[95e-34-PowerSaving-WA] - Version 0.0.5
RAN

3GPP TSG RAN Meeting #95-e RP-221003

Electronic Meeting, March 17 - 23, 2022

Agenda item: 9.5.2.3

Source: Moderator (RAN2 Chair)

Document for: Discussion and Desicion

1 Introduction

On the topic RLM BFD relaxation, a Working agreement was established at RAN2 117-e (February 22).

Working Agreement: UE can start/stop RLM/BFD relaxation by itself if it meets/fails the relaxation criteria. The feature is configured by RRC dedicated signalling, this is the only enable disable function that is supported.

The WA has been challenged, but there is no voting procedure in place for TSG RAN 95e.

Moderator: The aim of this discussion is to explore ways forward based on compromise, including CR updates in the end if agreeable.

Moderator (RAN2 Chair): A number of companies may be disappointed by the additional complexity of introducing a compromize. Moderator think that such complexity is not overwhelming and it would be better to prioritize conclusion of Rel-17 rather then keeping a challenged WA open, and asks companies to compromize.

2 Discussion

2.1 Initial round

In the technical discussion in RAN2, that led to the WA,

- The main requirement from companies challenging the WA was that the network shall have visibility of when a UE is in relaxation mode vs not.
- The main concern of companies supporting the WA was signalling overhead, and that the signalling may displace and remove the power consumption benefit.

Moderator suggests to first explore the following potential components of a compromize solution:

1. (Baseline component) As in the current solution, in CRs for this meeting, based on explicit configuraiton, the UE evaluates the conditions to be fullfilled in order to allow a UE to relax RLM and BFD measurements, respectively. When the UE is allowed according to current configured criteria, the UE may decide to relax RLM BFD measurements. The RLM BFD measurements relaxed or non-relaxed status is indicated in RRC signalling to the gNB. RLM and BFD relaxation is indicated separately.

2. (Alt1) The indication from the UE to the network shall be signalled at least whenever the UE starts or stops relaxation of RLM and or BFD measurements. This new trigger for signalling is configurable, separately for RLM and BFD relaxation. If the trigger is configured, the UE triggers signalling to the network at least at start and stop of RLM BFD measurement relaxation. If the trigger is not configured, the UE does not specifically trigger signalling to the network at start and/or stop of RLM BFD measurement relaxation.

3. (Alt2) The indication from the UE to the network is provided whenever a L3 measurement report transmitted, triggered by existing measurment report trigger and no specific trigger for RLM BFD relaxation start stop is introduced (i.e. no guarantee to cover exactly start stop, but network could configure e.g. periodic measurement etc if network want to track).

4. (general) Whether the signalling should be by extending L3 measurement report signalling or whether other RRC message for signalling would be preferred.

5. (for Alt1 with a new trigger): Whether hysteresis need to be introduced for the good cell criterion, e.g. by a configurable hysteresis parameter.

Please Note that Alt 1 and alt 2 are not strictly mutually exclusive. If Alt 1 with a new trigger is chosen and the signalling is based on L3 measurement report, then alt 2 may be supported as well. If applicable, could be discussed in next round (not the other way around obviously).

Please comment on what would be acceptable and preferable.

Feedback Form 1: BFD RLM relax WA compromize - initial Rnd

1 – MediaTek Inc.

Thanks moderator for organizing the email discussion and the feasible proposals. Below please see MediaTek views:

- RLM/BFD relaxation is a RAN4-led item, starting from study on the feasibility and performance impact. RAN4 concludes the feasibility and carefully defines good serving cell quality and low mobility criteria to ensure system performance. RAN2 further allows flexible configurations (per CG for RLM relaxation and per cell for BFD relaxation and with thresholds per FR) for maximum network controllability. **From performance and network controllability perspectives, current WA that bases on both RAN4 and RAN2 designs should be confirmed without any change**.

- Given the guaranteed performance and network controllability, **additional UE reporting is not essential. The additional transmission power consumption also conflicts with UE power saving target of this WI**.
- We understand the intention of statistics collection for potential optimization of network configurations, but **the only acceptable compromise is minimum transmission power overhead for the additional UE reporting. In this regard, Alt 2 is the right solution to move forward**.

2 – CATT

RAN4 has done a tremendous work in defining the criteria of RLM/BFD measurement relaxation. The criteria is similar to that of RRM measurement relaxation in Rel-16. RAN2 also has defined the mechanism for network to enable/disable the RLM/BFM measurement relaxation. The concern of negative effect of RLM/BFD measurement relaxation is the network lack of control of UE measurements. The RLM/BFD measurement relaxation still meet the same measurement performance requirement. There will be barely impact to RLM/BFD procedure. Thus, the UE report of the start/stop of RLM/BFD measurement relaxation is not necessary and would have negative impact to the UE power saving when UE increases the power consumption in sending the report back and forth to the gNB. However, we are OK to have UE including the condition of RLM/BFD measurement relaxation in the next measurement report as the reference of fault detection in the network operation without additional UE power consumption. Thus, we support Alt 2 of the proposal by moderator.

