3GPP TSG-RAN Meeting #92-eRP-21xxxx

Electronic Meeting, 14-18 June 2021

Agenda Item: 9.7.1.7

Source: Email discussion moderator (Intel)

Title: Report from Email Discussion [92-e-14-RedCap-WI]

Document for: Discussion and decision

# 1 Introduction

This document reports on the following email discussion during RAN#92-e:

**[92-e-14-RedCap-WI]**

Input contributions covered: RP-211038, RP-211070, RP-211153, RP-211219, RP-211360--> RP-211492

## 2 Proposed WID revisions

RP-211038 is a WID revision from the rapporteur. RP-211153, RP-211219 are discussion documents from Vivo and Nokia respectively that also propose updates to the wording of the objectives. In summary, the following WID updates are proposed:

1. RRM measurement relaxation updated to reflect recent RAN2 agreements (proposed by all 3 documents)
2. Update to the objective on early indication to reflect that indication in both Msg1 and Msg3 will be specified (proposed by RP-211219)
3. Update to the objective on camping restrictions to add "frequencies/PLMN" (proposed by RP-211219)
4. Update to the objective on eDRX to state that CN configures eDRX for Idle and RAN configures eDRX for RRC\_Inactive (proposed by RP-211219)

### 2.1 Initial Round

In the initial round of discussion companies are invited to provide feedback on each of the 4 proposed updates to the objectives. The initial focus should be on the necessity of the updates and the detailed wording can be refined in later stages of discussion.

|  |
| --- |
| **1/ Companies are invited to provide any comments related to the updates to RRM measurement relaxation objective:** |
| **Company** | **Comments** |
| Ericsson | We appreciate other companies for looking in to how to update this objective. We believe that our proposal RP-211038 accurately captures the RAN2 status to a sufficient level of detail.Some comments on the other proposals:RP-211153: This proposal, while not going beyond any RAN2 agreements, misses some relevant agreements in RAN2 which we think deserved being captured correctly such as that Rel-16 is baseline. And what happens when the criteria are fulfilled in IDLE vs. CONNECTED.RP-211219: Some RAN2 progress is not captured clearly in the proposal (e.g. that RAN2 has agreed to use Rel-16 as baseline). Also this proposal goes beyond RAN2 agreements w.r.t. beam measurements. That has not been agreed yet. There was a working-assumption in RAN2 for how it would be added, if added. But no agreement has been made so far w.r.t. whether it will be added or not: 1. Working Assumption: If beam-level criterion is adopted for Rel-17 stationary criterion in RRC\_IDLE/INACTIVE, it is configured separately with Rel-16 low mobility criterion reused
 |
| LG | In general, we agree that updates to RRM measurement relaxation objective is necessary. RP-211038 is a good baseline because it captures RAN2 progress properly and sufficiently. Detailed wording can be discussed at the next round.  |
| NordicSemi | We support an update. |
| Apple  | We think RP-211038 is a better wording, but with the below modifications.We think the details of stationary criterion are not needed to be captured in the WID, as RAN2 agreements/discussion already reflect this, but we still have FFS in RAN2 and adding the sub-bullets negates this. We can leave this to the WG discussion.We also do not prefer to add ‘measurement’ before relaxation. The details of this can be discussed in RAN2/4.* + Specify RSRP/RSRQ based stationary criterion, which is based on Rel-16 low mobility criterion, for RRM measurement relaxation [RAN2]
		- ~~For RRC\_Idle/Inactive, the stationary criterion allows the UE to perform RRM measurement relaxation when fulfilled.~~
		- ~~For RRC\_Connected, the stationary criterion triggers the UE to send a report to the gNB when fulfilled.~~
		- Enabling/disabling of RRM ~~measurement~~ relaxation should be under the network’s control. Specify both broadcast and dedicated signalling for enabling/disabling of RRM ~~measurement~~ relaxation.
	+ ~~Specify provision of thresholds for the Rel-16 not-at-cell-edge criterion, alternatively rely on the existing thresholds [RAN2]~~
	+ Specify RRM ~~measurement~~ relaxation [RAN4]
 |
| T-Mobile USA | Power savings for RRM relaxation are any technical discussion on relaxation criteria should be done in RAN2.  |
| Huawei, HiSilicon | In general fine, however we do not see RAN4 impact as RAN2’s agreement currently had not yet made clear whether new RAN4 requirements are needed. So if update, we prefer to have RAN2 impact only as what exactly proposed in RP-211038. Therefore we see RP-211038 can be a good starting point with following two comments:1) Beam-level criterion was agreed as FFS in RAN2. We can say “e.g. RSRP/RSRQ based xxx”.2) We need to specify Rel-17 not-at-cell-edge criterion, rather than Rel-16. Some clarification here is needed maybe.* Specify support for the following RRM measurement relaxations for neighbouring cells for RedCap devices: for RRC\_Idle/Inactive/Connected [RAN2, RAN4]:
	+ Specify stationary criterion, e.g. RSRP/RSRQ based on Rel-16 low mobility criterion, for RRM measurement relaxation [RAN2]
		- For RRC\_Idle/Inactive, the stationary criterion allows the UE to perform RRM measurement relaxation when fulfilled.
		- For RRC\_Connected, the stationary criterion triggers the UE to send a report to the gNB when fulfilled.
		- Enabling/disabling of RRM measurement relaxation should be under the network’s control. Specify both broadcast and dedicated signalling for enabling/disabling of RRM measurement relaxation.
	+ Specify provision of thresholds for the Rel-17 not-at-cell-edge criterion, alternatively rely on the existing thresholds [RAN2]
	+ ASpecify RRM measurement relaxation [RAN4]
	+ No RRM measurement relaxations are specified for the serving cell.
 |
| DOCOMO | We are generally fine with the update from the rapporteur (RP-211038), which is based on RAN2 agreements, while not OK to preclude beam-level criterion from RAN2 discussion at this stage. We are fine either to have conclusion on beam-level criterion at this RAN plenary or to continue RAN2 discussion. |
| DENSO | RP-211038 can be a baseline for the revision. We’re O.K to keep “RRM measurement relaxation” as proposed, since it is exactly what RAN2/RAN2 is aimed at specifying. The other RRM than measurement is not the target in this objective. The suggestion from Huawei saying “e.g. RSRP/RSRQ” sounds reasonable, given the other criterion is FFS. On the following reivisions,* + - For RRC\_Idle/Inactive, the stationary criterion allows the UE to perform RRM measurement relaxation when fulfilled.
		- For RRC\_Connected, the stationary criterion triggers the UE to send a report to the gNB when fulfilled.
		- Enabling/disabling of RRM measurement relaxation should be under the network’s control. Specify both broadcast and dedicated signalling for enabling/disabling of RRM measurement relaxation.

