes for RedCap evolution. It is a continuation of the discussion that took place in October where the moderator's summary can be found in RP-212665 [1], a draft SID proposal in RP-212732 [2], and a draft WID proposal in RP-212705 [3].

The goal of the discussion is to discuss and provide the final scopes of the SI and WI. The discussion on whether to include a RedCap SI and a RedCap WI in the Rel-18 work is part of the discussion led by the chairman and is not included here.

Please avoid any input like “We support / we do not support” without giving additional justification and motivation as this is not a “number counting” driven discussion. Instead justify your view with strong technical arguments and/or tangible commercial interests (near & longer terms).

The input documents to the discussion are listed in the reference section.

2 Initial round

2.1 Updated draft SID

The draft SID from the October discussion has been updated according to the chairman's instruction with rapporteur name and the proposed updates to the SI objective given in RP-213469 [4]:

- Study further UE complexity / cost reduction techniques based on Rel-17 evaluation methodology [RAN1]
 - Consider network impact, ~~compatibility with Rel-17 operation in a cell supporting Rel-17 RedCap UEs~~, coexistence of RedCap and non-RedCap UEs, UE impact, specification impact

- Potential solutions, which may complement each other, for reducing device complexity/cost are, e.g., focusing on:
 - UE bandwidth reduction to 5MHz in FR1,
 - Including the possibility of relaxing UE processing timeline
 - reduced the UE peak data rate,
 - Including the possibility of relaxing UE processing timeline
 - ~~relaxing UE processing timeline,~~
 - ~~ete.~~

The draft SID can be found in the RAN#94-e drafts inbox:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-07-R18-RedCapEvo%5D/Initial_phase/RP-21xxxx_New_SID_on_further_complexity_reduction.docx

Companies can provide input on the justification and the objectives in the feedback form.

Feedback Form 1: Views on the justification and objectives of the draft RedCap SID

1 – Futurewei Technologies

For the justification, we have several suggestions.

- Removing energy harvesting as it is considered in passive-IoT

”Now when the foundation has been laid in Rel-17, enhancements can be considered to improve the support for the mentioned use cases and also to expand RedCap into a new range of use cases such as smart grid or ~~devices operating on energy harvested from the environment.~~”

- As the first three paragraphs were motivations for Rel-17 RedCap, they should be removed from the justification for Rel 18 RedCap. A reference to RP-210918 can be provided if necessary.

For the objectives

- The outcome of the SI needs to be captured: as a technical report or augment TR 38.875.
- It is unclear whether all the objectives of the study item are applicable to only FR1. If so, it should be stated clearly to avoid further discussion in the working groups.
- Given the duration of the study phase is short, if we can agree on the list of aspects to be studied now, it would help focus the study.

2 – Ericsson LM

Regarding further UE bandwidth reduction: Different options are possible for how to realize “UE bandwidth reduction to 5MHz in FR1” and “Reduced the UE peak data rate”. For example, the bandwidth reduction can be done in RF+BB parts or in BB parts only. It might be good to clarify this to avoid potential confusion.

Regarding relaxed UE processing timeline: To clarify that the relaxed UE processing timeline may or may not be part of the solutions, “Including the possibility of relaxing UE processing timeline” should be reformulated to “Possibly including relaxing UE processing timeline”.

3 – DOCOMO Communications Lab.

Regarding the 1st sub-bullet, we support to remove "compatibility with Rel-17" as suggested in our contribution RP-213056. However, it seems that the revisited text "operation in a cell supporting Rel-17 RedCap UEs" and "coexistence of RedCap and non-RedCap UEs" say the same thing, and it looks sufficient with the latter one. Thus, we suggest to remove "operation in a cell supporting Rel-17 RedCap UEs" from the sentence.

Regarding the 2nd sub-bullet, it should not preclude other potential techniques than listed above, i.e., reduced number of HARQ processes should be included as a potential solution to study the cost reduction gain. For Rel-18, enhanced RedCap targets low-end use cases which are not considered for Rel-17 RedCap, and any complexity/cost reduction techniques which are beneficial for such use cases should be supported as long as the cost reduction gain is justified with reasonable NW impact.

4 – vivo Mobile Communication Co.

vivo: We are generally fine with the updated SI objective given in RP-213469 to have more focused solutions. There are two comments.

1. It is better to state the relaxed UE processing timeline is for data and CSI
2. In addition to relaxed UE processing timeline, we think reducing the maximum number of HARQ processes in DL/UL should also be studied to complement the other solutions like bandwidth reduction and reduced UE peak data rate so that the overall cost and complexity can be reduced practically.

5 – Guangdong OPPO Mobile Telecom.

The bandwidth reduction of 5MHz is fine for us.

We wondering "relaxing UE processing timeline" can be differently treated under 5MHz and lower peak rate. A single independent sub-bullet would be good enough. We prefer to move back the bullet.

6 – CATT

We are also not quite clear why relaxing UE processing timeline needs to be moved as sub-bullets for 5MHz UE BW and reduced peak data rate.

7 – Xiaomi Communications

(1) In our understanding, there is some overlapping between the UE bandwidth reduction and peak data reduction. Reduced UE bandwidth is also one solution to reduce the peak data rate.

(2) For the subbullet of "reduced the UE peak data rate", the current formulation is a little bit general and broad. Listing more detailed directions for the peak data rate reduction is helpful to provide clear guidance in the SI phase. In addition, it is better to state which case the peak data rate reduction solution target, FR1, FR2 or both.

(3) For the relaxed processing timeline, we prefer not to be moved as a sub-bullet of the UE bandwidth reduction and peak data rate reduction. Previous version is fine to us.

8 – CMDI

To minimize the impact of network deployment and network design, it is proposed to limit it to FDD band in FR1, otherwise, we don't think it agreeable. In addition, it is important to reduce impact on the network which is hard to force the network configure additional NCD-SSB in a separate BWP in a relatively much narrow FDD carrier as what defined in Rel-17 for REDCAP UE, so in the study of the cost and complexity,

UE supporting separate BWP without SSB should be taken into account for evaluating the total cost and complexity. So in summary, the objective is proposed to be revised as below:

UE bandwidth reduction to 5MHz in FDD band of FR1,

- **Including the possibility of relaxing UE processing timing**

Note: UE supporting separate BWP without SSB should be taken as one factor into account for evaluating the total cost and complexity

9 – Panasonic Corporation

In order to clarify the coexistence of RedCap and non-RedCap UEs is within a same cell (and not among different cells), the clarification of "operation in a cell supporting Rel-17 RedCap UEs" is useful.

We agree Ericsson that "UE bandwidth reduction to 5MHz in FR1" is not limited to the option of "RF+BB". The option of BB only is not excluded should be clarified.

10 – Samsung Electronics Polska

1. We suggest to clarify what is "network impact". For example, at least Network capacity and spectral efficiency, PDCCH blocking rate, as list in TR 38.875

2. We suggest to delete "Including the possibility of relaxing UE processing timeline".

a) At least, we think this is not belong to UE BW reduction. We think 5MHz bandwidth reduction shall focus on bandwidth reduction itself.

b) Although, UE processing timeline can be treated as potential techniques for UE peak data rate reduction, we don't think UE processing timeline needs to be listed, otherwise, we may need to list all the solutions. For example, TBS restriction, number of PRB restriction for PUSCH and/or PDSCH, HARQ process numbers. Etc.

3. We suggest to further clarify the supported frequency ranges, in our view, it may not be easy to apply for some bands for FR 1, e.g., for the bands only support 30kHz SCS for SSB.

4. We suggest to add the similar NOTE as in draft WID, including:

- The work defined as part of this WI is not to overlap with LPWA use cases.
- Coexistence with non-RedCap UEs and Rel-17 RedCap UEs should be ensured.
- This SI focuses on SA mode and single connectivity with operation in a single band at a time.
- This SI considers **FR1 with 15kHz SCS for SSB** and all applicable duplex modes unless otherwise specified.

Regarding on the supported band, we are fine with CMCC's suggestion, to add **FDD band of FR1**.

5. We also support to remove the wording related to energy harvesting description, as pointed out by futurewei.

11 – LG Electronics Inc.

Firstly, the study is on further cost/complexity reduction of RedCap UEs. Then, we think "the devices operating on energy harvested from the environment" should be removed from the justification part of the RedCap SID.

Secondly, we need some clarification on the followings:

- Whether the target peak data rate of 10Mbps for Rel-18 RedCap in the justification part is a hard target or a soft target that can be adjusted depending on the outcome of the study.

- “The enhancements should be applicable to the RedCap UE type and framework defined in Rel-17” at the end of the justification part is not clear for us. Perhaps we are defining a new RedCap UE type as an outcome of Rel-18 RedCap. Then does it mean the RedCap UE type defined in Rel-17 should also support the enhancements in Rel-18 RedCap? If that is not the intention, we should remove the “RedCap UE type” as in the justification part of the draft RedCap WID.

12 – SHARP Corporation

We are generally OK for the contents but have similar concern as other companies on current ”relaxing UE processing timeline” in sub-bullet level.
Previous description is preferred for it.