3 – Nokia Corporation

1. We support the proposed baseline component of the compromise proposal from the moderator.

2. We support Alt1.

3. Alt2 is not acceptable for us as UE reporting can be significantly be delayed if there are no other measurement reports to be sent. In addition the UE may change relaxation status (relaxed or non-relaxed) multiple times before the report is sent. In some cases UE reports would not even be sent to the network because UE does not send any other reports for other purposes. Alt2 would mean that the network would need to configure some L3 measurement reporting with sufficiently short periodical measurement report to ensure that the network knows if UE starts relaxing RLM or BFD. Periodical measurement reporting with short measurement interval is likely to have even bigger negative impacts on UE's power consumption and cause unwanted overheads.

4. In our view UE assistance info, which is also agreed to be used for Rel-17 RRM relaxations for RedCap UEs, could be used for this purposes. Prohibit timers in the UE assistance info can then be used to avoid UE sending reports too frequently. Extending L3 measurement report signalling with specific reporting triggers for entry and exit of RLM and BFD relaxations seems more complex.

5. Two criterions are agreed for RLM/BFD relaxation: 1) low mobility, 2) good serving cell quality. It is not clear to us how hysteresis would work for 1) low mobility where criterion is based on RSRP variation:

5.7.X.1 Relaxed measurement criterion for low mobility

The relaxed measurement criterion for UE with low mobility in RRC_CONNECTED is fulfilled when:

- (SS-RSRPRef – SS-RSRP) < SSearchDeltaP-Connected,

Where:

- SS-RSRP = current L3 RSRP measurement of the SpCell based on SSB (dB).

- SS-RSRPRef = reference L3 RSRP measurement of the SpCell based on SSB (dB), set as follows:

- After receiving low mobility criterion configuration, or

- After MAC of the CG successfully completes a Random Access procedure after applying a *reconfigurationWithSync* in *spCellConfig* of the CG while low mobility criterion is configured, or

- If (SS-RSRP - SS-RSRPRef) > 0, or

- If the relaxed measurement criterion has not been met for TSearchDeltaP-Connected:

- The UE shall set the value of SS-RSRPRef to the current SS-RSRP value of the SpCell.

Is the intention to use hysteresis only for 2) good serving cell quality ?

4 – KT Corp.

To keep the consistency in the commercial network regardless of UE from different vendors, KT supports Alt1 as operator will be aware of UE's RLM/BFD measurement relaxation.

5 – MediaTek Inc.

Moderator: reply to Nokia, the question on hysteresis is just intended to avoid very frequent triggering of signalling, and the reason why good cell criterion is mentioned is that it is just a single threshold so in unfortunate circumstance I guess the UE could change state very frequently. The low mobility criterion seems to not have this issue to the same extent .. However as is pointed out, maybe if UE assistance info message is used, the probhibit timer could be used for this purpose. IMHO this is not the most important detail but it is good to collect comments.

6 – TELECOM ITALIA S.p.A.

Same view as KT (support option 1).

We believe we can and must reach a compromise at this plenary.

And to be very clear, since the CR derived by the WA in RAN2 must be approved by RAN plenary: there is no consensus to approve those CRs, therefore we don't need to go for a vote - RAN simply rejects the current CRs.

7 – Ericsson LM

First, to give some perspective on this topic: In the RedCap WI there is another objective to save power by doing "RRM measurement relaxation" in CONNECTED mode. The agreed behaviour is:

1) Network configures a criterion which the UE evaluates to determine if the UE is stationary or not.

2) If the UE is stationary, the UE sends an indication in the UE Assistance Information-message to indicate this to the network.

3) The network can based on the UE indication configure the UE to relax RRM measurements (by means of e.g. removing some measurement objects).

4) RAN2 ensured that the UE does not send the indication too often by specifying that the UE can only signal a **change** in stationarity.

The above behaviour is a simple approach in terms of RAN2 specification complexity/work. And ”RLM/BFD relaxation” is in our mind something very similar to ”RRM measurement relaxation”. Therefore, we think we should consider the above when deciding the way forward for ”RLM/BFD relaxation”.

Based on all this, we think that a reasonable compromise is ”Alt1”.

Alt2 is in our view complicated. Actually, when RAN2 discussed RRM measurement relaxation, RAN2 **did** discuss to have an indication in the measurement report. But after long and careful consideration, RAN2 went ahead with the UE Assistance Information message instead partly to not mix in new/unrelated information in the measurement report. The UE Assistance Information-approach is in our view clearly a cleaner and more suitable approach also for RLM/BFD relaxation. And note: In the UE Assistance Information framework, there are prohibit timer functionality which can be used to avoid too frequent reports from the UE.