The first and second bullets can be regarded as the details of the third bullet. Given that these are clear from the meeting note, there would not be necessary to be stated in the WID.On the not-at-cell-edge criterion, the original proposal in RP-211038 reflects two options agreed in the last RAN2 meeting. So, it is O.K to keep as proposed. |
| Deutsche Telekom | In general, we are fine with defining the related RRM measurement relaxation which might be mainly effective and relevant for stationary us cases. We remind the group that REDCAP also targets wearables which are to be used in medium (bicycles) and fast moving situation. Any impact on especially handover performance in such situations must be understood before agreeing on relaxations. The customer will not accept an increased HO failure rate due to relaxed RRM requirements. |
| Samsung | We prefer the updates in RP-211038 from the WI rapporteur among three alternatives. |
| Vodafone | In general fine with RP-212038: the important thing is that any RRM relaxation is under VPLMN control. |
| Nokia | We agree to update the RRM measurement relaxation objectives. Our view is that NW control is very important for RRM relaxations and NW should be able to control in dedicated manner the UE for all the RRC states. It is ok for us to use the proposal from the rapporteur as baseline for the updates but to help the progress both in RAN2 an RAN4 we see that some additional clarifications would be needed. In our view it would also be beneficial to confirm the RAN2 working assumptions as RAN4 also needs to work on its requirements. Below we have proposed updates on top of the WID update proposal from the rapporteur in RP-211038:* + Specify RSRP/RSRQ and beam-level based stationary criterion for RRM measurement relaxation, which is based on Rel-16 low mobility criterion, for RRM measurement relaxation [RAN2]
		- For RRC\_Idle/Inactive, the stationary entering/leaving criterion allows/disallows the UE to perform RRM measurement relaxation when fulfilled. For further network control, gNB should be able to allow RRM measurement relaxation in dedicated signalling.
		- For RRC\_Connected, the stationary entering and leaving criterion triggers the UE to send a indication to the gNB when fulfilled. Based on this indication gNB can enable/disable RRM measurement relaxation.
		- Enabling/disabling of RRM measurement relaxation should be under the network’s control. Specify both broadcast and dedicated signalling for enabling/disabling of RRM measurement relaxation.
 |
| Orange | We are fine with the revised objectives as long the QoE of the targeted service is not affected negatively  |
| ZTE | We are generally fine with the update from the rapporteur (RP-211038), and below “Rel-16” needs to be updated to “Rel-17”. Specify provision of thresholds for the Rel-17 not-at-cell-edge criterion, alternatively rely on the existing thresholds [RAN2] |
| CATT | 1. It is not agreed to preclude beam-level criterion in RAN2 but the following bullet from RP-211038 only focus on the RSRP/RSRQ based stationary criterion
	* Specify RSRP/RSRQ based stationary criterion, which is based on Rel-16 low mobility criterion, for RRM measurement relaxation [RAN2]
2. “Rel-16 not-at-cell-edge” should be “Rel-17 not-at-cell-edge”.
 |
| Qualcomm Incorporated | We agree that it is necessary to update the objectives on RRM measurement relaxations. However, we think details of the wording may be refined to better reflect the latest RAN2 agreements. For example, we do not think it is necessary to capture too much WG-level details, e.g. the first two level-3 bullets under “Specify RSRP/RSRQ based stationary criterion” in [RP-211038](http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_92e/Docs/RP-211038.zip) may be removed or made more generic. |
| Spreadtrum | We are fine to take any proposal in RP-211038, or RP-211153, or RP-211219 as the starting point. Regarding the proposal in RP-211153, we think it is better to add the description to reuse R16 low mobility criterion for stationary criterion. |
| MediaTek | Our preference is to use the update from the rapporteur (RP-211038) as the baseline for these discussions, as it best reflects RAN2 agreements. Given that we tasked RAN2 with a deadline of RAN#92e to study RRM relaxation criteria, and the only agreed criteria is based on RSRP/RSRQ measurements, and also considering Rel-17 time pressures, we do not agree to the inclusion of beam-level criteria in this release.  |
| Thales | We are fine with the proposed update as outlined in RP-211038. Any further discussion on technical realization should be done in RAN2. |
| SONY | We are OK with the RRM-related updates in RP-211038. Maybe “stationary criterion” should be “stationarity criterion”. |
| Intel | We support to update the WID to reflect RAN2 agreements. Beam-level based criterion should be also reflected in the WID although it is working assumption in RAN2. It could be captured as Specify RSRP/RSRQ and beam-level based (if confirmed in RAN2) RRM measurement relaxation criteria  |
| vivo | We are also fine to take any one in these three contributions as the baseline. We think our proposal in RP-211153 with the suggestion to add the description to reuse R16 low mobility for stationary criterion, exactly captured the current RAN2 conclusion and progress. If we take the proposal in RP-211219 as the start point, we think the suggestion “Specify provision of thresholds for the Rel-16 not-at-cell-edge criterion, alternatively rely on the existing thresholds” needs to be revised, as it precludes some potential solution for not-at-cell-edge criterion in Rel-17, which is not aligned with the current RAN2 conclusion “FFS whether the R16 not-at-cell-edge thresholds can be reused or separate R17 not-at-cell-edge thresholds are needed.”. Meanwhile, we think we should not preclude the beam level based criteria, according to RAN2 agreements “Working Assumption: If beam-level criterion is adopted for Rel-17 stationary criterion in RRC\_IDLE/INACTIVE, it is configured separately with Rel-16 low mobility criterion reused”. On this point, we support the suggestion from Intel. |
| OPPO | We are ok with the update. |