13 – CEWIT

We are quite fine with the proposal and similar to other companies have concerns on including ”relaxed UE processing timeline” as a sub bullet

14 – ZTE Corporation

1) For the objective part, “operation in a cell supporting Rel-17 RedCap UEs” overlaps with “coexistence of RedCap and non-RedCap UEs”, removing it together with “compatibility with Rel-17” will be clearer.
2) We are OK to focus on UE bandwidth reduction to 5MHz, reduced the UE peak data rate, and relaxing UE processing timeline. Also we are fine with the Ericsson’s revision: “Possibly including relaxing UE processing timeline”. Additionally, it is believed that listing potential directions for peak data rate reduction is beneficial for a converged discussion with the limited TU in the study phase. Therefore, we prefer the following version

- reduced the UE peak data rate, *including reduced HARQ processes number, reduced TBS, smaller scaling factors*
 - o Including the possibility of relaxing UE processing timeline

15 – VODAFONE Group Plc

As other companies stated, removing energy harvesting from the ”Justification” seems reasonable as it is not in the ”Objectives” scope. On the objective we share the same view as NTT Docomo

16 – Huawei Tech.(UK) Co.. Ltd

- Regarding the comments to limit the SI/WI to FDD bands, we don’t think this is necessary, and certainly not in an SI where feasibility can be investigated for TDD as well before reaching a decision.
- For limiting to 15 kHz SCS, similarly this should be left to RAN1 to conclude on during a feasibility SI. Even in a WI, which SCS to include is a rather technical matter best left to detailed discussions rather than pre-deciding in RAN.
- On the ”possibility of relaxing UE timeline, etc”, it could be more appropriately included only under the peak rate reduction bullet, since it does not need to be a consequence (i.e. a sub-bullet) of BW reduction to 5 MHz:
 - *UE bandwidth reduction to 5MHz in FR1*
 - *Other additional solutions for reduced the UE peak data rate*

- *E.g. the possibility of relaxing UE processing timeline etc.*

17 – Huawei Tech.(UK) Co.. Ltd

A further comment: we agree with others that it's useful to clarify the meaning of "the enhancement should be applicable to the RedCap UE type and framework defined in Rel-17" since its possible Rel-18 outcomes define a new UE type. It should be sufficient to refer to simply the framework, and let the technical decisions give a view on UE type.

18 – Nordic Semiconductor ASA

We support the proposal in general. In addition, we believe it would be worth to study as well HD-FDD with relaxed DL to UL switching gap compared to R17 RedCap (using TDD gap). We believe that this could further reduce cost of baseband.

In addition, we would like to clarify that reduction of BW could be done only UL, where reduction of transmit BW would reduce hardware costs. Therefore we suggest, the following:

UE bandwidth reduction to 5MHz in FR1 in DL and/or UL ,

19 – InterDigital Communications

We also are not clear why processing time relaxation is at the sub-bullet level. In addition, it may be good to clarify that this relaxation may apply to data, CSI, etc.

20 – Lenovo (Beijing) Ltd

- Putting relaxing UE processing timeline under BW reduction and peak data rate reduction is not fine with us. We prefer the previous version to make it as a parallel bullet.
- Similar view with LG, the sentence in justification part "The enhancements should be applicable to the RedCap UE type and framework defined in Rel-17" is not clear, we also suggest remove it.

21 – Everactive

Regarding energy harvesting in the justification - this is a type of use case, gaining traction in industrial sensors, and very relevant to a study on cost/complexity reduction in RedCap devices. We prefer to leave this use case in for the SI as justification for the objectives.

22 – MediaTek Inc.

We agree with several other companies above that the sub-bullet on 'relaxing UE processing timeline' needs to move up a level. As a complexity reduction approach, it works independently of the approaches suggested by the other bullets, and there is no reason to artificially conflate them together in the SID. The clarification suggested by Ericsson to 'Possibly include...' is unnecessary as the top bullet already indicates that these are only 'potential' solutions.

We also agree with Futurewei, that references to energy harvesting has to be removed from the Justification section.

We support CMCC's suggestion to clarify that the study on BW reduction to 5MHz needs to focus on FR1 FDD bands.

23 – Intel Corporation (UK) Ltd

We second the suggestion from Futurewei to delete the following in the justification section:

”Now when the foundation has been laid in Rel-17, enhancements can be considered to improve the support for the mentioned use cases and also to expand RedCap into a new range of use cases such as smart grid ~~or devices operating on energy harvested from the environment.~~”

We also support clarifying that the scope of eRedCap studies for further cost/complexity reduction is limited to FR1.

Regarding the potential solutions, it would be good to clarify if the below use of “UE peak data rate” corresponds to instantaneous (per symbol) max data rate (corresponding to the max data rate from TS38.306) or max sustained (average) data rate. Our understanding is the former. In any case, it would be good to clarify.

We are also supportive that relaxed UE processing timeline be moved one indent to the left as a separate solution. Further, in our view, the following methods should also be considered as part of the study, and it is preferred that they be explicitly identified. Here, addition of “reduced maximum number of HARQ processes” is added under assumption that “peak data rate” corresponds to the max data rate defined in TS38.306.

- Potential solutions, which may complement each other, for reducing device complexity/cost are, e.g., focusing on:
 - o UE bandwidth reduction to 5MHz in FR1,
 - o Including the possibility of relaxing UE processing timeline
 - o reduced the UE peak data rate,
 - ~~Including the possibility of relaxing UE processing timeline~~
 - o Reduced maximum number of HARQ processes
 - o Type B HD-FDD

24 – Sony Europe B.V.

The objectives are OK, although we are not sure they yield significant complexity reduction.

”reduced ~~the~~ peak data rate” should read ”reduced peak data rate”, or something similar.

25 – Qualcomm Incorporated

We are generally fine with the draft SID but suggest clarifications on the followings:

- The wording related to energy harvesting needs to be removed from the justification section as pointed out by multiple companies.
- We share the same view with NTT DoCoMo and Vodafone that “operation in a cell supporting Rel-17 RedCap UEs” and “coexistence of RedCap and non-Redap UEs” say the same thing and the former needs to be removed.
- It is not necessary to limit the SCS and duplex in the SID. RAN1 will discuss it during the study item.

26 – Nokia France

We agree that the mention of energy harvesting in the Justification is now superseded.

Please also add at the end of the Justification section: “The enhancements should be applicable to the RedCap UE type and framework defined in Rel-17, **including principles of network awareness of device capabilities**” (i.e. the same as in the WID justification).

27 – Sequans Communications

In our view ”devices operating on energy harvested from the environment” could be removed from the justification as it could be understood as passive IOT, which is handled separately. Moreover, there is no real corresponding objective.

Regarding UE processing timeline, we have a similar view as Samsung: although it can be treated as potential techniques for UE peak data rate reduction, we don’t think UE processing timeline needs to be listed, otherwise, we may need to list all the solutions. For example, TBS restriction, number of PRB restriction for PUSCH and/or PDSCH, HARQ process numbers. Etc. If it is listed explicitly, we think it should be rather listed as a separate parallel bullet (as in earlier version, not as a sub bullet of BW reduction and peak data rate reduction), and the ”etc” bullet should be kept as well to not exclude above solutions.

We have a similar view with Ericsson that ”UE bandwidth reduction to 5MHz in FR1” might not be limited to the option of ”RF+BB”. That could be done with a BB option only.

2.2 Updated draft WID

The draft WID from the October discussion has been updated according to the chairman’s instruction with rapporteur name and the proposed updates to the WI objective given in RP-213469 [4]:

Power saving/energy efficiency enhancements

- Enhanced eDRX in RRC_INACTIVE (>10.24s) [RAN2, RAN3, RAN4]
 - *Note that this objective requires SA2, CTI involvement*

Complexity/cost reduction

- *TBD based on SI outcome: Further reduced UE cost / complexity [RAN1]*
 -
- Support for lower UE power class [RAN4]
 - Focus on non-coverage-limited scenarios, e.g., indoor industrial (i.e., no intention to specify any dedicated coverage recovery schemes)

Notes:

- The work defined as part of this WI is not to overlap with LPWA use cases.
- Coexistence with non-RedCap UEs and Rel-17 RedCap UEs should be ensured.
- This WI focuses on SA mode and single connectivity with operation in a single band at a time.
- This WI considers all frequency ranges and all applicable duplex modes unless otherwise specified.

The draft WID can be found in the RAN#94-e drafts inbox:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-07-R18-RedCapEvo%5D/Initial_phase/RP-21xxxx_New_WID_on_RedCap_evolution.docx

Companies can provide input on the justification and the objectives in the feedback form.

Feedback Form 2: Views on the justification and objectives of the draft RedCap WID

<p>1 – Futurewei Technologies</p> <p>Following the discussion in the GTW that we do not need to approve the WID now, but will revisit when the study is completed.</p>
<p>2 – Ericsson LM</p> <p>Justification: The paragraph about operating without needing battery replacement since aspects such as energy harvesting and wake-up receivers are no longer considered as part of this WI scope.</p> <p>Objective: One of the notes stipulates that coexistence with non-RedCap UEs and Rel-17 RedCap UEs should be ensured. It would be good to also state (similar as in the SID) that both network impact and UE impact should be considered.</p> <p>Impacted specs: Due to the eDRX objective, the following RAN3 specs can be listed among the impacted specs: 38.413 (NG-AP), 38.423 (Xn-AP) and 38.473 (F1AP).</p>
<p>3 – Guangdong OPPO Mobile Telecom.</p> <p>”– TBD based on SI outcome: Further reduced UE cost / complexity [RAN1]”. To make the bullet consistent with SI phase. Better to change to ”– TBD based on SI outcome: Further UE complexity / cost reduction techniques based on Rel-17 evaluation [RAN1]”</p>
<p>4 – DOCOMO Communications Lab.</p> <p>We are fine with the justification and objectives of the draft WID.</p>
<p>5 – Panasonic Corporation</p> <p>Our view is no need to approve WID for this meeting.</p>

6 – Samsung Electronics Polska

Based on the GTW on Monday, we also support not to approve this WID in this meeting.