The measurement report approach (Alt2) would mix functionality and would result in that in some situations, the UE **never** reports that the UE has started/stopped RLM/BFD relaxation, hence Alt2 fails to address the ”main requirement from companies challenging the WA”.

8 – Futurewei

Q1. OK with this baseline (matches the WA).

Q2. If we go with something on top of the baseline, the direction of Alt1 is generally OK. However, we dislike calling the configuration for signaling a trigger, because it sounds like there will be different threshold(s) to report than the threshold(s) to start/stop (see Q5). Enable/disable (1-bit) the requirement of reporting may be more appropriate.

Q3. We are negative to Alt2. The key point of the UE reporting is for the network to timely know the status change occurred in the UE. Using other L3 measurement report may not meet the timeliness requirement.

Q4. Since the status is as simple as relaxed vs. not relaxed, a simple UAI can be used for the UE reporting.

Q5. If the hysteresis refers to different in/out conditions for start/stop relaxation, we may be OK with it but understood that will take more spec effort. If the hysteresis refers to different threshold(s) for the UE reporting (see Q2), then we are not OK with it.

9 – AT&T GNS Belgium SPRL

AT&T supports the idea that the network shall have visibility of whether or not the UE is in relaxation mode. However, a solution should also have minimal signalling overhead to still maintain the power consumption benefit. To this end, we support the Alt1 solution as a compromise.

10 – Intel Corporation (UK) Ltd

At first glance, Alt2 was more favorable because it doesn’t trigger additional transmission. However, if the measurement reporting is configured more frequently with periodic measurement reporting, it becomes worse than Alt1. That is, the power consumption between Alt1 and Alt2 would be dependent on how frequently start/stop of RLM/BFD relaxation would happen.

Assuming that start/stop of RLM/BFD relaxation would happen very rarely, Alt1 would be more predictable and simpler. Therefore, we prefer Alt1.

In addition, we could consider gNB configuration of enabling/disabling of UE reporting so that gNB can disable UE reporting when gNB thinks UE behavior is predictable.

11 – Guangdong OPPO Mobile Telecom.

We support Alt2 as a compromise.

12 – Apple Gesellschaft m.b.H.

Thanks moderator for organizing the email discussion and the feasible proposals. Please find below Apple views.

1. The current working agreements takes into account both configurability and network control aspects fully. So we prefer that this is agreed fully without any change.

2. To alleviate some companies concern about UE not informing the NW about when it started/stopped RLM/BFD, we would ideally a want a solution which has least power cost, and not to override the achieved power savings. To this effect we would support Alternate 2 of the moderator, as it piggy backs on existing signaling.

13 – vivo Mobile Communication Co.

1. We share the same view as MediaTek and CATT. The feasibility and performance requirements have been evaluated and discussed carefully in RAN4. The criteria defined already ensure that there is no performance impact on the RLM/BFD relaxation.

As we commented before, network already has a control (to configure the criteria for RLM/BFD relaxation) for the feature, so any additional procedure is not needed.

Thus, we should confirm the WA first.

2. Regarding the compromise, we still don't have enough confidence on the motivation for additional reporting, which would increase UE power consumption and complexity (e.g. we have a lot of work to discuss how/when to report).

If majority really think it is important for network to know whether UE is performing relaxation, we could consider the compromise.

3. Regarding whether Alt1 or alt2 is preferrable, we think it depends on whether the reporting requires timeliness. Considering the requirement from operators and network is to use the reporting to optimize the network configuration and values, it should be a long-term collection. It is not so urgent, so Alt2 is preferrable.

Besides, we think we should target to UE power consumption when we consider the additional optimization. Reporting with existing measurement report whenever a L3 measurement report transmitted could meet the requirement for network without less impact on UE power consumption or less signaling overhead.

As it is super late to close this rel-17 WI, any new introduced solution should have minimal impact to current feature and little impact to the specification.

Thus, we think alt2, i.e. report together with existing measurement report is enough.

4. Additionally, we think whether this report is needed can be configured by network, which could provide enough flexibility to network. In our understanding, in early stage of deployment, UE reporting may be needed to help network adapt the configuration. In this scenario, network may configure the configuration. While in later stage of deployment, there may be no such requirement. Then, network may not configure the UE reporting.

5. Regarding the hysteresis, I assume there is no need to introduce hysteresis for the good cell criterion, if we agreed alt2.

14 – Samsung Electronics Co.

We would like to stress that we still prefer to agree the WA as it is, as network already has enough controllability with the WA (and the feature itself has to be enabled in a very conservative way anyway).

If we have to choose among the listed options, we may consider going with alt. 2. It should be noted that the baseline component and alt. 1 above do not address the concern from UE side (i.e., power consumption), so they are not acceptable to us.

15 – DOCOMO Communications Lab.