|  |
| --- |
| **2/ Companies are invited to provide any comments related to the updates to the objective on early indication:** |
| **Company** | **Comments** |
| Ericsson | We agree to the change. |
| LG | We do not agree to the change. The removal of “or” from ‘Msg1 and/or Msg3’ is against RAN2#114 agreement that “either” Msg1 and/or Msg3 early identification will be supported. |
| NordicSemi | We see benefit from supporting early identification in both MSG1 and MSG3, but early indication shall not be in both MSG1 and MSG3 at the same time. This should be clarified in objectives. In addition, gNB may have option not to configure early identification in any of those.  |
| FUTUREWEI | We do not agree to the change. There is no need to support Msg 3, as evidenced by the working assumption in RAN1: “for 4-step RACH, support the early indication of RedCap UEs at least in Msg1”. Either we remove Msg 3, or let the WGs continue their work without update of the WID.  |
| Apple  | Same view as LG. we do not agree to removal of ‘or’.  |
| T-Mobile USA | T-Mobile USA doesn’t see the need for early indication, if we have to have the feature then it’s impact should be minimal. We agree with LG’s comment |
| Huawei, HiSilicon |  If the change means we need to support both Msg1 and Msg3 for early identification from specification point of view, we are fine. On the other hand we think when and whether to use Msg1 and Msg3 is up to the network configuration, i.e. the network can configure either Msg1, or Msg3, or both for early identification. So it is better to have a common understanding on whether “or” here allows flexibility of network configuration before removing it. |
| DOCOMO | We don’t agree with the update. Either Msg1 (which was agreed as working assumption in RAN1) or existing UE capability reporting based on NW configuration is enough for RedCap UE indication.  |
| DENSO | Same view as LG and Apple. Better not to discuss here and should be left to RAN WGs to decide. |
| Deutsche Telekom | Early indication was agreed as baseline in RAN#91e for operators accepting the relaxation down to 1 Rx (instead of 4). It seems that RAN2 has not (yet) defined the early indication. We co-signed an input to RAN#92e on this in [RP-211360]. We should not reopen the agreement from RAN#91e, otherwise we operator re-open the discussion if 1 Rx is allowed for REDCAP … 😉 |
| Telecom Italia | Same view as DT |
| Samsung | We don’t agree on the change. It can leave to WG discussion on whether both msg 3 and msg 1 can be used for early indication  |
| Vodafone | The network controlled capability to have an early indication of the UE’s RedCap capability in either Msg 1 or Msg 3 is sufficient for us. |
| BT | As explained by DT above, the early indication was part of the compromise agreement for accepting the relaxation to 1 Rx rather than 4 Rx. We consider that this agreement should be respected in the work in RAN2, otherwise we would support re-opening the discussion on the scope of RedCap, and in particular the question of permitting 1 Rx.  |
| Nokia | We agree to the change. It is also important to note that it has already agreed earlier and clearly defined in the WID objectives that the early indication is configurable by the network. Therefore, msg3 is needed when msg 1 is not configured. RAN1 has agreed that Msg1 indication should be configurable by the network. If network does not configure Msg1 indication, then Msg3 indication is clearly needed in order that the UE can be scheduled correctly before the RRC Connection is established.Regarding LG’s comments we have different view. In our understanding “either” Msg1 and/or Msg3 means "Msg1 and Msg3" or "Msg1 or Msg3". |
| Orange | Same view as DT. We co-signed the contribution RP-211492 with DT, Telecom Italia and BT. Early indication with msg1 and msg3 is essential for the network to control the admission of 1 Rx devices on the network, and make more flexible decisions than with a simple cell barring mechanisms as with the SIB indication. Early identification can for instance allow the admission of a quota of 1 Rx devices on a cell, trigger redirection to other bands beyond a certain threshold. |
| ZTE | We don’t agree with the update. The removal of “or” is against RAN2#114 agreement. |
| CATT | We don’t agree with the update to remove ‘or’. |
| Qualcomm Incorporated | The objective text can be clarified with the assumption that it defines the mechanisms RAN2 is tasked to specify. In this sense we think;* Removing “or” from “Msg1 and/or Msg3” is OK, i.e RAN2 is specifying both solutions, not one of them only.
* Removing “if supported” for MsgA is not in line with RAN2 agreement so far.
* Removing the ability for Msg3 indication is OK (our understanding is that Msg3 is used when Msg1 scheme is not configured).