However, per request from moderator, we would like to share some comments:

1. In general, we support power saving part on eDRX. We think this can be started earlier.
2. For the complexity reduction part, we'd like to clarify that, this is just a place holder. If the outcome of SI doesn't recommend to introduce a further reduced UE cost/complexity, this will be removed. If so, we like to add a bracket for this bullet
3. For the NOTE, as we commented before, the bands for the further reduced UE cost/complexity might be based on the outcome of SI. Therefore, we like to either remove the last bullet, or put change it into the wording agreed for SI, and put it into bracket as:

This WI considers [**at least FR1 with 15kHz SCS for SSB**] ~~all frequency ranges~~ and [all applicable [duplex modes] unless otherwise specified.

Please note that, this is different from the wording we proposed for SID, since we think it shall be updated depends the outcome of SID.

7 – Deutsche Telekom AG

We only support the eDRX > 10.24s in INACTIVE for REDCAP for the time being

8 – LG Electronics Inc.

Similar comments as above on the SID on the energy harvesting and the operation without needing battery replacement. They should be removed.

In general, fine tuning of the justification part can be done at the end of the SI phase, together with the discussion on the WI objectives. Furthermore, according to the Chair announcement in the last GTW session, the WID is not likely to be approved at this meeting. Then, we could just focus on the SID for now and then come back to the WID at the end of the SI.

9 – SHARP Corporation

We are fine with the current description on the justification and objectives though we are OK to approve in future meeting.

10 – ZTE Corporation

We are generally fine with the WID. For the lower UE power class, it may have RAN2 impacts, e.g., UE capability definition. Therefore, RAN2 also should be involved in.

11 – VODAFONE Group Plc

Same comment as Ericsson. We also agree that the WID should not be approved during this meeting and it can wait until the SI is finished

12 – MediaTek Inc.

We share similar views as DT and Samsung, i.e. that the WID should only contain the eDRX aspects at this point in time.

The complexity reduction part is just a placeholder until the SI is complete, at which point in time this section may be populated. For now, this bullet ought to be in square brackets and the Note on frequency ranges and duplex modes should be removed until the SI recommendations are available.

<p>13 – Intel Corporation (UK) Ltd</p> <p>It is not clear if we need to discuss the WID objectives now if the WID is expected to be considered only upon completion of the SI.</p>
<p>14 – Qualcomm Incorporated</p> <p>As discussed in the GTW, we suggest not to approve the WID now and revisit it when the study item is completed.</p>
<p>15 – Nokia France</p> <p>We assume that this will be revisited when the outcome of the SI is clear; no need to approve it now.</p>
<p>16 – AT&T GNS Belgium SPRL</p> <p>Agree with the view that the WID should be revisited after the completion of the SI</p>
<p>17 – Sony Europe B.V.</p> <p>Do we need to approve a WID now when the objectives are unclear?</p> <p>On the power saving / energy efficiency enhancements, we would like to see some focus on using energy harvesting in the objectives. The justification talks about energy harvesting. Energy harvesting is of greater importance to IWSN than low power consumption on its own. It should be possible to operate IWSN without the need to change batteries. Energy harvesting allows this.</p>

2.3 Summary of initial round

Regarding the updated draft SID:

For the Justification part, several companies commented that the mentioning of energy harvesting should be removed since it is not in the scope of the SI objective. Some companies also commented that the last sentence regarding "RedCap UE type and framework" may not be adequate and it was suggested to replace it with the corresponding sentence from the draft WID.

Regarding targeted frequency ranges, bands, duplex modes, and subcarrier spacings, some companies discussed the possibility to limit the study to e.g. only FR1, or only FR1 FDD, or only FR1 with 15 kHz SCS for SSB. It may be worthwhile to include a question about this in the intermediate round to see whether there is broad support for such a limitation of the scope of the study.

Regarding UE bandwidth reduction, some companies proposed to clarify that there are several bandwidth reduction options to consider (DL and/or UL, RF and/or BB parts).

Regarding relaxed processing timeline, several companies expressed a preference to make it a separate bullet instead of a sub-bullet to the UE bandwidth reduction and reduced UE peak data rate. There were also suggestions to not mention the relaxed processing timeline at all or to include other techniques for relaxed processing.

Regarding the updated draft WID:

The overall RAN Rel-18 package in RP-213469 [4] was endorsed in the online (GTW) session on Monday 7th

December 2021. In line with the discussion during the online session and the majority of the responses to the WID related question in Section 2.2 in this document, the following proposal can be considered, and the remainder of the discussion in this meeting can focus on the SID drafting.

Proposal: Future Rel-18 RedCap WID discussion should use the October draft WID in RP-212705 as a starting point.

3 Intermediate round

3.1 Updated draft SID

An updated draft SID has been provided based on the feedback received in the initial round (see summary of the initial round in Section 2.3).

The updated draft SID can be found in the RAN#94-e drafts inbox:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-07-R18-RedCapEvo%5D/Intermediate_phase/RP-21xxxx_New_SID_on_further_complexity_reduction_v2.docx

The updated draft SID has the Justification and Objective as shown in Figure 1 and Figure 2, respectively.

Companies can provide input on the updated draft SID in the first feedback form below. In addition, companies are invited to provide input in the next feedback form regarding potential limitation of the SI scope with respect to frequency ranges, bands, duplex modes, and subcarrier spacings, and in the final feedback form regarding the proposal that further WID discussion should be based on the October draft WID.

Feedback Form 3: Views on the justification and objectives of the updated draft RedCap SID

1 – DOCOMO Communications Lab.

We are fine with the updated justification in general.

Regarding the 1st sub-bullet in objectives, the difference between "operation in a cell supporting Rel-17 RedCap UEs" and "coexistence of RedCap and non-RedCap UEs" is still unclear for us. Therefore, we suggest removing the former one (i.e., "operation in a cell supporting Rel-17 RedCap UEs") and update latter one as "coexistence of **Rel-17 and Rel-18** RedCap and non-RedCap UEs".

In addition, same as other companies, we prefer to list the potential techniques in SID objectives and at least reduced number of HARQ processes should be included.

2 – Spreadtrum Communications

Thank moderator for the great efforts. We are supportive of the current justification and objectives updated by moderator.

In addition to these objectives, as proposed by several companies in the first round, reducing the maximum number of HARQ processes in DL/UL should also be studied, since HARQ relaxation is also benefit to the cost/complexity (we want to mention this in the first round, but missed the deadline accidentally). As "etc" is removed, so we prefer to have an independent sub-bullet for HARQ.

3 Justification

5G aims to accelerate industrial transformation and digitalization, which improve flexibility, enhance productivity and efficiency, reduce maintenance cost, and improve operational safety. Industrial sensors play an important role for realizing such a vision. Not only widely used in industrial automation and digitalization use cases, industrial sensors are also widely used in the general environmental monitoring use cases such as monitoring of critical infrastructure (e.g., buildings, bridges, water dams, etc.) or monitoring for natural disasters (e.g., wild fire, flood, tsunami, earthquake, etc.).

Another emerging new class of new 5G use cases is the smart city vertical, which covers data collection and processing to more efficiently monitor and control city resources, and to provide services to city residents. Especially, the deployment of surveillance cameras is an essential part of the smart city but also of factories and industries.

Furthermore, there have been increasing interests in wearables use cases such as smart watches, eHealth related devices, and medical monitoring devices. These use cases call for different design considerations and have different requirements in terms of form factor, UE complexity and energy efficiency, compared to eMBB devices.

The support of industrial sensors, video surveillance, and wearables were the motivations behind Rel-17 RedCap. Through the Rel-17 NR RedCap work item, 3GPP has established a framework for enabling reduced capability NR devices suitable for a range of use cases, including the industrial sensors, video surveillance, and wearables use cases, with requirements on low UE complexity and sometimes also on low UE power consumption.

Now when the foundation has been laid in Rel-17, enhancements can be considered to improve the support for the mentioned use cases and also to expand RedCap into a new range of use cases such as smart grid ~~or devices operating on energy harvested from the environment~~.

To further expand the market for RedCap use cases with relatively low cost, low energy consumption, and low data rate requirements, e.g., industrial wireless sensor network use cases, some further cost and complexity reduction enhancements should be considered.

Rel-18 RedCap should provide NR support for low-tier devices between existing LPWA UEs and the capabilities of Rel-17 RedCap UEs. The supported peak data rate for Rel-18 RedCap targets to 10Mbps. Rel-18 RedCap should not overlap with existing LPWA solutions.

The enhancements should be introduced while maintaining the integrity of the RedCap ecosystem and maximizing the benefit of economies of scale. ~~The enhancements should be applicable to the RedCap UE type and framework defined in Rel-17. The SI targets enhancements applicable to the RedCap framework defined in Rel-17, including principles of network awareness of device capabilities.~~

Figure 1: Justification (intermediate round)

3 – CMDI

The first sub-bullet looks more like a note or description in justification rather than an objective.

