[97e-14-R18-LP-WUS] - Version 0.0.6
RAN

3GPP TSG RAN Meeting #97e RP-222574

Electronic Meeting, September 12 - 16, 2022

Source: vivo (Moderator)

Agenda item: 9.2.9

Title: Moderator's summary for discussion [97e-14-R18-LP-WUS]

Document Type: Report

1 Introduction

This email discussion covers the following Tdoc submitted to RAN#97e

RP-222442 Discussion on Rel-18 Low-power WUS ZTE, Sanechips

The above Tdoc discussed the SID objectives of Rel-18 low-power WUS/WUR study item (latest approved SID in RP-221271), with following proposals:

- Proposal 1: Clarify whether NB-IoT/MTC use case is studied in the SI stage.
- Proposal 2: Consider to modify text proposal for coverage availability in the objective part of the SID

2 Initial Round

2.1 Issue#1: Whether LTE NB-IoT/MTC is in scope of the study

As stated in SID title "Study on low-power Wake-up Signal and Receiver **for NR**" and Acronym "FS_**NR**_LPWUS", the study is for NR only thus LTE NB-IoT/MTC is not in scope of the study.

Moderator proposal 1: The Rel-18 study on low-power WUS/WUR is for NR only and LTE NB IoT/MTC is not in scope of the SI, no need for SID update.

Feedback Form 1: Do you agree with moderator proposal 1?

1 – Guangdong OPPO Mobile Telecom. We understand the item is for NR not for LTE. It seems the SID did not explicitly state that.
2 – Nordic Semiconductor ASA Do not support. The WUR can wake up any 3GPP technology, is it NR, LTE or LPWA. Therefore, at least

within SI, this should not be precluded.

3 – Panasonic Corporation

We support the view.

4 – Ericsson LM

Yes

5 – ROBERT BOSCH GmbH

We support the limitation to 3GPP NR only.

6 – CATT

We also support to limit the scope of Low-power WUS for NR only at this time.

7 – Huawei Tech.(UK) Co.. Ltd

This is an NR SI, as indicated in its title and WI code, as well as implied by the related WIs section of the SID, and the 38-series number of the output TR (rather than the joint 37-series). That is: there is no confusion here in being NR-only.

8 – VODAFONE Group Plc

We see some benefits on the LP WUS/WUR being agnostic to the technology it wakes up, however we are fine to just focus in NR during R18

9 – Nordic Semiconductor ASA

Nobody argues that LP-WUS will be specified outside NR specifications :). We understand that LTE NAS or AS of LTE/LPWA would need to be enhanced with configuration of LP-WUS, which would have LTE spec impact as well. On the other hand, LP-WUS WUR coupled with LPWA main radio would be definitely valid use-case for further consideration. And NR R18 design should not intentionally preclude such use-case.

10 – Philips International B.V.

A low-power WUR/WUS solution would be very benificial for NB-IoT/eMTC. Although the current SID has NR in the title, the design of the WUR/WUS should be made radio-agnostic. This should be considered during the study, e.g. when choosing between different solution options. It would be good to add some statement about this in the SID.

11 – InterDigital

Yes, focus on NR only first. Later, we may consider to use it for LTE LPWA use cases.

12 – Apple Italia S.R.L.

Agree.

13 – Futurewei Technologies

We agree that this SI is for NR only while extension can be done later to other use cases. About applying to NB-IoT/eMTC, we see a potential issue that the coverage requirements for wakeup signal will be significantly larger there and hence demand different design. It is better to be focused at this stage.

14 – Samsung Electronics Co.

Agree.

15 – Qualcomm Incorporated

We agree that only NR should be addressed in the SI in this release.

16 – ZTE Corporation

We are OK to preclude the NB-IoT and MTC in the current SI stage.

17 – Fujitsu Limited

Fine

18 – DOCOMO Communications Lab.

Agree.

19 – Nokia Corporation

We agree with the moderator proposal

20 – Sony Europe B.V.

We agree with the moderator proposal

21 – MediaTek Inc.

Thanks for moderator proposal (and ZTE contribution trigging this discussion). The clarification is useful, and we support capturing the proposal as a RAN plenary conclusion.

22 – EURECOM

We agree with the proposal.

23 – China Unicom

Agree with the moderator proposal.

24 – Spreadtrum Communications

Agree. There is no motivation of low cost for LP-WUR, e.g. some components of RF may be more expensive than that of NR receiver. So LP-WUR may not be suitable for LTE NB-IoT or MTC.

25 – Lenovo (Beijing) Ltd

Agree. The scope is for NR.

26 – Deutsche Telekom AG

Agree, NR only ..