At the same time, we should clarify that Msg1 and Msg3 schemes are not configured simultaneously. |
| Spreadtrum | We do not see the need of the change. The removal of “or” from ‘Msg1 and/or Msg3’ would imply that early indication in both Msg1 and Msg3 should be supported, which is not aligned with the whole picture of current discussion in RAN1 and RAN2. We prefer no update on early indication objective, which would still provide the room for further discussions in WGs. |
| MediaTek | Msg1 based early identification has a serious RACH resource impact and should be avoided unless absolutely necessary. Msg3 based early identification would alleviate this resource impact. Therefore it is very useful for NWs to have the option to not configure Msg1 based early identification and use Msg3 based early identification where appropriate. However, we see no need to have both Msg1 and Msg3 early identification mechanisms simultaneously configured as these are redundant. This needs to be clarified if this objective is updated. |
| Thales | We don’t agree on the change. Further discussion whether both Msg1/Msg3 can be used should be left to the WGs. |
| SONY | It should be clear in the WID what “and”, “or”, “and / or” means. We think that it should be possible for the network to configure that early indication is sent in Msg1. It should also be possible to configure that early indication is sent in Msg3.  |
| Intel | Agree with LG and others that there is no need to make any changes to WID objective for this. Currently, RAN1 has agreed to support early indication at least during Msg1 with additional/alternative indication during Msg3 as FFS. This is fully consistent with the current description in the WID objective with “Msg1 and/or Msg3”. In fact, the proposed change to “Msg1 and~~/or~~ Msg3” would not be consistent with the latest status in RAN1. Thus, we do not agree to changes in the objective in this regard. |
| vivo | We do not agree the update. This removal of “or” is against RAN2 conclusion.Besides, we think which direction should be taken is the task of WG. |
| OPPO | We think the Msg1 and Msg3 could be both used for earlier indication about RedCap capabilities. It is in the scope of approved WID. Clarification would be needed to help WG discussion. |

|  |
| --- |
| **3/ Companies are invited to provide any comments related to the update to the objective on camping restrictions to add "frequencies/PLMN":** |
| **Company** | **Comments** |
| Ericsson | We do not understand why "frequencies" is added and what it implies.About adding "PLMN", would be reverting the following RAN2 agreement:The cell barring for RedCap UE is per cell (not per PLMN). Hence we do not agree with these changes. |
| LG | Agree with Ericsson.  |
| NordicSemi | Same opinion as Ericsson |
| Apple | Agree with Ericsson |
| T-Mobile USA | We don’t agree with adding the new language. Support Ericsson’s comment.  |
| Huawei, HiSilicon | Agree with Ericsson. |
| DOCOMO | We share the view with Ericsson on “PLMN” that it is precluded by the RAN2 agreement.Regarding “frequencies”, we would like to ask proponent to clarify the intention |
| DENSO | Agree with Ericsson |
| Deutsche Telekom | We disagree with the observation (RAN2 agreement?) that Cell barring for REDCAP is per cell … it needs to be (per cell) per PLMN – otherwise MOCN network sharing is not supported correctly, where different operator policies regarding REDCAP allowance might exist. This needs to be corrected in RAN2 |
| Telecom Italia | Same view as DT. Network sharing has to be taken into account when defining RedCap |
| Samsung | Agree with Ericsson |
| Vodafone | The “per PLMN” category raises security concerns that would need to be addressed to SA3. A NAS signalling reject would be more appropriate for PLMN/TA control (and would benefit from a NAS Capability Bit for ‘RedCap UE’). |
| BT | We support the comments from Deutsche Telekom and Telecom Italia. |
| Nokia | We agree with the update proposal. It seems that our proposal was unclear. Intention of our proposal was that the NW can signal frequencies supporting RedCap. Such information is available in in the network. It was discussed in RAN2 meeting whether cell barring or PLMN barring should be supported. We think that both can be supported. Information which frequencies and PLMNs supports RedCap would be useful for the UE for power saving purposes because UE can then skip scanning of the frequencies not supporting RedCap. In addition it was discussed in RAN2 that network could broadcast list of cells supporting RedCap. In our view, this would require unnecessary coordination between gNBs and would result in significant broadcast signaling overhead. Therefore, it would be better to broadcast frequencies supporting RedCap and in addition information whether RedCap is not supported on the whole PLMN. |
| Orange | We agree with DT that per PLMN barring helps addressing the case of MOCN |
| ZTE | We also want to clarify the intention of “frequencies”. |
| CATT | Agree with Ericsson |
| Qualcomm Incorporated | Agree with Ericsson. |
| MediaTek | Agree with Ericsson that the addition of ‘PLMN’ reverts a RAN2 agreement and therefore do not agree with this change. We have the same question as others on the intention and implications behind the term ‘frequencies’ |
| Thales | Avoiding the scanning of frequencies where REDCAP devices will not be allowed or indicating frequencies where REDCAP as supported by the UE is allowed, could be beneficial for power saving as certain frequencies can be skipped from scanning. Whether a frequency indication is an addition to the current per cell agreement or even more suitable should be left to RAN2 for further discussion. We would like to discuss this proposal further in the technical group i.e. RAN2. |
| SONY | Agree with Ericsson |
| Intel | Agree with Ericsson.  |
| Vivo | Agree with Ericsson. |
| OPPO | Same views as Ericsson. |