In addition, as we commented in the first round, in the evaluation of cost and complexity, it should not only focus on capability reduction, it should also consider potential new capability for reducing the impact/burden on network. we propose adding a note as: it does not preclude new capability requirements for guarantee of network flexibility.

4 – Panasonic Corporation

On the first sub-bullet in objectives, our understanding is following.

- "operation in a cell supporting Rel-17 RedCap UEs" clarifies the relation between Rel.17 UEs in the same cell.
- "coexistence of RedCap and non-RedCap UEs" clarifies the relation between Rel.18 RedCap UEs and non-RedCap UEs.

4 Objective

4.1 Objective of Core part WI

To further reduce the complexity/cost of RedCap devices, the following should be studied, and the results should be captured in TR 38.875:

- Study further UE complexity / cost reduction techniques based on Rel-17 evaluation methodology [RAN1]
 - Consider network impact, compatibility with Rel-17 operation in a cell supporting Rel-17 RedCap UEs, coexistence of RedCap and non-RedCap UEs, UE impact, specification impact
 - Potential solutions, which may complement each other, for reducing device complexity/cost are, ~~e.g.~~, focusing on:
 - UE bandwidth reduction to 5MHz in FR1,
 - including bandwidth reduction in DL and/or UL
 - including bandwidth reduction in RF and/or BB parts
 - Including the possibility of relaxing UE processing timeline
 - reduced ~~the~~ UE peak data rate,
 - Including the possibility of relaxing UE processing timeline
 - ~~relaxing UE processing timeline,~~
 - relaxing UE processing timeline
 - ~~etc.~~

Figure 2: Objective (intermediate round)

If it needs to be merged, it can be described as "coexistence **among** Rel-18 RedCap UE, Rel.17 RedCap UE, and non-RedCap UEs **in a cell**".

5 – Apple Poland Sp. z.o.o.

On the first sub-bullet of coexistence, the simpler wording from DCM is sufficient and similar wording has been used in TS 38.875 for Rel-17 Redcap coexistence description. We support to add 'reduced number of HARQ processes in DL/UL' as a separate SID objective to minimize the cost.

6 – LG Electronics Inc.

We are fine in general with the justification part of the updated draft SID.

On the updated SI objectives, we have a concern on reiterating the same study and discussion on the relaxing UE processing timeline that we had in Rel-17, which we think is the reason that the relaxing UE processing timeline was put under the other two potential solutions in the previous version. To address our concern, we propose to clarify, e.g., by adding a note or sub-bullet, that "for the relaxing UE processing timeline, only the aspects related to the UE BW reduction to 5MHz in FR1 and reduced UE peak data rate will be considered."

7 – Samsung Electronics Polska

1. Different from LTE MTC study item, there is no whole band PDCCH in NR. Therefore, we think it is not clear for the case that only considers BB parts for BW reduction. And there may have some overlapping with UE peak data rate reduction, which, in our view, includes PRB restriction for PUSCH/PDSCH. Therefore, we would like to suggest the following changes:

- UE bandwidth reduction to 5MHz in **FDD band of FR1**
 - o including bandwidth reduction in DL and/or UL
 - o including bandwidth reduction in RF and/or BB parts
 - o **Note: Rel-15 SSB/CORESET #0 is reused**
- reduced UE peak data rate,
 - o **including bandwidth restriction for PUSCH/PDSCH**

2. We suggest to clarify what is “network impact”. For example, at least Network capacity and spectral efficiency, PDCCH blocking rate, as list in TR 38.875

3. The frequency ranges, bands, duplex modes, SCS shall be included in SID, based on the outcome of the next two questions. (show as the changes above, and as commented in next question)

8 – vivo Mobile Communication Co.

vivo: we have following comments

1. We support to make the relaxed UE processing timeline to the separate bullet, but it should be clarified that it includes the timeline for data and CSI. So, we suggest modifying as “relaxing UE processing timeline **for PDSCH/PUSCH and/or CSI**”

2. Same as some solutions/directions listed in UE bandwidth reduction, the possible directions like reduced maximum number of HARQ processes commented by several companies for reducing the UE peak data rate can be added as below

- reduced the UE peak data rate,
- **including reducing the maximum number of HARQ processes in DL and/or UL**

9 – SHARP Corporation

We are fine with the updated justification and objectives.

10 – ZTE Corporation

Similar comment as previous round. ”operation in a cell supporting Rel-17 RedCap UEs” should be removed. For simplicity, the first bullet in objective part can be modified as following:

- Consider network impact, ~~operation in a cell supporting Rel-17 RedCap UEs, coexistence of~~ **with** RedCap and non-RedCap UEs, UE impact, specification impact

11 – Xiaomi Communications

Based on the TR 38.875, it is observed that bandwidth reduction is the dominant factor for the cost reduction and the peak data rate reduction. While for the other solutions, e.g., reduced TBS, reduced HARQ process number, they were evaluated and discussed during the RedCap study but adopted in the RedCap WI phase considering limited gain. Considering this point, we prefer to remove the bullet of peak data rate reduction and focus on the UE bandwidth reduction

12 – Huawei Tech.(UK) Co.. Ltd

Justification

The justification is stable at this point. It could also mention ‘network access control’ after network awareness, but it’s not critical.

Objectives

We are a little surprised that the 5 MHz bandwidth bullet is suddenly rewritten, and think it is better to keep it as it was before. This is an SI, and the WGs can figure out what combinations of UL, DL, RF, BB they need to look at - they have plenty of experience in those angles.

On UE processing timeline, it seems to be an up-scoping to make it newly a standalone bullet. As others have suggested, it may be a part within peak rate reduction, and with that understanding the WGs can be left to decide to what extent to discuss it. Thus, “relaxed UE processing timeline” should be either a sub-bullet of peak rate reduction at most, or simply removed.

13 – Guangdong OPPO Mobile Telecom.

We are fine with the update.

14 – VODAFONE Group Plc

We’re generally fine with the updated draft SID. We also agree NTT Docomo and Apple’s comments on clarifying coexistence between R17/R18 RedCap UEs and non-RedCap UEs, and reducing maximum number of HARQ processes

15 – InterDigital Communications

We are supportive of the SID.

16 – Futurewei Technologies

The comments regarding the first bullet show that some clarification of deployment targets is needed to avoid the difficulties RAN1 encountered in Rel-17.

17 – Intel Corporation (UK) Ltd

We share the same view as DOCOMO that at least **reduced maximum number of HARQ processes for DL/UL** should be listed as one of the options. In addition, we still think **Type B HD-FDD** should be considered as an effective tool for further cost/complexity reduction.

We are fine with the clarification suggested by Vivo on relaxing minimum UE processing times that it includes data channels and/or CSI feedback.

18 – Ericsson LM

The updated justification and objective look fine to us. The list of potential solutions to study (UE BW reduction, reduced UE peak data rate, and relaxed UE processing timeline) should not be expanded further to avoid excessive discussion time, considering a planned 6-month SI duration.

19 – Everactive

We strongly disagree with removing energy harvesting as a use case for RedCap Evo in general. This is an important use case for the proliferation of RedCap devices that received support in prior email discussions. It is relevant to the ultimate (WID) objectives on eDRX and a lower transmit power mode. If it is removed as a use case for this SID, we encourage companies to reconsider including this use case for the WID.

To comment on the relevance to passive IoT - energy harvesting (EH) does NOT imply a passive device. For example, active cellular devices have been demonstrated with EH as a primary source of power. The objectives and use cases for passive IoT are very different from the use cases targeted by RedCap Evo.

20 – Nokia France

The latest version of the Justification and Objectives are OK.

21 – Deutsche Telekom AG

We appreciate the removal of "energy harvesting". Devices can use or not use energy harvesting technologies, this does not need a standard.

We are also surprised about the re-write of the bandwidth limitation in the update. With this wording it implies that there could be unsymmetric UL and DL bandwidth. This has never been the intention and we strongly discourage such a direction !

We also agree with DOCOMO and Vodafone on the question on co-existence of these REDCAPs with Rel-17 REDCAPS and non-REDCAPS in general.

22 – MediaTek Inc.

We are generally fine with the current version of the Justification and Objectives.

In addition, we are supportive of limiting the study on bandwidth reduction to 5MHz to FDD spectrum, as indicated in our response to the next question.

23 – Qualcomm Incorporated

We are fine with the justification part.

For the objective part, as pointed out by many companies, we suggest updating the first sub-bullet:

- Consider network impact, ~~operation in a cell supporting Rel-17 RedCap UEs, coexistence of~~ **with Rel-17 RedCap and non-RedCap UEs, UE impact, specification impact**

24 – Philips International B.V.

We are fine with the updated justification and objectives.

25 – Sequans Communications

We are generally fine with the update.

Feedback Form 4: Views on whether the SI scope should be limited certain frequency ranges, bands, duplex modes, and subcarrier spacings

1 – DOCOMO Communications Lab.

We agree with Samsung that it is beneficial to down-scope the target FR, duplex modes and SCS as FR1 FDD with 15kHz SCS in terms of standardization workload. If 30 kHz SCS is included as objective for UE bandwidth reduction to 5MHz, the current SSB design would not be reused. Then, the specification impact would increase significantly and it may require quite long-time discussion to specify. Furthermore, in Rel-17 RedCap WI, the discussion for reduced maximum UE bandwidth in TDD band was controversial and it is still ongoing. To avoid such heavy standardization workload, we support limiting SI scope as FR1 FDD with 15kHz SCS in SID.