(-> if someone wants to extend this also to NB-IoT/LTE-M/LTE, Rel-19 is the next chance)

2.2 Issue#2 Whether SID update is needed for coverage study?

In the following part of the SID, the first sentence was intended to say that coverage availability should be considered in the power saving study compared with Rel-15/16/17 baseline, due to the general understanding that there is a tradeoff between power saving benefit and receiver sensitivity for different receiver structures. The next sentence was intended to say that network coverage should be evaluated in the study of system impact due to introduction of low-power WUS/WUR. It seems no strong need to update the SID although ”coverage” was mentioned twice in the objective.

- Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms and their coverage availability, as well as latency impact. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1]
    - Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.

Moderator proposal 2: There is no need to update the SID objective for coverage study at current stage.

Feedback Form 2: Do you agree with moderator proposal 2?

1 – VODAFONE Group Plc

By referring to ”existing Rel-15/16/17 UE power saving mechanisms **and** their coverage availability” it seems to imply that a coverage comparison is to be done between LP-WUS and aforementioned legacy UE power saving mechanisms. Since there is no coverage impact evaluation done in TR 38.840 it seems to imply that it needs to be performed on this SID to allow to perform the comparison. A clarification on how the coverage evaluation will be performed seems needed.

2 – Guangdong OPPO Mobile Telecom.

The coverage availability was not performed usually in RAN1 study. The first sentence seems means coverage should not be compromised by WUS compared with existing power saving technologies. We assume most of the power saving technology does not impact coverage, thus, the coverage would be the same, then it means same thing for the last sentence. This may depend on what features can be looked as UE power saving schemes.

But we are Ok to clarify this during the study.

3 – Nordic Semiconductor ASA

Power consumption is a function of sensitivity/coverage. Maybe it would be good to clarify what is coverage baseline here, e.g. should UL CovEnh in R17 be considered when ”existing Rel-15/16/17 UE power saving mechanisms” coverage is studied?

4 – Panasonic Corporation

We agree the proposal.

5 – Ericsson LM

Agree. The “coverage availability” in the SID objective is not referring to Rel-15/16/17 functionality, but to the coverage availability of the WUR itself.

6 – ROBERT BOSCH GmbH

We agree with a proposed clarification that the ”their coverage availability” to ”their WUS coverage availability”.

7 – CATT

The low-power WUS solution would decide both the UE power consumption and the associated receiver sensitivity in dBm. From the UE receiver sensitivity, the coupling loss/path loss could be derived with a given gNB Tx power. The coupling loss/path loss would define the coverage area. Thus, the low-power WUS solution would provide the bi-product of UE power consumption and its associated coverage area explicitly. Thus, we agree that no update of SID is needed to include the coverage since it is implicitly included in the SID.

8 – Huawei Tech.(UK) Co.. Ltd

As per Ericsson, Bosch, et al., grammatically the ”their” refers to WUR/WUS, not Rel-15/16/17. It is better not to edit documents unless critically necessary, so we suggest taking these replies from companies as confirmation enough.

On Nordic Semiconductor’s suggestion, the setting of a suitable baseline is likely within the technical competence of RAN1 rather than RAN.

9 – Nordic Semiconductor ASA

@Huawei: I suppose if RAN can clarify baseline, as it did already before for e.g. R17 power saving enhancements, this would save lots of discussion in RAN1. RAN1 then could focus on technical discussion of LP-WUS design instead of burning TUs on what should be baseline coverage, the one of R15 UE, R17 RedCap UE, with or without R17 CovEnh?

10 – InterDigital

Agree. We have the same understanding with few other companies that ”their” refers to WUR/WUS.

11 – Apple Italia S.R.L.

Agree with the proposal.

12 – Futurewei Technologies

We share the same understanding that ”coverage availability” is referring to WUS. A wording change to make it clearer or a conclusion of the discussion to clarify will be ok.

13 – Qualcomm Incorporated

We agree with the proposal. No need to update the SID regarding coverage. Our understanding is that maintaining coverage for LP WUS is highly desirable but may not be feasible. In case it is not feasible, the trade off between power saving and coverage reduction need to be made clear in the SID conclusion. The current objective already says the same.

14 – Samsung Electronics Co.

We share a view that ”their coverage availability” refers to the coverage availability of LP-WUS/WUR itself. But, we are open to make it more clear in current SID.

15 – ZTE Corporation

We are also OK to clarify that ”their coverage availability” refers to the coverage availability of LP-WUS/WUR, instead of the Rel-15/16/17 existing power saving mechanisms. Therefore, it is better to have a modification to make it clearer, e.g., ~~their~~**LP-WUS** coverage availability.

16 – DOCOMO Communications Lab.

We agree the proposal.