|  |
| --- |
| **4/ Companies are invited to provide any comments related to the update to the objective on eDRX:** |
| **Company** | **Comments** |
| Ericsson | This is in-line with RAN2 agreements and is fine. |
| LG | The change properly captures RAN2 agreement. However, it seems true that current objective has no problem, i.e. no strong need to update WID on this aspect.  |
| NordicSemi | We do not see that RAN2 agreements are against current objectives. No need for any update. |
| Apple | The current objective seems to be fine. |
| Huawei, HiSilicon | OK, aligned with RAN2 agreement. |
| DOCOMO | We are fine with the update, which is aligned with RAN2 agreement |
| DENSO | Whilst the update is aligned with RAN2 agreement, we’re not sure if the WID objective has to be updated to reflect what to do for that objective… The original objective seems sufficient to work on this objective. |
| Samsung | RAN 2 already made clear agreement. We don’t see the need to update WID.  |
| Vodafone | OK, it seems to be aligned with RAN2 agreement. |
| Nokia | We agree with the update proposal. |
| Orange | We are fine with the revision |
| ZTE | Since RAN2 already had agreement on this item, we can update this objective or delete the whole sub-bullet from the WID. |
| CATT | Fine with the update which is align with RAN2 agreement |
| Qualcomm Incorporated | We think the current objectives should be updated to reflect the latest RAN2 and SA2/CT1 agreements:1. Since SA2/CT1 (C1-213966) can’t reach consensus regarding the feasibility of extending eDRX cycle in RRC\_INACTIVE up to 10485.76 seconds, we think the related objective shall be removed the from WID, i.e.

Extended DRX for RRC ~~Inactive and~~ Idle with eDRX cycles up to 10485.76 s~~; the details of mechanisms and feasibility regarding maximum length of the extended DRX cycles for RRC Inactive and Idle need to be checked by SA2, CT1 and/or RAN4~~.1. RAN2 have agreed to support 2.56s as the lower bound of eDRX cycle in RRC\_IDLE and RRC\_INACTIVE. We think this agreement should be captured in the WID, e.g.

The lower bound for extended DRX for RRC\_IDLE and RRC\_INACTIVE down to 2.56 seconds. |
| MediaTek | While the change correctly captures RAN2 agreements, we agree with LG and Apple that we see no issue with the current objective either, as it leaves the decision to RAN2 (which RAN2 has taken into account). |
| Thales | We agree with the updated proposal. |
| SONY | OK with updates. |
| Intel | Do not see the need to update the objective.  |
| vivo | Whether to update this objective will not impact RAN2 work. Thus, whether to have this change is fine.  |
| OPPO | Not necessary for the update. |

### 2.2 Summary from Initial Round

The initial round invited comments on the following updates to the WID

1. RRM measurement relaxation updated to reflect recent RAN2 agreements (proposed by all 3 documents)
2. Update to the objective on early indication to reflect that indication in both Msg1 and Msg3 will be specified (proposed by RP-211219)
3. Update to the objective on camping restrictions to add "frequencies/PLMN" (proposed by RP-211219)
4. Update to the objective on eDRX to state that CN configures eDRX for Idle and RAN configures eDRX for RRC\_Inactive (proposed by RP-211219)

For update 1 on RRM measurement relaxation, the majority of companies are in favour to updating the WID to reflect the RAN2 agreements in the last quarter. Most companies are happy to use the proposal from the rapporteur as a starting point for further discussion.

For update 2 relating to the objective on early indication in Msg1 and Msg3, diverse views were expressed and certainly no majority in favour of a change to the wording of the WID. It seems clear that there is more discussion to take place in the WGs. In the moderator's view there is no contradiction between the current status of the WGs and the wording of the WID and therefore it would be better to take no action in RAN and let the WGs progress their discussions.

For update 3 relating to the objective on camping restriction there is a clear majority in favour of not making any update to the WID. From the discussion it was observed that there are various aspects still to be discussed within RAN2.

For update 4 relating to the objective on eDRX, it was generally commented that the proposed change is consistent with RAN2 agreements but also that the current text is consistent with RAN2 agreements and hence there is not a strong reason to revise the WID.

In the moderator's view it is in general not necessary to constantly update a WID objectives to reflect the latest agreements from the WGs as long as those agreements remain consistent with the objectives. To do so just generates extra plenary discussion with limited benefit to the overall progress of the work. With regard to the RRM measurement relaxation, the current WID refers to a RAN2 study phase until RAN#92e, and in this case it is justifiable to update the WID to reflect the conclusion of that study phase.

**Moderator's proposals from Initial Round**:

1 The WID is updated to reflect the outcome of RAN2's agreements on RRM measurement relaxation. The revision from the rapporteur provided in RP-211038 is used as a baseline for this update and discussion of the detailed wording can take place during the Intermediate Round.

To facilitate a productive discussion in the intimidate round, the moderator recommends to not go beyond what has been agreed by the WGs, and also not attempt to capture every detail from the WG agreements (remembering that the purpose of the WID objectives are to guide the work to be done, and not form a record of what has been agreed so far). It also doesn't seem productive to attempt to capture WG working assumptions or FFS points as part of the WID objectives.