2 – CMDI

It should be limited to FR1 FDD with 15KHz SCS in SID.

3 – Panasonic Corporation

Our view is SI scope itself is not required to limit 15 kHz SCS. 30 kHz or higher SCS cannot reuse current SSB would be rather outcome of the study when RF+BB is 5MHz limitation. When RF can be wider but only user data assignment is limited to 5MHz (i.e. SSB itself can be wider than 5MHz), it has backward compatibility including SSB and SIBs. Therefore, these aspect should be studied/concluded.

4 – LG Electronics Inc.

We are fine in general with limiting the SI scope for a reasonable workload. From our perspective, the SI scope may be limited to FR1 and 15kHz SCS. For further details, we prefer to leave them for further discussion during the SI phase.

5 – Samsung Electronics Polska

We think current SSB shall be reused for Redcap. Therefore, it is not able to support 30kHz SCS for SSB, which means Redcap with 5MHz RF bandwidth is not applicable for the bands that only support 30kHz SCS. Therefore, we suggest add

- UE bandwidth reduction to 5MHz in **FDD band of** FR1,

Or add a note under UE bandwidth reduction (with removal of “/or” for BB parts”)

-UE bandwidth reduction to 5MHz in FR1,

- including bandwidth reduction in DL and/or UL
- including bandwidth reduction in RF and/or BB parts
- **Note: Rel-15 SSB/CORESET #0 is reused**

On the other hand, we also understand that there is no need to put restriction of the other two techniques, i.e., peak data rate reduction and UE processing timeline reduction.

On Panasonic's comment, we think reuse SSB is the baseline of Rel-17 Redcap study item, which shall be followed for Rel-18 as well, especially considering the limited TU for this SI (1+1 TU in 6 months), otherwise, more TUs are needed.

6 – vivo Mobile Communication Co.

We are fine to limit the SI scope to FR1 only. The supported duplex mode(s) and SCS(s) in FR1 can be part of the study and also depend on the bandwidth reduction is only in BB part or RF+BB parts.

7 – Nordic Semiconductor ASA

We are fine to limit to FR1, but not OK to limit to 15kHz only. We believe R18 RedCap UEs could be capable to receive system information/SSB in 20MHz, but would not be able to receive dedicated signals or transmit in more than 5MHz, this would provide cost reduction and maintain good coexistence with legacy. Therefore, no need to restrict to 15kHz at this point yet, before these aspects have been studied.

8 – ZTE Corporation

We are OK to focus on or prioritize FR1 FDD with 15kHz in SID. However, it seems no need to conclude to preclude the other possibilities without sufficient discussion currently.

9 – Xiaomi Communications

We are OK to focus on the FR1. For the part e.g., SCS and duplex mode, they can be discussed and decided during the SI

10 – Lenovo (Beijing) Ltd

In general we prefer not to have such limitations at this stage. In the first subbullet, there is already "consider...specification impact". Potential limitations can be evaluated and discussed based on this during the SI phase.

11 – Huawei Tech.(UK) Co.. Ltd

We are ok to keep the limitation to FR1 as stated in the 5 MHz BW objective. We do not agree to limit the scope to particular SCS or FDD/TDD, because this is pre-judging the technical merits of such things before a SI has had a chance to look at their feasibility and benefits in the WGs.

12 – VODAFONE Group Plc

We share the same view as vivo, Lenovo and Huawei

13 – Futurewei Technologies

The study should consider operation in any band within FR1, any duplexing (TDD/FDD), and any SCS.

14 – Intel Corporation (UK) Ltd

In our view, it should be sufficient to limit to FR1 bands, while decision on FDD/TDD and SCS can be left up to the actual study in RAN1. Being too conservative at this stage may unnecessarily preclude use-cases and deployment scenarios for potential Rel-18 RedCap UEs with further reduced cost/complexity which would be undesirable.

15 – Ericsson LM

We think Rel-18 eRedCap should have the same scope with respect to these aspects as Rel-17 RedCap. Any reduction of the duplex mode/FR2 support would be limiting for the intended use cases. Any reduction of the supported SCSs would be limiting for the eRedCap deployment. That is, RedCap is likely to be rolled out as a software upgrade in existing deployments, and it may be very limiting if that would be possible only in NR deployments with 15 kHz SCS.

16 – Everactive

Should the scope be limited in any way, the reduced scope should include FR1 and FDD.

17 – Deutsche Telekom AG

A reduction of the scope to consider FR1 FDD and TDD is preferred, while the numerologies should cover the widely deployed ones. If we are too restrictive we are going to fragment the market even further ...

18 – Nokia France

We are fine to limit the scope to FR1 and 15kHz SCS.

19 – Qualcomm Incorporated

We are fine with the limitation to FR1 as stated in the 5 MHz BW bullet. However, it is not necessary to limit the SCS and duplex in the SID. RAN1 will discuss this during the SI.

20 – MediaTek Inc.

We support reusing the current SSB for RedCap, and therefore support limiting the scope of the study on UE bandwidth reduction to FDD FR1 bands.

We also agree with Samsung that such restrictions only apply to the technique of UE bandwidth reduction to 5MHz, and is not needed for the others (peak data rate restriction and processing timeline relaxations).

21 – Apple Poland Sp. z.o.o.

It is reasonable to limit FR1 for this study item. However, it is pre-mature or even unreasonable to conclude 15kHz SCS only before study is conducted in working group level. The SSB/CORESET#0 issue is understood. However, it is also pretty clear that supporting 15kHz only will significantly limit the use case of Rel-18 eRedcap and make it sort of useless since vendors likely have no any commercial interest for it, given the fact that other SCSs are widely used in network and can not be accessed by Rel-18 eRedcap devices. It is unlikely that operator will re-deploy 15kHz SCS in order to accommodate the Rel-18 eRedcap devices. Without economies of scale, it is questionable whether we can practically reduce the cost even the supported BW is reduced to 5MHz.

22 – Philips International B.V.

We agree with Nordic

23 – Sequans Communications

The SI has already the FR1 limitation, and given it also considers "specification impacts", potential further limitations should be analyzed and discussed as part of the SI.

3.2 Starting point for WID discussion

Feedback Form 5: Views on the proposal that future Rel-18 RedCap WID discussion should use the October draft WID in RP-212705 as a starting point

1 – DOCOMO Communications Lab.

We are fine with the proposal.

2 – Spreadtrum Communications

We are fine with moderator's proposal, i.e., Future Rel-18 RedCap WID discussion should use the October draft WID in RP-212705 as a starting point.

In addition, we want to remind that the detailed objectives for the TBD part will impact the TU arrangement. For example, if both 5MHz and reduced peak data rate are need to be specified, the required TU for WI may increase. So we prefer adding bracket [X] for Rel-18 RedCap WID TU arrangement later at this stage.

3 – Panasonic Corporation

We think no discussion on WID in this meeting already imply "future Rel-18 RedCap WID discussion should use the October draft WID in RP-212705 as a starting point". Therefore, although we agree the proposal, it is also not so necessary to conclude so.

4 – Apple Poland Sp. z.o.o.

October draft WID in RP-212705 is the latest version and naturally to serve as the starting point for further WID discussions. On the other hand, given the guideline from Mr.chairman i.e., no approval of Rel-18 eRedcap WID in the meeting, there is no need to conclude on this regard.

5 – Nordic Semiconductor ASA

We agree with Apple and Panasonic input

6 – LG Electronics Inc.

We agree with the Moderator's summary and the proposal on this issue.

7 – Samsung Electronics Polska

For the draft WID, we have the following comments:

1 **Justification part** can be updated with SID. And put all the related text on complexity reduction in to bracket, as a place holder.

1 Objective part:

- Power saving part on eDRX can be a starting point of WID.
- Bracket for complexity reduction part as:
 - *[TBD based on SI outcome: Further reduced UE cost / complexity [RAN1]]*
- NOTE on frequency range need to be in bracket as well

<p>– [This WI considers all frequency ranges and all applicable duplex modes unless otherwise specified.]</p> <p>We also share similar view with Apple and Panasonic to not conclude on WID, however, we think eDRX part should be stable.</p>
<p>8 – vivo Mobile Communication Co.</p> <p>We are fine with the proposal. Also share the views with Panasonic and Apple.</p>
<p>9 – SHARP Corporation</p> <p>We are OK with the moderator’s proposal and share the same view with Panasonic and Apple.</p>
<p>10 – ZTE Corporation</p> <p>We are fine with it.</p>
<p>11 – VODAFONE Group Plc</p> <p>We support moderator’s proposal</p>
<p>12 – Guangdong OPPO Mobile Telecom.</p> <p>We are fine for the proposal.</p>
<p>13 – Futurewei Technologies</p> <p>We are ok to use the October draft WID as a starting point but no conclusion on the WID is necessary.</p>
<p>14 – Intel Corporation (UK) Ltd</p> <p>We are fine with the proposal.</p>
<p>15 – Ericsson LM</p> <p>We are fine with the proposal. Objectives on eDRX and lower UE power class are clear enough and the objectives related to the SI outcome will anyway be added later.</p>
<p>16 – Everactive</p> <p>We support the moderator’s proposal.</p>
<p>17 – Deutsche Telekom AG</p> <p>No need to discuss now in RAN#94e – we discuss when the time is ready.</p>
<p>18 – Nokia France</p> <p>We agree</p>
<p>19 – MediaTek Inc.</p> <p>From the discussions in October, we have identified that eDRX work in RRC_INACTIVE has SA2 and CT1 dependencies (as stated in RP-212705). Given that this is a stable objective, it is also clear that RAN will work on this in Rel-18 (regardless of whether the work starts right away or at a later point in time).</p>

However, it is important that **we indicate now to SA and CT** that RAN will work on eDRX in this release, **so that they can plan their work** accordingly.