Thanks moderator for the suggestions of potential compromise.

Our preference is Alt 1 as the functionality would help performance monitoring and if power consumption is problematic then the reporting can be turned off.

As for Alt 2, we are not sure it is worth pursuing as we think the additional information can be a ”hint” at best. However, we are open to discuss either solution for progress.

16 – LG Electronics Inc.

First, we support current WA as it is. The configuration of RLM/BFD relaxation is provided by the network, and thus the network has controllability of RLM/BFD relaxation. The performance degradation is already evaluated by RAN4, and they conclude that there is no severe degradation by the relaxation.

Secondly, if visibility is concern, we think the Alt2 can provide visibility to operators. We do not support Alt1, because dedicated trigger for start/stop reporting would degrade power saving gain. Note that this WI is for “Power Saving”, and the Alt1 does not meet the WI objective. We think the Alt2 is the desirable way to go, if visibility is really a concern.

17 – China Telecommunications

We support Alt1 and share the same view with AT&T and KT as the network shall have visibility of UE’s RLM/BFD measurement relaxation.

18 – SoftBank Corp.

Thank you for providing feasible options.

Alt1 is preferred option for awareness of UE status. For alt1, we also prefer to reuse UAI message with hysteresis to avoid frequent UE reporting.

19 – KDDI Corporation

For us, both Alt1 and Alt2 are acceptable. We prefer Alt1, since Alt2 is interesting idea as a compromise but little bit complicated.

20 – Beijing Xiaomi Mobile Software

We saw the big concern of operators if the NW is not aware of UE's relaxation status. So we are will to discuss the **additional UE reporting proposed by the** moderator. Otherwise, if the operators do not enable UE this feature, then the whole feature would be useless in the filed if operators have big concern.

We support Alt 2 of the proposal by moderator as this doesn't trigger additional transmission as it piggy backs on existing signaling. Some people would concern that Alt2 would result in that in some situations, the UE never reports that the UE has started/stopped RLM/BFD relaxation. But in the field, the operators would normally configure UE with RRM for mobility then the measurement report can always be expected and the *TimetoTrigger* can avoid UE sending the report back and forth to the gNB.

If the NW want to track UE's relaxation status timely, the NW just configure some L3 measurement reporting with sufficiently short periodical measurement report. Otherwise, the NW do not need to get UE's relaxation status timely.

Alt2 is a good compromise of the operators and the camp who does not want any reporting.

For alt1, we would spend a lot of time discussion on the dedicated trigger for start/stop reporting, e.g., how to configure UE to report, which would a burden at this stage of time.

21 – NEC Corporation

For 1, we are fine with the baseline component.

For 2-4, we support the Alt1. This is because as moderator captures, it is very important for the network to understand the UE's situation as much as possible even though the relaxation is allowed. Given the intention to have the UE reporting is to let the network know the UE's situation, the Alt2 reusing a L3 measurement will not achieve the expected gain, unless the periodic measurement is configured. However, configuring the periodic measurement is contradicting to the motivation of Alt.2. We are wondering what the views from UE side are on this potential more power consumption.

Regarding the RRC signalling, we prefer other RRC message for this indication from UE, along with the Alt1. In the past RAN2, it was agreed that "if UE report on fulfillment or not (entry/exit) to network for RLM/BFD relaxation is agreeable, UAI is used to provide the report". This should be the baseline.

22 – InterDigital

Thank you to the moderator for organising and we appreciate the compromise attempt.

We note that in RAN2#116bis-e it was agreed to include this report in UE Assistance Information, if a report would be introduced, and that this is also the reporting mechanism for RedCap RRM relaxation.

We would therefore support Alt.1, and should consider using UE Assistance Information rather than measurement report, as this appears to be the most straightforward and consistent approach.

On Alt.2:

We understand that the proposal to include in measurement report based on existing triggers is an attempt to address the concerns from both points of view. Although this does seem to address the signalling overhead concern in case of event triggered reporting it does not appear to fully address the need for the network to be aware. If the NW would instead have to configure e.g. periodic reporting to ensure the UE state is tracked as suggested, then this does not address signalling overhead concerns either. There is another possibility - rather than extending measurement report, consider whether other means than RRC signalling can be used in order to address signalling overhead concerns without limiting how frequently the report can be provided by too much.

23 – QUALCOMM JAPAN LLC.

We support Alt.1 as compromise. Configurability of UE reporting is important because we believe eventually there is going to be a mature phase where the network is fully confident about the relaxation criteria that it is configuring and no longer needs to monitor the UE behaivour. It also allows the network to ”sample” some UE for performance monitoring but not all UEs.

We do not see a strong need of defining hysteresis mechanism, or optimizations for signalling reduction.