2 Do not update the early indication objective of the WID (as proposed by RP-211219)

3 Do not update the camping restriction objective of the WID (as proposed by RP-211219)

4 Do not update the eDRX objective of the WID (as proposed by RP-211219)

### 2.3 Intermediate Round

Companies may provide comment to the moderator's conclusion from the initial round. Discussion of detailed wording of the revised WID will now move to the email reflector and a draft WID on the server (a folder will be provided).

|  |
| --- |
| **Companies are invited to provide comments to the moderator's conclusion from the initial round** |
| **Company** | **Comments** |
| vivo | Regarding the update 1 related to RRM relaxation, we are fine to use the proposal from the rapporteur as a starting point, and agree with moderator’s guidance. Besides, we think the proposed update should not conflict with current RAN2 conclusion, including the decided parts (i.e. agreement) and the remaining parts (i.e. FFS). |
| Spreadtrum | Agree with moderator's proposal. |
| Apple | We agree with the moderator’s proposals: * WID update on RRM, to be discussed based on the guidance from the moderator to not capture every detail. We can discuss further based on the content proposed.
* No update on early indication/camping restriction and eDRX objectives.
 |
| Qualcomm Incorporated | We believe it makes sense to try to down scope where possible from what we know at the moment.On eDRX, the current objective indeed mentions SA2/CT1 implications. And as we commented, SA2/CT1 (C1-213966) couldn’t reach consensus regarding the feasibility of extending eDRX cycle in RRC\_INACTIVE up to 10485.76 seconds. We think the related objective can be removed.* Extended DRX for RRC ~~Inactive and~~ Idle with eDRX cycles up to 10485.76 s~~; the details of mechanisms and feasibility regarding maximum length of the extended DRX cycles for RRC Inactive and Idle need to be checked by SA2, CT1 and/or RAN4~~.
 |
| DOCOMO | We are fine with moderator’s proposal. |
| Deutsche Telekom | Early indication: We are fine not updating the WI as proposed by RP-211219), but we need to enforce that RAN2 follows the guidance of RAN#91/#92 meetings and does introduce the early indication which was baseline for the REDCAP agreements in RAN#91Camping restriction: It must be clear that this is per cell per PLMN individually, otherwise MOCN cases are not covered correctly. RAN2 needs to work on this and the related update of the WID is necessary (like in RP-211219, but we don’t understand why frequencies are mentioned ?)eDRX: We think particularly for REDCAP device a possibility to define extended DRX in RRC\_INACTIVE is essential and hence RAN2 should discuss with SA2/CT1 how this can be achieved.  |
| Samsung | Regarding RRM relaxation, we are fine with Qualcomm's updates with some further clarification: Since the only remaining options in RAN2 is whether to use the same or different thresholds from the Rel-16 criterion, we can update the wording 'can be' to 'is' from QC's updates (the proposed change is also provided in the WID update\_v02\_Samsung). |
| ZTE | We are fine with the moderator’s proposals. For ‘RRM relaxation’, in the baseline revision proposed by moderator, “Rel-16 not-at-cell-edge” needs to be updated to “Rel-17 not-at-cell-edge”.  Specify provision of thresholds for the Rel-17 not-at-cell-edge criterion, alternatively rely on the existing thresholds [RAN2] |
| Huawei, HiSilicon | We are OK with the way forward. May have detailed comments once the WI update is sent. |
| OPPO | Would be good to clarify the earlier indication. But we also see the current wording in WID include both indication.Others are OK |
| Telecom Italia | We support the considerations made by DTIn general, we are concerned with the impact on user experience caused by relaxation of RRM procedures, especially in case of wearables. Therefore, the impact on user experience must be assessed before agreeing on any solution and it should be possible to discriminate between stationary and non stationary devices |

## 3 RP-211070

RP-211070 discusses some of the WG discussions on RedCap and makes the following proposals:

* **Proposal 1**: WGs shall follow the approved WID and the related compromised discussion together with the approved WID. If necessary, it is recommended that all companies or Rapporteurs or Feature leaders should track the RAN discussion procedure and the implied meanings of WID to avoid unnecessary discussion in WGs.
* **Proposal 2**: If deemed necessary, a joint GTW or joint email discussion can be considered among different WGs in future to assist the standardization of R17 RedCap.