Ideally, we should approve the WID with just the eDRX objective, along with a Note that the other objectives will be updated at a later point in time. If we do not intend to approve a WID in RAN#94e, we should at least agree that '*RAN will work on eDRX > 10.24s in RRC_INACTIVE in Rel-18*', to help SA and CT groups to plan their work.

20 – Qualcomm Incorporated

We are fine with the proposal.

21 – Philips International B.V.

We agree with Panasonic and Apple

22 – Sequans Communications

We are fine with the proposal.

23 – Sony Europe B.V.

We are fine with the proposal

3.3 Summary of intermediate round

Regarding the updated draft SID:

A vast majority of companies expressed that they would prefer or be fine with limiting the SI scope to FR1. Some companies also wanted to limit the SI scope to FDD and/or 15 kHz SCS, whereas others did not want to limit the SI scope with respect to duplex modes and subcarrier spacings.

Several companies expressed that they would like to clarify the formulation about coexistence of Rel-17 and Rel-18 RedCap and non-RedCap UEs in a cell.

Some companies expressed concerns with the new sub-bullets to the bullet on UE bandwidth reduction, and some wanted to clarify that Rel-15 SSB/CORESET#0 is reused. Some companies preferred to mention the possibility of restricted PDSCH/PUSCH bandwidth reduction under the bullet on reduced UE peak data rate rather than under the bullet on UE bandwidth reduction.

One company wanted to clarify that aspects such as operation in a separate BWP without SSB should be considered in the evaluation of UE cost/complexity and NW impacts and that introduction of new capabilities in order to guarantee NW flexibility should not be precluded.

Some companies expressed that they would like to see the possibility of relaxed UE processing timeline as a sub-bullet to reduced UE peak data rate, and some wanted to clarify that the relaxed UE processing timeline concerns PDSCH/PUSCH/CSI.

Several companies expressed that they would like to include the possibility of reduced maximum number of HARQ processes in the SI scope, and some expressed that they think it could be a sub-bullet of the reduced UE peak data rate.

Regarding the WID discussion:

Companies were generally fine with the proposal to use the October WID draft as a starting point for further WID drafting in future RAN plenary meetings, and several companies commented that this proposal would not require any agreement in this meeting.

One company proposed to agree that 'RAN will work on eDRX > 10.24s in RRC_INACTIVE in Rel-18' to help SA and CT groups to plan their work.

4 Final round

4.1 Updated draft SID

An updated draft SID has been provided based on the feedback received in the initial round (see summary of the initial round in Section 3.3).

The updated draft SID can be found in the RAN#94-e drafts inbox:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-07-R18-RedCapEvo%5D/Final_phase/RP-21xxxx_New_SID_on_further_complexity_reduction_v3.docx

The updated draft SID has the Objective as shown in Figure 3.

Feedback Form 6: Views on the justification and objectives of the updated draft RedCap SID

<p>1 – DOCOMO Communications Lab.</p> <p>We support updated draft SID.</p>
<p>2 – CMDI</p> <p>It seems the objectives in NWM and draft SID are not fully aligned, in details, in NWM, the note for w/o SSB is missing compared to the draft SID.</p> <p>we are fine with the version of draft SID instead of the one here.</p>
<p>3 – Panasonic Corporation</p> <p>We support the proposal and we would like to be supporting company.</p> <p>PS. as the reply to Samsung: Yes, SSB/CORESET#0 shall be reused. It is the discussion on whether data assignment only has 5MHz limitation as also explained by Nordic.</p>
<p>4 – Spreadtrum Communications</p> <p>Thank moderator for the great efforts, some further comments are as follows:</p> <ol style="list-style-type: none">1. As mentioned by CMDI, we also noticed that the objectives in NWM and draft SID(in inbox) are not fully aligned, and we think the draft SID(in inbox) is the correct one.2. For the second sub-bullet of the “Potential solutions” part, e.g., reduced UE peak data rate in FR1. Although we can focus on FR1, we should not exclude SI output for reduced UE peak data rate in FR1 can

be applied to FR2 in WI stage. Since the solutions may be applicable to all frequency bands.

3. For “relaxed UE processing timeline” and “reduced maximum number of HARQ processes”, we still think they are not belong to reduced UE peak data rate. These two features can also be a complement solution with UE bandwidth reduction to 5MHz in FR1, therefore, they should be separate bullets.

Base on the above, we have the following suggestions for the current SID.

Potential solutions, which may complement each other, for reducing device complexity/cost are focusing on:

- o UE bandwidth reduction to 5MHz in FR1,
 - Note 1: Rel-15 SSB/CORESET#0 is reused.
 - **Note 2: Operation in separate BWP with/without SSB should be considered.**
- o reduced UE peak data rate in FR1,
 - including the possibility of restricted bandwidth for PDSCH and/or PUSCH
 - **Note 3: it does not exclude SI output for reduced UE peak data rate in FR1 can be applied to FR2 in WI stage.**
 - ~~including the possibility of relaxed UE processing timeline for PDSCH and/or PUSCH and/or CSI~~
 - ~~including the possibility of reduced maximum number of HARQ processes for DL and/or UL~~
- o **Relaxed UE processing timeline for PDSCH and/or PUSCH and/or CSI**
- o **Reduced maximum number of HARQ processes for DL and/or UL**

5 – Ericsson LM

As moderator Unfortunately, the objective listed in Figure 3 was not aligned with the updated draft SID. The bullet ”Note: Operation in separate BWP with/without SSB should be considered” was missing in Figure 3. Figure 3 has now been updated with the missing bullet. Sorry about the confusion.

6 – DENSO CORPORATION

The latest update looks good in shape to us.

7 – vivo Mobile Communication Co.

We are fine with the updated SID and would like to be the supporting company. As for Spreadtrum’s comments to have separate bullets of ”relaxed UE processing timeline” and “reduced maximum number of HARQ processes”, given the main bullet says ”Potential solutions, **which may complement each other**, for reducing device complexity/cost”, our understanding is they can also be used for bandwidth reduction to 5MHz in FR1.

8 – CATT

We support the latest draft SID.

9 – Xiaomi Communications

Generally, we are OK the SID.

And we only have a small comment on the Note: Rel-15 SSB/CORESET#0 is reused. Since the bandwidth of CORESET#0 can be up to 96 RBs, then it is difficult reuse the R15 CORESET#0 in many cases. Considering this point, we prefer to remove CORESET#0 in the note

Note: Rel-15 SSB/CORESET#0 is reused

10 – Intel Corporation (UK) Ltd

We are mostly fine with this version, except that the bullets on the relaxed min. UE processing times and reduced max number of HARQ processes should NOT be sub-bullets under peak rate reduction. For example, it is not clear how CSI processing times cause peak rate reduction. Similarly, PDSCH/PUSCH processing times and max number of HARQ processes may not always affect achievable peak rates in all configurations. Thus, we do not see a technical reason that these bullets should be under the “reduce peak rate” bullet.

To the comment from vivo that we can rely on “complement each other”, we actually see this as a motivation then to keep them at same level as the other two. For instance, it is not clear how to interpret the currently proposed “nesting approach” – e.g., why should a combination of BW reduction and reduced # of HARQ processes or a combination of BW reduction and relaxed UE processing time for PDSCH/PUSCH and/or CSI feedback be precluded? And if they are not precluded then what is the justification for the current way of listing them?

There is already a preface that some of these solutions may complement each other and therefore, there is no need to try to “nest them”.

On the newly added note on “separate BWP” while the idea may be understandable, use of “separate BWP” is not clear – separate from what? Perhaps using just “BWP” w/o “separate” is sufficient and more accurate in terms of its original intention?

In summary, we propose the following:

- 1. Move the bullet on relaxed *minimum* UE processing times for PDSCH/PUSCH and/or CSI to the same level as other solutions (BW reduction, peak rate reduction)**
- 2. Move the bullet on reduced maximum number of HARQ processes for DL/UL at the same level of indentation as other solutions (BW reduction, peak rate reduction).**
- 3. For the note on “separate BWP”, change to “a BWP”.**

11 – Apple Poland Sp. z.o.o.

We share the same concerns as Intel.

In brief, we do not see any reasoning to put ‘processing relaxation’ and ‘reduced number of HARQ processes’ under the objective ‘peak data rate reduction’, which are independent feature without any coupling. We therefore support the 1st and 2nd proposal from Intel to put them on the same level.

12 – Nordic Semiconductor ASA

- We are fine with moving BB BW limitation to next bullet, but it should include also PRACH, SRS in this case, therefore we suggest the following

o **including the possibility of restricted BW for channels and signals**

- Agree with Intel that separate BWP should be changed to "**dedicated BWP**" or "**a BWP**"
- Still wondering why "**relaxing DL-UL switching gap**" cannot be listed as one of study points.

13 – Transsion Holdings

We are fine with the latest draft SID.