17 – Nokia Corporation

Agree with the moderator, no need to update the SID text at this point in time. Coverage impact as such is naturally an important aspect to be captured as the study outcome in the TR.

18 – MediaTek Inc.

We somehow think ZTE proposal in RP-222442 looks better: Given **coverage** has been included as part of system impact, we can remove ”and their coverage availability”. The change is shown below for ease of reference.

”Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms ~~**and their coverage availability**~~, as well as latency impact. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network **coverage**/capacity/resource overhead should be included in the study [RAN1]”

19 – EURECOM

We agree with the proposal.

20 – China Unicom

We agree the proposal.

21 – Spreadtrum Communications

In R17 PEI discussion, coverage was discussed in form of MDR/FAR performance. For example, we assume the coverage is unchanged, and MDR/FAR requirement are provided or in a common assumption, and then companies can evaluate and provide the results of resource overhead. Could we follow this principle behind our evaluation? Or, we should explicitly state it in SID? We are not sure. Maybe keeping the current version of SID is fine.

We also notice Apple has some proposals for mobility study in RAN4. We share the view that both coverage and mobility are important for real deployment of LP-WUS. Therefor we suggest:

Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms, **their coverage availability and mobility requirement**, as well as latency impact. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network capacity/resource overhead should be included in the study [RAN1/**RAN4**]

22 – Spreadtrum Communications

In R17 PEI discussion, coverage was discussed in form of MDR/FAR performance. For example, we assume the coverage is unchanged, and MDR/FAR requirement are provided or in a common assumption, and then companies can evaluate and provide the results of resource overhead. Could we follow this principle behind our evaluation? Or, we should explicitly state it in SID? We are not sure. Maybe keeping the current version of SID is fine.

We also notice Apple has some proposals for mobility study in RAN4. We share the view that both coverage and mobility are important for real deployment of LP-WUS. Therefor we suggest:

Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms, **their coverage availability and mobility requirement**, as well as latency impact. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network capacity/resource overhead should be included in the study [RAN1/**RAN4**]

23 – Lenovo (Beijing) Ltd

We have the same understanding that ”their” refers to WUR/WUS. So we think there is no need to update the SID.

24 – Deutsche Telekom AG

This discussion shows that 3GPP needs to put more focus on only approving high quality SID/WIDs ! We should spent more time on carefully drafing SIDs/WIDs. Having said this, we agree with the proposal that it is clear.

2.3 Summary of initial round discussion

2.3.1 Issue#1

Based on the inputs from companies, moderator propose to take the original moderator proposal 1 as conclusion and close issue#1. Note that this does not prevent possible extension of NR LP-WUR/WUS design to other RATs in future release(s).

Conclusion: The Rel-18 study on low-power WUS/WUR is for NR only and LTE NB IoT/MTC is not in scope of the SI, no need for SID update.

2.3.2 Issue#2

Based on the inputs from companies, it seems several companies prefer to have some text changes for better readibility. Moderator propose to consider the following editoral changes, which is to be checked in the intermediate round.

- Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms ~~and their~~ , the coverage availability, as well as latency impact of low-power WUR/WUS. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1]
    - Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.

3 Intermediate round

3.1 Issue#2 Whether SID update is needed for coverage study?

In intermediate round, companies views are invited to the following potential editorial update for the SID. If agreeable, a revised SID will be provided later on. Otherwise, no SID update in this meeting.

Proposed SID revision:

- Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms ~~and their~~, the coverage availability, as well as latency impact of low-power WUR/WUS. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1]
    - Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.

Feedback Form 3: Do you agree with above SID revision?

1 – VODAFONE Group Plc We are fine with the moderator's proposed SID revision.
2 – Ericsson LM We are fine with this update of the SID objective.
3 – Huawei Tech.(UK) Co.. Ltd We should avoid unnecessary editorial tweaking. Does the moderator think the preceding discussion leaves any uncertainty?

4 – Apple Italia S.R.L.

We are fine with the moderator's proposal to clarify the coverage aspect, even though we do not think it is absolutely necessary.

Thanks Spectrum for referring to our contribution. We strongly believe mobility related impact (e.g. RRM measurement) is an important aspect to be considered/evaluated, and we also thought this is the common understanding among the companies (as this aspect was discussed during the SID discussion). Therefore, we would like to encourage companies to consider the following update to clarify. If you prefer not to have this update (on top of the moderator's proposal), we would also like to understand whether you agree that mobility related impact falls within the SI scope.

- Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms ~~and their~~, the coverage availability, **the mobility related impact** as well as latency impact of low-power WUR/WUS. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1, **RAN4**]
    - Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.
    - **Note: The need for RAN4 RRM evaluation will be triggered by RAN1.**

5 – Nordic Semiconductor ASA

To clarify wording, the wording should be something like this

- Study LP-WUS compared to the existing Rel-15/16/17 UE power saving mechanisms with respect to [RAN1]
    - potential UE power saving gains
    - coverage availability
    - latency.
- Study LP-WUS system impact, such as [RAN1]
    - network power consumption,
    - coexistence with non-low-power-WUR UEs,
    - network coverage/capacity/resource overhead .
- Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.

6 – CATT

We are OK with moderator's proposed change. We are also fine without any change of SID.

7 – InterDigital

Ok with the suggested update from moderator for better clarity.

8 – Futurewei Technologies

We are ok with the suggested update to make thing clear.

9 – ZTE Corporation

We are also OK with the suggested change to make it clearer.

10 – Qualcomm Incorporated

We support the proposal made by Apple. We think that without the appropriate mobility design considerations, the power spent on making RRM measurements based on the legacy signals can easily negate the LP-WUS power benefits. Therefore we support adding mobility considerations.

The Apple proposal also incorporates the moderator's proposal, we are ok with that.

11 – Panasonic Corporation

We support the proposal.

12 – EURECOM

We are ok with the proposal. Along with Apple and QC we also think that mobility has to be considered since turning ON the main radio for frequent RRM measurements can easily outweigh any power saving gains obtained by the LP-WUS.

13 – vivo Mobile Communication Co.

We are fine with moderator's proposed editorial update for the SID.

Besides, we agree with companies that mobility design of LP-WUS is quite important as it provides measurement chances based on low power signals without turning on the main radio, which provides more flexibility and power saving gains.

14 – Beijing Xiaomi Mobile Software

OK with the update

15 – Sony Europe B.V.

We are fine with the moderator proposal, which would not preclude any company contributions on the different aspects elaborated above.

16 – MediaTek Inc.

Support moderator proposal.

On inclusion of RRM in the updated scope, it is not expected to be discussed since up-scoping is not handled at this meeting as per chair's guidance.

17 – Samsung Electronics Co.

We are OK with the moderator proposal.

On the other hand, regarding adding the mobility aspect, the WUR architecture and LP-WUS designs (LP-WUS itself, the coverage of LP-WUS and etc) are uncertain at this stage and their study will start from the next RAN1 meeting. In this sense, using LP-WUS for mobility measurement is too early to be discussed. In other words, any kind of upscoping at this point is not desirable because any discussion has not been started yet. Also, it is not aligned with Chair's guidance "No handling of new proposals to upscope the existing R18 items". Having said that, we don't support to add the mobility aspect. Instead, we suggest to have a focus on the current objectives first and then further to discuss whether to extend the scope or not in later RAN meeting.

18 – Spreadtrum Communications

We share the similar view that mobility can be stated explicitly. If we have chance to update SID to make it clearer, it is better we can update it in time. And we suggest making it general:

- Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms and ~~their~~the coverage~~ availability,~~/**mobility related impact** as well as latency impact of low-power WUR/WUS. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1, **RAN4**]
    - Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.
    - **Note: The need for RAN4 RRM evaluation will be triggered by RAN1.**

19 – Nokia Corporation

We are fine with the moderator proposal. Also we agree with Apple that mobility should be an aspects to be considered as well.

3.2 Summary of intermediate round discussion

Most companies agreed with the proposed editoral change for SID, moderator suggest to endose a revised SID with changes as below.

Proposed SID revision:

- Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms ~~and their~~, the coverage availability, as well as latency impact of low-power WUR/WUS.

System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1]

- Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.

Several companies discussed the need of adding RRM/mobility study objective in the SID. However, it is the moderator's understanding that up-scoping of existing Rel-18 SID/WID is not allowed in RAN#97e, per RAN Chair's guidance. This issue can be treated in future meeting(s), if needed and possible.

With above, moderator suggest to close this email thread.

4 Conclusion

The following conclusions were endorsed by RAN chair.

Conclusion:

- The Rel-18 study on low-power WUS/WUR is for NR only and LTE NB IoT/MTC is not in scope of the SI, no need for SID update.
- Endorse a revised SID with the following editorial changes.
  - Study potential UE power saving gains compared to the existing Rel-15/16/17 UE power saving mechanisms ~~and their~~ , the coverage availability, as well as latency impact of low-power WUR/WUS. System impact, such as network power consumption, coexistence with non-low-power-WUR UEs, network coverage/capacity/resource overhead should be included in the study [RAN1]
    - Note: The need for RAN2 evaluation will be triggered by RAN1 when necessary.

5 References

[1] RP-222442 Discussion on Rel-18 Low-power WUS ZTE, Sanechips

[2] RP-221271 Revised SID: Study on low-power Wake-up Signal and Receiver for NR, vivo