24 – China Mobile Com. Corporation

CMCC was engaged in the working group level discussion of this issue in RAN4 and RAN2, we believe that the current working agreement in RAN2 reflects the RAN4 LS on dedicated signalling. The relaxation criteria is configured by network through dedicated signalling, which is controllable by the network. Thus, we don’t think this can damage network performance.

Regarding to the compromised way forward, we are OK with Alt2. Uplink indication in MDT way would be helpful for network maintenance. For example, UE indicates to network that the monitor is relaxed in **measurement report and RLF report**. Compared to Alt1, Alt 2 introduces less power consumption and signaling. Furthermore, the timestamp along with the start/stop of relaxation could be introduced to solve the multiple-status-transition issue. Details can be discussed in the next round.

For the hysteresis issue: If Alt1 is preferred by majority, the hysteresis or the prohibit timer for UAI could be used to avoid frequent reports.

25 – Orange

We support Alt1

26 – BT plc

BT shares Nokia and Ericsson views.

Rel-16 RRM relaxations are specified for IDLE while Rel-17 addresses CONNECTED mode where the consequences of radio link failures and beam failures are more severe impacting directly the KPIs.

- **BT supports Alt.1**. It is the best compromise between UE UL signalling and network awareness.
- Alt.2 is not acceptable due to the UE can start and stop RLF/BFD relaxed measurements once or more before a measurement report is sent to the network. Therefore, the main goal to make the network aware when UE starts/stops RLF/BFD relaxation measurements cannot be achieved.

We echo TIM's proposal to simply reject current CRs.

27 – HUAWEI TECHNOLOGIES Co. Ltd.

[Huawei, HiSilicon]

1. Based on the current working agreements, the network already can control the feature, and the relevant feasibility and performance requirements have been evaluated by RAN4. Therefore we think no additional mechanism is need. But as one compromise, we think the following ***alt.3*** *can be also considered.*

□***Alt 3***□*The network can configure whether the UE can perform RLM/BFD relaxation by itself based on the relaxation criteria evaluation. If the UE is allowed by the network to relax RLM/BFD by itself whenever the relaxation criteria is fulfilled, then no additional mechanism is needed and it is consistent with the current working agreement. If the UE is configured to start/stop RLM/BFD relaxation under the network control, then the UE reports the fulfilment status for the relaxation criteria (where the UAI reporting mechanism specified in the RedCap WI for RRM relaxation can be re-used) and waits for further control from the network on whether the RLM/BFD relaxation is allowed.*

The Alt3 can eliminate operators and network concerns and it have less impact to UE vendor and network vendor because:

- If a network vendor does not want to have "additional" control, there is no any new impact for UE and network.
- If a network vendor wants to have the "additional" control, the network should implement the above "new control DL message", and we can reuse the UAI mechanism i supported in REDCAP.

28 – ZTE Corporation

We support Alt-1.

For Alt-2, as commented by other companies, if the network wants to know the RLM/BFD relaxation status, the UE will be configured with short periodical measurement reporting, and this will consume much more power compared with Alt-1.

Similar to R17 RRM relaxation, we actually see no big problem to use UAI for reporting RLM/BFD relaxation status, and the UE only needs to send the report when the criteia are fulfilled or not fulfilled any more, if companies concern about the additional power (e.g. caused by good serving cell), we can reuse the prohibit timer to avoid frequent report.

29 – VODAFONE Group Plc

I feel like Alt-2 might be a compromise.

30 – KPN N.V.

We support alt-1.

2.2 Report of initial Round

Report on point 1: Some companies state that they prefer the WA but no-one actually object to Point 1, the baseline component of proposed compromise, so Moderator think this can be agreed. There was some

potential confusion on what is new vs already in the current CR, so below for clarity moderator split into agreements 1a and 1b (still same text as above).

Report on Points 2 and 3: For the compromise solution a majority expresses support for Alt1 19 (29). A couple of companies think Alt2 would result in higher power consumption than Alt1, as it means that Measurement Configurations need to be tailored to give visibility for this feature (e.g. periodic with short period), which defeats the purpose of lower power consumption to greater extent than Alt1. One company think that Alt1 is not acceptable, but it seems that most Opponents to the signaling indication can anyway accept Alt1 it if the reporting signalling is configurable separately (was mentioned by a cpl of companies). NOTE that indeed this was intended as part of the Alt1 proposal above, so Moderator think alternative 1 can be agreed. Moderator suggests to re-write the text somewhat to make the intentions very clear.

Report on further details: All companies who expressed a view on signaling (alt1 supporters) indicated a preference for using *UE Assistance Information message*, with a prohibit timer, similar to prohibit timer for other indications conveyed in this message, and this has also been captured as the primary option at an earlier RAN2 meeting. Moderator think the details may need to be confirmed in the next phase.

Outcome of initial round:

Agreement 1a: As in the current input CRs for TSG RAN 95-e, based on explicit configuration, the UE evaluates the conditions to be fulfilled in order to allow the UE to relax RLM and BFD measurements, respectively. When the UE is allowed according to current configured criteria, the UE may decide to relax RLM BFD measurements (no change).