14 – VODAFONE Group Plc

We support the updated draft SID and agree with Intel's suggestions

15 – SHARP Corporation

We are OK with the current description.

16 – NEC Corporation

We are fine with the updated draft SID.

17 – Huawei Tech.(UK) Co.. Ltd

We agree with the comment by Xiaomi on removing the CORESET#0 statement, because there are technical aspects that need to be considered at WG level due to the bandwidth reduction. RAN1 can decide to include/exclude those aspects on the basis of feasibility during the SI.

The added note on BWP with/without SSB would benefit from a small clarification to avoid re-discussion of points from Rel-17:

- Note: Operation in separate BWP with/without SSB (**i.e. with RF retuning**) should be considered.

The reduced peak rate bullet seems to have de-stabilized and now includes points which have not had any meaningful discussion, and/or raised by just one company. We suggest removing all, and going back to the simplified single bullet that has been quite stable until recently. There is adequate time and technical familiarity in RAN1 (e.g. a preceding SI with TR 38.875) to investigate as much or little as needed. In particular, the bandwidth reduction for PDSCH/PUSCH should not be there, since it has not been discussed what number(s) of PRBs are considered (anything from 1 PRB upwards? Other?), nor how it disrupts the objective on UE bandwidth reduction. It seems to cause a lot of confusion between RF and BB between and within the different objectives.

18 – ZTE Corporation

We are fine with the updated version.

19 – CAICT

We can support the draft SID.

20 – Samsung Electronics Polska

We are fine with this version, also fine with Intel’s suggestion to delete ”separate” for the Note for BWP. Reusing the Rel-15 design for initial access is the basic assumption for r18 RedCap SI with only 2 TUs in 6 months. And we don’t agree with Xiaomi’s comments that not support 96 PRBs for CORESET #0 becomes an issue. Therefore, we support to keep the note for SSB/CORESET #0.

21 – Guangdong OPPO Mobile Telecom.

We are fine to keep remove the CORESET#0 suggested by spreadtrum.

We were also indicate that the relaxing timeline bullet could promoted and be stated only once. But we are also OK for updating of the part.

22 – LG Electronics Inc.

We are mostly fine with the latest update. We just have a few minor comments.

For the note “Rel-15 SSB/CORESET#0 is reused”, some of the CORESET#0 may not be available for Rel-18 RedCap UEs with 5MHz UE bandwidth. To reflect this situation better, we suggest the following additions:

“Note: Rel-15 SSB/CORESET#0 is reused **if applicable.**”

Or, removing CORESET#0 is also fine for us.

For the last note on the operation of separate BWP with/without SSB under the UE bandwidth reduction to 5MHz in FR1, we wonder if it is really needed. What the note is trying to say is not precluded anyway without the note and the note itself doesn’t help limit or clarify the scope of this SI.

23 – Nokia France

Thank you for the good refinement of this SID. A couple of remaining comments:

1. We agree with the companies who propose that the bullets on relaxed UE processing timeline and reduced max number of HARQ processes should be promoted.
2. As already implied by a number of companies, there may be some aspects of CORESET#0 that cannot be directly reused. We suggest softening the statement to ”Note: The basic design of Rel-15 SSB/CORESET#0 should be reused”.

24 – Lenovo (Beijing) Ltd

Similar with Xiaomi, Huawei, Nokia and others, we also think CORESET#0 cannot be directly reused. Prefer to remove CORESET#0 in the note.

We are in general fine with other proposals.

25 – Ericsson LM

Regarding BW reduction options, it is important that the SI scope includes study of different BW reduction options, i.e., not only RF+BB bandwidth reduction but also BB-only bandwidth reduction. We are fine with capturing this aspect either under the UE bandwidth reduction bullet or under the UE peak data rate reduction bullet or as a separate bullet, as long as it is clear that not only RF+BB bandwidth reduction but also BB-only bandwidth reduction is in the SI scope. One option that seems attractive is BB-only bandwidth reduction for PDSCH/PUSCH (to approximately 5 MHz).

Regarding the note that Rel-15 SSB is reused, it seems to imply that the potential 5-MHz RedCap UE might be restricted to deployments using 15 kHz SCS. If support of >15 kHz SCS is to be considered in the

WI, it should also be included in the SI scope. In that case, a note stating, e.g., that “Deployment options should not be restricted compared to Rel-17 RedCap” would be useful.

Regarding FR2, we agree with Spreadtrum’s proposal to add a note stating that it is not precluded that the solutions for reduced UE peak data rate in FR1 can be applied to FR2 in WI stage.

26 – MediaTek Inc.

Thank you for your work on moderating this discussion.

We share the same concern as Intel and others, that the bullets on ‘*relaxed UE processing timeline*’ and ‘*reduced number of HARQ processes*’ should move up a level and not be dependent on the objective of ‘*peak data rate reduction*’. As commented in the initial round, these techniques work independently of the objective of ‘*peak data rate reduction*’ and an artificial dependency between them should not be introduced. They can, of course, complement each other as indicated in the top level objective.

We are ok with the remaining text in this draft.

27 – Futurewei Technologies

Since the list of examples does not appear to be inclusive, it is probably better to remove the list. But, given the interest in the timeline subbullet, it should be promoted into its own bullet.

28 – Qualcomm Incorporated

We also suggest removing CORESET#0 in the note as the meaning of “reused” is not clear for CORE-SET#0.

We share the views that the bullets on ‘*relaxed UE processing timeline*’ and ‘*reduced number of HARQ processes*’ does not depend on the objective of ‘*peak data rate reduction*’ so either the bullets go up by one level (preferred) or same bullets have to be added under ‘*UE bandwidth reduction to 5MHz in FR1*’.

29 – Philips International B.V.

We agree with Intel’s suggestions

30 – Sony Europe B.V.

We agree with Intel and other companies that UE processing times and reduced max number of HARQ processes should not be sub-bullets of “reduced peak data rate”.

Agree with Ericsson that for bandwidth reduction “*the SI scope includes study of different BW reduction options*”. We think that the current formulation in the SID allows for the study of different BW reduction options since it doesn’t list a restricted set of options. We are hence OK with the bandwidth reduction in the current SID.

31 – Sequans Communications

We are generally ok. We would also agree with Intel’s suggestion regarding moving the bullets on ‘*relaxed UE processing timeline*’ and ‘*reduced number of HARQ processes*’. We also agree with Ericsson’s comment regarding BW reduction options, and it seems the formulation allows for such study.

Feedback Form 7: Please indicate whether you would like to co-source the SID

<p>1 – DENSO CORPORATION</p> <p>We would appreciate if "DENSO CORPORATION" could be a supporting company. Thank you in advance.</p>
<p>2 – DOCOMO Communications Lab.</p> <p>We would like to be a supporting company as "NTT DOCOMO, INC."</p>
<p>3 – CATT</p> <p>CATT would like to be a supporting company. Thanks.</p>
<p>4 – Xiaomi Communications</p> <p>Please include Xiaomi in the supporting company list</p>
<p>5 – Nordic Semiconductor ASA</p> <p>Nordic is happy to co-source the SID, given that wording is updated as following "<u>possibility of restricted BW for PUSCH/PDSCH channels and signals</u>" maybe the best if this sub-bullet would be made as a main bullet</p>
<p>6 – Transsion Holdings</p> <p>We Transsion would like to be a supporting company.</p>
<p>7 – SHARP Corporation</p> <p>"SHARP" would like to be a supporting company. Thanks.</p>
<p>8 – Honor</p> <p>Many thanks to the moderator for the great effort. Please add "HONOR" to the list of supporting companies.</p>
<p>9 – NEC Corporation</p> <p>NEC is happy to co-source the SID.</p>
<p>10 – ZTE Corporation</p> <p>We are happy to co-source as adding the "ZTE Corporation" and "Sanechips" to the supporting list.</p>
<p>11 – CAICT</p> <p>CAICT would like to be a supporting company.</p>
<p>12 – Guangdong OPPO Mobile Telecom.</p> <p>OPPO is supporting company.</p>

13 – Nokia France

Please add Nokia and Nokia Shanghai Bell. Thank you.

14 – Lenovo (Beijing) Ltd

Please add Lenovo and Motorola Mobility as the supporting companies, thanks.

15 – Futurewei Technologies

Please add FUTUREWEI

16 – Qualcomm Incorporated

Qualcomm would like to co-source the SID on condition that our comments are reflected in the SID.

17 – Philips International B.V.

Please add Philips as a supporting company for this WID

18 – Sony Europe B.V.

Please add SONY as a supporting company

19 – Sequans Communications

Please add Sequans as a supporting company.