### 3.1 Initial Round

|  |
| --- |
| **Companies are invited to provide any comments related to the proposals in RP-211070** |
| **Company** | **Comments** |
| Ericsson | P1: We already think it is established that WGs should follow the WIDs.P2: We do not think a joint session between WGs will be fruitful. |
| LG | We agree with P1. On P2, We do not think a joint session between WGs is really necessary.  |
| NordicSemi | We do not think joint sessions between WGs are of any benefit, it is typically difficult to find common language between WGs. However, RAN should discuss how to handle overlaps between WIDs, for example for Early identification of RedCap UE and Early identification of UE requiring coverage enhancements. |
| FUTUREWEI | P1. The WID directs the work, and RAN conclusions (if there are any) are followed along with the WID. Unclear what we need to agree to here, we are uncomfortable formalizing a new tracking procedure or including feature leads in the working procedures.P2. We do not think a joint GTW / email discussion is necessary |
| Apple  | Similar views as Ericsson. P1: Our view is that the approved WID has been tightly followed by working grouping. P2: We did not identify specific Redcap topic that motivates the joint session. We had separate agenda in RAN1 to handle RAN2-Led topics/issues and many of them were concluded to leave to RAN2 decision unless RAN1-relevant context was clearly identified.  |
| T-Mobile USA | No new process is needed, RAN requires each project to provide a status report and if the WG’s aren’t following the WID then that is the time to flag the SR and have a discussion at plenary.  |
| Huawei, HiSilicon | Proposal 1 should already be the existing way that delegates work, Proposal 2 can be done in an alternative way, that WGs do their leading topics and if coordination is required, measures like LSs can be triggered. We think the current way works well. So in summary we see no need to agree these proposals. |
| DOCOMO | P1: No agreement is necessary as it is common understanding among companiesP2: We don’t think joint GTW or email discussion is necessary |
| DENSO | Agree with the others commented so far. P1 is the existing and conventional procedure delegates have been working so far. Based on the past history, the joint session does not always bring the useful outcome, whilst it requires the longer discussion than expected originally.  |
| Deutsche Telekom | (strange discussion) It is obvious that the WG SHALL follow the guidance of the RAN plenary and not reopen or repeat discussion which have let to a RAN plenary decision. If guidance is not clear it is the responsibility of the WG chair together with the WI rapporteur to collect input to the topic and provide guidance to fine an agreeable WF. If further RAN plenary guidance is needed, either the WG chair reports this or a LS is sent to RAN* No further discussion needed on this document -
 |
| Samsung | Current working procedure is clear, and we don’t see motivation to have joint session.  |
| Nokia | We do not see need for a joint GTW or email discussion. It is of course important that all WGs follow the agreed WID objectives. |
| Orange | We do not think discussions should be reopened. The guidance from the last plenary was clear enough. |
| ZTE | P1: It is common understanding among companies.P2: We don’t think “joint GTW” or “joint email discussion” could be more efficient.  |
| CATT | For proposal 1, it is not clear what needs to be agreed.For proposal 2, we agree with other companies that a joint meeting may not help much. |
| Qualcomm Incorporated | We think P1 is fine. We have not seen any serious coordination issues between WGs blocking the progress of the RedCap WI. We hence do not think joint session is necessary. |
| Spreadtrum | **For P1,** we simply want to clarify that one area and its background (UE complexity reduction for higher layers) have been discussed and included in the WID, which could potentially avoiding unnecessary duplicated discussion in WGs in future.**For P2,** we are quite open with our proposal whose motivation is to give a potential suggestion to improve the coordination among WGs.  |
| MediaTek | We do not support these proposals.P1: This is already the way that delegates are expected to workP2: We agree with others that there isn’t a strong motivation for a joint GTW or email discussion between different WGs |
| Thales | P1: We think this is already followed.P2: We do not think a joint GTW / email discussion is necessary. |
| SONY | We think that current working procedures are fine and don’t need a joint session. |
| Intel | Similar views as Ericsson and others. P1 is “business as usual” and has been followed as such in WGs. P2 is not necessary in our view. LS-based interactions are sufficient at this stage.  |
| vivo | Regarding P1, we actually support the observation that the study of UE complexity reduction for higher layers is in the RedCap WID scope. I assume this is the intention for this proposal Regarding P2, it could be up to Rapporteur and/or WG Chair to coordinate how to split the discussion area or how to proceed the corresponding work. |

### 3.2 Summary from Initial Round

The majority view is that the proposal 1 should already be established practice (i.e. the WGs should follow the approved WID in their work) but that no general agreement needs to be captured for this. For proposal 2, the majority of companies felt that joint GTW or join email discussion are not necessary.

**Moderator's proposal from Initial Round**:

The proposals are not agreed and RP-211070 can be noted.

### 3.3 Intermediate Round

Companies may provide comment to the moderator's conclusion from the initial round.

|  |
| --- |
| **Companies are invited to provide comments to the moderators conclusion from the initial round** |
| **Company** | **Comments** |
| Spreadtrum | We are fine with moderator’s proposal.But we would like to clarify the motivation for RP-211070 in short: During last RAN2#114 meeting, 8 companies think the study of UE complexity reduction techniques for higher layers is in the scope for Rel-17, while 8 companies hold the opposite view. In RP-211070, we give our observation that the study of UE complexity reduction for higher layers is in the RedCap WID scope. |
| Apple | Agree with the moderator’s proposal. |
| DOCOMO | We agree with moderator’s proposal. |
| Samsung | Agree with Moderator’s proposal |
| ZTE | We are fine with moderator’s proposal. |
| Huawei, HiSilicon | We are OK with the way forward.  |
| Telecom Italia | I must say that WG have to follow RAN directions, but it seems this is not the case for this work item. Looking to the sentence from Spreadtrum8 companies think the **study** of UE complexity reduction techniques for higher layers is in the scope for Rel-17, while 8 companies hold the opposite viewI suggest this is a very good candidate for downscoping, since if studies are not yet started how can you imagine to complete the normative work in time??? |
|  |  |

## 4 RP-211492 (revision of RP-211360) - Early indication of number of Rx branches

RP-211492 (revision of RP-211360) discusses the need for early indication of number of Rx branches and makes the following proposals:

* **Proposal 1**: include the information on the number of Rx branches supported by a RedCap UE within the early indication during the initial access
* **Proposal 1b**: if Proposal 1 is agreed, RAN to send a LS to RAN1 and RAN2 to take the agreement into account for their normative work
* **Proposal 2**: if Proposal 1 is not agreed, RAN to task RAN1 to identify pros and cons of having the information on the number of Rx branches supported by a RedCap UE within the early indication during the initial access for the purpose of RACH procedure efficiency; RAN1 will then liaise with RAN2 so that RAN2 agreement from RAN2#104-e meeting can be revisited accordingly (if needed)