Agreement 1b: The RLM BFD measurements relaxed or non-relaxed status is indicated in RRC signaling to the gNB. RLM and BFD relaxation is indicated separately.

Agreement 2: If RLM and or BFD relaxation indication is configured, the indication from the UE to the network is signaled when the UE changes relaxation of RLM and or BFD measurements from relaxed to non-relaxed state or from non-relaxed to relaxed state, subject to a signaling limitation, such as prohibit timer. The case of RLM and or BDF relaxation being configured, while the corresponding indication is not configured shall be supported (details TBD).

3 Intermediate Round

3.1 The outcome of previous round

Companies can comment on the moderators proposed agreements from the Initial Round, see above, subclause 2.2, Agreement 1a, Agreement 1b and Agreement 2.

Feedback Form 2: Outcome of Initial Round

1 – Deutsche Telekom AG

Dear Johan, I missed putting our support in the initial round, but I thought Deutsche Telekom's position was clear from the WA challenge anyway ...

We really thanks all for the constructive spirit to address our concerns. We are on a good way o solve the issue here in plenary without imposing unacceptable delay.

On the 3 agreements from the initial round, we assume they all go together and under that condition we are happy to support them !

2 – QUALCOMM JAPAN LLC.

We support all proposals.

3 – AT&T GNS Belgium SPRL

Generally, we support the 3 proposals. The detailed signalling can be concluded in RAN2.

4 – Guangdong OPPO Mobile Telecom.

We support all proposals.

5 – SoftBank Corp.

We support all proposals.

6 – Intel Corporation (UK) Ltd

We support all proposals.

7 – vivo Mobile Communication Co.

We are fine with Agreement 1a and 1b.

While for Agreement 2, our understanding on the UE reporting is used to optimize the network configuration/values. It doesn't require timeliness. But we are fine to accept the compromise to follow the majority view, as it could be anyway configurable by network.

8 – China Mobile Com. Corporation

We support all proposals.

9 – CATT

We are OK with Agreements 1A and 1B.

For Agreement 2, we would like to clarify the following aspects,

- Whether UAI is used for reporting (per earlier RAN2 agreement), and is configurable?
- Whether infinite value of Prohibit timers are supported?
- Whether UE reporting its status "relaxing" / "not relaxing" should be a UE capability independent of the RLM/BFD relaxation capability itself (some UEs could support the RLM/BFD relaxation without supporting the reporting feature)?

10 – Futurewei

We support all proposals. We also think in Proposal 1b, ”is indicated” can be changed to ”can be indicated” to reflect the configurability. But if all companies think the configurability is clear, then we are also fine not to make the change.

11 – Samsung Electronics Co.

We can accept all the proposals from the moderator, although we are not happy with them...

12 – KT Corp.

KT can accept all the proposals from the moderator.

13 – KPN N.V.

We support all proposals.

14 – DOCOMO Communications Lab.

We support all proposals.

15 – MediaTek Inc.

Moderator, to CATT:

bullet 1: yes that is the proposal UAI = UE Assistance Information.

bullet 2: well that could potentially be a way to support the last part of A2 (not the best way IMHO): ”The case of RLM and or BDF relaxation being configured, while the corresponding indication is not configured shall be supported (details TBD).”

bullet 3: I have assumed that we clarify UE caps in Q2, but given the discussion here I don’t think this would be a separate capability.

16 – Beijing Xiaomi Mobile Software

We are fine to accept the Agreement 2 as the compromise since using the UAI is the majority view.

17 – MediaTek Inc.

Moderator to Futureway:

Given the discussion, I assumed that the UE shall indicate relaxation status based on whether the UE actually relaxes the measurement or not (as this is the requested visibility), not e.g. based on criteria that the UE may/can relax the measurements and thereby may/can indicate ..

18 – TELECOM ITALIA S.p.A.

We agree with the proposal. many thanks to the moderator and all the companies willing to accept the compromise

19 – ZTE Corporation

We support all proposals.

20 – Nokia Corporation We support all the proposals.
21 – NEC Corporation We support all the proposals.
22 – Ericsson LM We support all proposals.
23 – MediaTek Inc. (Company view) We are OK with Agreements 1a, 1b and 2.
24 – InterDigital We're fine with all the proposals. We do think there is merit in the Alt.3 proposed by Huawei in the initial round, and it seems straightforward to be made possible as an option if reporting and relaxation are separately configurable, but also understand the compromise proposed so OK to stick with that.
25 – HUAWEI TECHNOLOGIES Co. Ltd. [Huawei, HiSilicon] We support all the proposals from the moderator
26 – VODAFONE Group Plc We support the proposals suggested by moderator
27 – BT plc *We support all proposals*

3.2 Further details

Moderator Comment and assumptions based on initial round discussion:

In THIS CASE of RLM BFD relaxation, there are two triggering conditions: a good cell criterion and a low mobility criterion, and indeed a prohibit timer is a simple option and if good enough, simple options are preferable. When prohibit timer is used, gNB may not get informed about all changes, just some, and some may be delayed. If following the specification of the other indications with prohibit timers, it would be a separate timer which is configurable (and thus also its impact is configurable). As the Agreement 1b above indicates that the reporting of RLM relaxation and BFD relaxation is separate, the moderator assumes that there should be separate prohibit timers as well. Moderator think it can be proposed to use the RRC UE Assistance Information Message, where indication for RLM relaxation and BFD relaxation are separate and covered by separate prohibit timers.

Proposal: For RLM BFD relaxation indication, the RRC UE Assistance Information Message is used, where

indication for RLM relaxation and BFD relaxation are separate indications and covered by separate prohibit timers.

Moderator invites for comments on the proposal

Feedback Form 3: Further details on the proposal

1 – Deutsche Telekom AG Deutsche Telekom also supports this proposal.
2 – QUALCOMM JAPAN LLC. This looks reasonable to us.
3 – Apple Gesellschaft m.b.H. This agreement to use UAI with prohibit timer (configured to a reasonable value) is fine with us.
4 – AT&T GNS Belgium SPRL We agree with the moderator's proposal to use separate indicators for RLM and BFD relaxation in the UAI message, along with separate prohibit timers.
5 – SoftBank Corp. We support the proposal.
6 – Intel Corporation (UK) Ltd We support this proposal.
7 – vivo Mobile Communication Co. We support the proposa. A small suggestion on the wording for the proposal: "For RLM BFD relaxation **statustoggles** indication, the RRC UE Assistance Information Message is used, ...", as we agreed above "indication is signaled when the UE changes relaxation of RLM and or BFD measurements from relaxed to non-relaxed state or from non-relaxed to relaxed state".
8 – CATT We support this proposal.
9 – Futurewei We support the moderator's proposal.
10 – Samsung Electronics Co. We are fine with the proposal. We were a bit worried about additional impact by having the compromised solution, so this type of guidance seems indeed desirable (to avoid the same discussion in the WG).
11 – Guangdong OPPO Mobile Telecom. We are ok with the proposal.

12 – KT Corp.

KT support this proposal.

13 – DOCOMO Communications Lab.

The proposal looks reasonable to us.

14 – KPN N.V.

We support this proposal.

15 – China Mobile Com. Corporation

We are OK with the proposal. However, since it is mainly about network maintenance, we still prefer to send the indication for RLM relaxation and BFD relaxation along with the MR/RLF report.

16 – MediaTek Inc.

Moderator To vivo: The current wording in A2 is chosen so it would fit with RRC procedure text similar to other indications of UE Assistance Information Message.

17 – TELECOM ITALIA S.p.A.

we agree with the proposal

18 – Beijing Xiaomi Mobile Software

We agree with the moderator's proposal to use separate indicators for RLM and BFD relaxation in the UAI message.

We still have a question:

If a good cell criterion and a low mobility criterion are configured, t-SearchDeltaP in low mobility criterion is comparable to prohibit timer, so frequent reporting is limited even without prohibit timer. Do we still need a probilit timer for such case?

19 – ZTE Corporation

We support this proposal

20 – Nokia Corporation

We support Moderator's proposal.

21 – NEC Corporation

We agree with the motivation and are fine with the proposal.

22 – Ericsson LM

We support all proposals.

23 – MediaTek Inc. (Company view) Given Agreements 1b and 2, UAI looks a flexible framework for network to control reporting overhead-/frequency as well as the impact to UE power saving. In this regard, moderator proposal is a reasonable way forward.
24 – InterDigital Agree
25 – HUAWEI TECHNOLOGIES Co. Ltd. [Huawei, HiSilicon] we support this proposal.
26 – BT plc *We support the proposal*
27 – China Telecommunications We support the proposal
28 – MediaTek Inc. Moderator to xiaomi: Yes I think you are correct, but given that the good cell criterion is mandatory to configure and the mobility criterion is optional it seems easier to just support the prohibit timer for the signaling anyway, and then the operator just have to configure consistently for optimal behaviour.

Other details on CR impact.

Moderator: It is obvious that the RRC CR would need to updated, and that Stage-2 update should be considered. With the proposed direction there seems to be no impact to RAN4 CRs.

Invite for opinions on CR impacts in general.

Feedback Form 4: Other CR impacts

1 – Deutsche Telekom AG Agree
2 – Apple Gesellschaft m.b.H. Agree
3 – AT&T GNS Belgium SPRL Agree with the moderator proposal

4 – SoftBank Corp.

Agree.

5 – Intel Corporation (UK) Ltd

We agree with the CR impacts listed by the moderator.