4 Objective

4.1 Objective of Core part WI

To further reduce the complexity/cost of RedCap devices, the following should be studied, and the results should be captured in TR 38.875:

- Study further UE complexity / cost reduction techniques based on Rel-17 evaluation methodology [RAN1]
 - Consider network impact, compatibility with Rel-17 operation in a cell supporting Rel-17 RedCap UEs, coexistence of Rel-17 and Rel-18 RedCap and non-RedCap UEs in a cell, UE impact, specification impact
 - Potential solutions, which may complement each other, for reducing device complexity/cost are, e.g., focusing on:
 - UE bandwidth reduction to 5MHz in FR1,
 - including bandwidth reduction in DL and/or UL
 - including bandwidth reduction in RF and/or BB parts
 - Including the possibility of relaxing UE processing timeline
 - Note: Rel-15 SSB/CORESET#0 is reused.
 - Note: Operation in separate BWP with/without SSB should be considered.
 - reduced ~~the~~ UE peak data rate in FR1,
 - including the possibility of restricted bandwidth for PDSCH and/or PUSCH
 - Including the possibility of relaxing UE processing timeline
 - including the possibility of relaxed UE processing timeline for PDSCH and/or PUSCH and/or CSI
 - including the possibility of reduced maximum number of HARQ processes for DL and/or UL
 - ~~relaxing UE processing timeline,~~
 - ~~relaxing UE processing timeline~~
 - ~~etc.~~

Figure 3: Objective (final round)

4.2 Proposal regarding eDRX

As mentioned in the summary of the intermediate round in Section 3.3, companies generally agree that there is no need to discuss the draft WID further in RAN#94e, but one company proposed to agree already in RAN#94e that 'RAN will work on eDRX > 10.24s in RRC_INACTIVE in Rel-18' to help SA and CT groups to plan their work.

Feedback Form 8: Views on the proposal to agree already in RAN#94e that 'RAN will work on eDRX > 10.24s in RRC_INACTIVE in Rel-18' to help SA and CT groups to plan their work

1 – MediaTek Inc.

The eDRX objective has been quite stable for a while now, and it is clear that RAN will work on this objective in Rel-18. However, this work on eDRX has SA2 and CT1 dependencies as identified in the draft WID (RP-212705), and these related aspects need to be addressed by SA and CT groups in parallel with RAN.

It is therefore important that RAN agrees to the proposal above now (regardless of when the work will actually start in the Rel-18 timeframe), so that SA and CT can plan their work on these dependent aspects.

2 – Panasonic Corporation

Based on the explanation from MediaTek, we understand the need to agree 'RAN will work on eDRX > 10.24s in RRC_INACTIVE in Rel-18'. We support to capture it in the minutes. (If necessary, it can be sent LS).

3 – vivo Mobile Communication Co.

We understand the explanation from MediaTek. Since both the enhanced eDRX > 10.24s in RRC_INACTIVE and support for lower UE power class objectives are stable, it is fair and better to endorse above two stable proposals for Rel-18 eRedCap in this meeting.

4 – Intel Corporation (UK) Ltd

To our understanding SA2 is discussing the work on eDRX>10.24s for RRC_INACTIVE in Rel-18. RAN2 already agreed to support it in Rel-17, but has to stop the work since SA2/CT1 cannot work on it in Rel-17. To avoid the same situation of happening again, it would be good to wait for SA2 and then work on it if/when SA2/CT1 confirm that it is feasible in Rel-18. Therefore we do not see the need to rush. The proposal of WID can be approved once the SI is completed.

5 – MediaTek Inc.

In response to Intel:

The situation in Rel-17 was that the request from RAN to SA/CT on eDRX in Inactive mode came midway through the release once the SI was complete. As this request was very late in the release cycle, SA2 and CT1 did not have the time available to accommodate this work (despite their willingness to do this). If we again wait for the Rel-18 SI completion before agreeing to work on this objective (despite there being no dependency of this objective with the SI), we risk a repeat of the Rel-17 scenario in Rel-18, i.e. that we leave SA and CT with too little time again.

This work on eDRX in Inactive is RAN-driven as the power savings are in RAN. SA/CT can only decide whether to work on this, if RAN has committed to work on this objective in Rel-18.

<p>6 – CATT</p> <p>We support the proposal from MediaTek to avoid the same situation as in Rel-17.</p>
<p>7 – VODAFONE Group Plc</p> <p>We support the proposal</p>
<p>8 – ZTE Corporation</p> <p>The LS can be sent to ask SA/CT whether eDRX>10.24s can be supported.</p>
<p>9 – Samsung Electronics Polska</p> <p>We support the proposal.</p>
<p>10 – Deutsche Telekom AG</p> <p>We also support capturing this at RAN#94e</p>
<p>11 – LG Electronics Inc.</p> <p>We share a similar view with Intel. We are not sure if agreeing on part of the WI objectives in advance can help SA2 plan their work.</p>
<p>12 – Nokia France</p> <p>We support capturing this in the minutes.</p>
<p>13 – Ericsson LM</p> <p>We are fine with the proposal.</p>
<p>14 – Futurewei Technologies</p> <p>We do not support this proposal. It should be business as usual to draft the WID at that time; we should not be piecemeal approving the future WID now.</p>
<p>15 – Huawei Tech.(UK) Co.. Ltd</p> <p>There is ongoing discussion relating to this in SA2.</p>
<p>16 – Qualcomm Incorporated</p> <p>We support the proposal to agree that 'RAN will work on eDRX > 10.24s in RRC_INACTIVE in Rel-18'. If this is agreeable in RAN#94e, we are also fine to start the work on eDRX > 10.24s in RRC_INACTIVE in RAN2/3 first from Q2 2022 if possible as it is helpful for SA and CT to get RAN2/3 feedbacks on their solutions which are likely to be available in Q1 2022.</p>
<p>17 – Philips International B.V.</p> <p>We support the proposal from MediaTek</p>

4.3 Summary of final round

Regarding the updated draft SID:

Regarding relaxed UE processing timeline and reduced number of HARQ processes, many companies express that they would like these subbullets to be promoted to the same level as (or possibly be listed as subbullets under both of) the bullets on UE bandwidth reduction and reduced UE peak data rate.

Regarding UE bandwidth reduction, several companies proposed to remove or soften the note that CORESET#0 should be reused. Some companies proposed to remove the word "separate" from the note about "operation in separate BWP", and one company proposed to clarify that "without SSB" means "with RF retuning".

Regarding FR2, two companies proposed to note that it is not precluded that solutions for FR1 can be applied to FR2 in WI stage.

Regarding reduced UE peak data rate through restricted bandwidth, some companies expressed that this should be seen as a UE bandwidth reduction option. One company proposed to replace "PDSCH and/or PUSCH" with "channels and signals" in order to include also PRACH and SRS.

Finally, one company proposed to include study of relaxed DL-UL switching gap in the SI scope.

Regarding eDRX:

Although companies generally agree that there is no need to discuss the draft WID further in RAN#94e, most companies expressed that they are fine to agree already in RAN#94e that 'RAN will work on eDRX > 10.24s in RRC_INACTIVE in Rel-18' to help SA and CT groups to plan their work. Some companies think that this can wait till the WID drafting in a future RAN plenary meeting, though. Based on the received responses, the following proposal can be considered.

Proposal: Capture in the minutes that RAN expects to work on eDRX > 10.24s in RRC_INACTIVE in Rel-18.

5 Conclusion

An email discussion summary was provided in RP-213487 [5] and a corresponding SID proposal in RP-213521 [6].

After discussion in an online (GTW) session on Thursday 10th December 2021, it was concluded to continue the discussion the following week based on the draft SI objective in Figure 4.

The updated draft SID can be found in the RAN#94-e drafts inbox:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-07-R18-RedCapEvo%5D/Final_phase/RP-21xxxx_New_SID_on_further_complexity_reduction_v4.docx

A corresponding updated draft SID has been provided in RP-213582 [7].

Regarding the proposal in Section 4.3 to capture in the minutes that RAN expects to work on eDRX > 10.24s in RRC_INACTIVE in Rel-18, it was concluded in the online session that such an agreement would not be

needed at this point, but that it can be assumed there is a "gentlemen's agreement" that such RAN work will be done in Rel-18.

- Study further UE complexity/cost reduction techniques based on Rel-17 evaluation methodology [RAN1]
 - Consider network impact, coexistence of Rel-17 and Rel-18 RedCap and non-RedCap UEs in a cell, UE impact, specification impact
 - Potential solutions, which may complement each other, for reducing device complexity/cost are focusing on:
 - UE bandwidth reduction to 5MHz in FR1,
 - Note: The basic design of Rel-15 SSB/CORESET#0 should be reused.
 - Note: Operation in BWP with/without SSB and without/with RF retuning should be considered.
 - Possibly relaxed UE processing timeline for PDSCH and/or PUSCH and/or CSI
 - reduced UE peak data rate in FR1,
 - including the possibility of restricted bandwidth for PDSCH and/or PUSCH
 - Possibly relaxed UE processing timeline for PDSCH and/or PUSCH and/or CSI
 - Note: It is not precluded that solutions for FR1 can be applied to FR2 in WI stage.

Figure 4: Bullets in objective (update from online session)

6 References

1. RP-212665, "Moderator's summary for discussion [RAN94e-R18Prep-05] RedCap (Reduced Capability) Evolution", Ericsson
2. RP-212732, "New SI: Study on further reduced RedCap UE complexity / cost for NR", Ericsson (Moderator)
3. RP-212705, "New WI: Enhanced support of reduced capability NR devices", Ericsson (Moderator)
4. RP-213469, "Summary for RAN Rel-18 Package", RAN Chair (Qualcomm), RAN1 Chair (Samsung), RAN2 Chair (MediaTek), RAN3 Chair (ZTE), RAN4 Chair (Huawei)
5. RP-213487, "Moderator's summary of discussion [94e-07-R18-RedCapEvo]", Ericsson

6. RP-213521, "New SID on further NR RedCap UE complexity/cost reduction", Ericsson

7. RP-213582, "New SID on further NR RedCap UE complexity/cost reduction", Ericsson