6 – vivo Mobile Communication Co.

Agree.

7 – CATT

Agree with moderator

8 – Futurewei

There is a timing issue that might have RAN4 impact. When low mobility criterion is also configured for RLM/BFD measurement relaxation, it is clear that a UE determines that it has fulfilled the low mobility criterion for a Tseach period always at the end of that Tsearch period, because the inequality needs to hold for the entire Tsearch period. But when the situation changes from fulfilled to unfulfilled (the low mobility criterion), it is unclear whether the UE should declare it no longer fulfills the low mobility criterion as soon as the inequality no longer holds (even if the current Tsearch period has not ended yet) or it has to wait until the end of the Tsearch period. The timing difference between these two approaches can be as much as 5 minutes. In legacy RRM relaxation, this was not specified clearly, probably because it is no big deal for IDLE/INACTIVE. But for CONNECTED mode, delaying the determination of ”no longer fulfilled” (the low mobility criterion) by up to 5 minutes may result in RLF or beam failure. Therefore, we may not be able to leave it to UE implementations anymore. This timing should be specified clearly in the spec (38.133).

9 – Guangdong OPPO Mobile Telecom.

Agree

10 – KPN N.V.

Agree

11 – MediaTek Inc.

Moderator to Futurewei: Whether to have such correction of not seems not dependent on whether we have the signaling compromise discussed in this discussion. It is also quite specific to RAN4. Suggest that if you think this is needed, you can bring this as a correction proposal to RAN4 on Q2.

12 – TELECOM ITALIA S.p.A.

Agree. a question to the moderator: do you plan to finalize the CR at this plenary (preferred way for me) or go back to RAN2?

13 – ZTE Corporation

Agree

14 – Beijing Xiaomi Mobile Software Agree.
15 – Nokia Corporation We agree
16 – MediaTek Inc. (Company view) We agree no impact to RAN4 CR and suggest to approve it accordingly. For RAN2 CR, we also prefer to make simple update in this meeting; otherwise, to accommodate the additional RAN2 work, it is necessary to **adjust the WID scope, update TU plan**, in addition to updating SR and creating exception sheet. It is appreciated if moderator can also suggest a feasible update to RAN2 CR and check potential agreement with companies.
17 – InterDigital Agree
18 – HUAWEI TECHNOLOGIES Co. Ltd. [Huawei, HiSilicon] We agree with the moderator
19 – BT plc Agree
20 – MediaTek Inc. Moderator to Telecom Italia: Lets attempt now, and if there are many detailed comments we can do it in Q2 instead in the WG. Normally I dont like to do CRs at plenary but these CRs should not be very complex.
21 – MediaTek Inc. Moderator to CMCC: Well SON MDT visibility may be wanted but it seems like a non-real-time-issue, and can be discussed separately. Could e.g. be part of R18 SONMDT. I hope that is ok.

4 Way forward after Intermediate Round

This way forward is also reflected in RP-220894

The Following points can be agreed:

- 1a: As in the current input CRs for TSG RAN 95-e, based on explicit configuration, the UE evaluates the conditions to be fulfilled in order to allow the UE to relax RLM and BFD measurements, respectively. When the UE is allowed according to current configured criteria, the UE may decide to relax RLM BFD measurements
- 1b: The RLM BFD measurements relaxed or non-relaxed status is indicated in RRC signaling to the

gNB. RLM and BFD relaxation is indicated separately.

- 2: If RLM and or BFD relaxation indication is configured, the indication from the UE to the network is signaled when the UE changes relaxation of RLM and or BFD measurements from relaxed to non-relaxed state or from non-relaxed to relaxed state, subject to a signaling limitation, such as prohibit timer. The case of RLM and or BDF relaxation being configured, while the corresponding indication is not configured shall be supported (details TBD for CR discussion).
- 3: For RLM BFD relaxation indication, the RRC UE Assistance Information Message is used, where indication for RLM relaxation and BFD relaxation are separate indications and covered by separate prohibit timers

Additional Aspects, Thus:

- According to 1a, the WA can be considered agreed/confirmed
- The current contents of CRs doesn't need to be modified.
- According to 1b, 2, 3 new signalling is added
- The new signaling impacts 38.331 and 38.300.
- Moderator proposal on CRs: Attempt to converge at current TSG RAN, update current CRs with the new additions.

THE ABOVE WAY FORWARD was approved (See Meeting Notes for RP-220854)

5 Way Forward after Final and Ext Rounds

These rounds with extensive discussion were handled on the ftp server and by email (not NWM), and are not reflected here in detail.

Moderator Proposal:

- Approve Company CRs in RP-220960 and RP-220961
- Acknowledge the following Open Issue, expected to be addressed in RAN2 in Q2: How to / whether to limit or remove impact of prohibit timer w.r.t. consistency between UE relaxation state the corresponding knowledge at gNB.