### 4.1 Initial Round

|  |
| --- |
| **Companies are invited to provide any comments related to the proposals in RP-211492** |
| **Company** | **Comments** |
| Ericsson | For Msg1-indication: The issue with this proposal is that it will cause even more partitioning of the preambles. Already now RAN2 are discussing partitioning of preambles for: Coverage enhancements, RedCap vs. non-RedCap, Slicing, and SDT. To partition even further would cause twice as many partitions. It is perhaps not a feasible way forward to partition too much.For Msg3-indication: perhaps it would be possible to indicate the nrof Rx branches. |
| LG | In RAN2#114, RAN2 concluded that there is no need to support Rx branch-specific early identification from RAN2 perceptive (final decision up to RAN1). In RAN1#105e (May), there was a RAN1 conclusion declaring no consensus to support early identification of the number of Rx branches in Msg1/Msg3/MsgA for Redcap UE in Rel-17. So, from procedural point of view, we think RX branch-specific early indication is not well justified.  |
| NordicSemi | We agree with Ericsson that there cannot be early identification for everything. Moreover, MSG2 repetitions could be bundled with MSG3 repetitions and could be discussed under CovEnh WID? |
| FUTUREWEI | Early identification is useful to address the resulting performance degradation due to a reduced number of Rx branches.There is no critical problem with allowing the *possibility* of RX branches by configuration. The motivation should be clear from RAN discussion, where early identification was included as part of the discussion to allow 1RX. If an operator does not see the benefit, then they won’t configure it.Note: regardless of 1RX early identification, the WGs can design RSRP thresholds for ROs which could differently handle “poor” RedCap UEs. |
| Apple  | Like what LG mentioned, RAN2 does not see the need to differentiate. In RAN1, this issue (i.e., early indication of Rx branches number) was also extensively discussed in RAN1 105 e-meeting under Agenda 8.6.1.2. The detailed pros/cons analysis for each option was conducted and documented in Table 1 of FL summary R1-2106125. Based on two rounds debating, the following was concluded in GTW session based on majority companies’ views:  Conclusion* No consensus to support early identification of the number of Rx branches in Msg1/Msg3/MsgA for Redcap UE in Rel-17

Given the fact that this issue has been extensively discussed and explicitly concluded in RAN1/RAN2, as commented by LG, we did not see the need of any of these proposals.  |
| T-Mobile USA | T-Mobile USA doesn’t support early indication; thus we agree with Ericsson, LG and Apple’s comments.  |
| Huawei, HiSilicon | This has already been discussed in RAN1/RAN2 and not agreed, thus we do not see need to reopen this discussion. According to the study in TR 38.875, the DL coverage of 1Rx could be similar as the case of 2Rx and thus early identification seems not essential. On the other hand more early identification would make the situation worse for RACH partitioning as REDCAP and non-REDCAP UEs has already required early identification via Msg1.if the intention is to bar UEs differently for 2Rx and 1Rx, it is already agreed to support such differentiation in SIB1 as “SIB1 (not MIB) indicates cell barring for 1 Rx branch and 2 Rx branches separately for RedCap UEs.”. |
| DOCOMO | We don’t support the proposals. Corresponding WGs already have made following conclusions and thus no further discussion is necessary:[RAN1]**Conclusion:*** No consensus to support early identification of the number of Rx branches in Msg1/Msg3/MsgA for Redcap UE in Rel-17

[RAN2]AgreementThere is no need to support Rx branches specific early identification from RAN2 perceptive (final decision up to RAN1). |
| DENSO | As agreed by RAN2, it is reasonable to make the final decision by RAN1. Since RAN1 didn’t agree on not supporting the early indication in Rel-17, but it was concluded as “no consensus”, it could be discussed by RAN1 based on company contributions, if time is permitted.  |
| Deutsche Telekom | This also relates to the clear process which is established in 3GPP and not followed by the WGs. It is the responsibility of the WG chair to make clear that the groups follow the RAN plenary guidance.Early indication of the number of Rx branches has been agreed as part of the “compromise” in RAN#91e allowing to go down to 1 Rx. The document clearly lists the agreement from RAN#91e.If early indication (no preference for msg 1 or 3 from our point – can be left to RAN1/2 decision) is not defined in RAN2 than we re-open the discussion on the number of Rx for REDCAP and request limiting it to 2 Rx, where 4 Rx are mandatory for none-REDCAP devices. |
| Telecom Italia | We of course support the proposal. The current RAN1 and RAN2 assumptions are reverting the RAN plenary guidance. As clearly stated in the contribution, if there is no differentiation, a further inefficiency is introduced in the network, which has to plan for the worst case scenario (1 Rx antenna) |
| Samsung | RAN 1 and RAN 2 had studied and discussed the early indication of the number of RX branches. There is no consensus in RAN 1 on the support of early identification of the number of Rx branches. No need to discuss it again in RAN.  |
| Vodafone | If the UE was in RRC Inactive then the existing Rel 15 UE Capability handling framework would seem to provide the RAN with the number of UE rx antennas at Msg 3. We are also concerned about the number of features proposing PRACH resource partitioning.RAN 1 has already evaluated many of the pros and cons. |
| BT | We support the proposal as we believe that early indication of the number of Rx branches is essential for efficient operation of our network.  |
| Nokia | We do not see need for the WID updates but we see that it would be important to urge RAN2 to progress its work on Rx branch specific barring per frequencies and dedicated control for RRM measurements for all RRC states, especially as so far RAN2 has not been able to confirm these objectives although the objectives should be clear. |
| Orange | We co-signed the proposal and agree with DT that early indication of the number of Rx antenna was part of the compromise to accept relaxation to 1 Rx at the last plenary. |
| ZTE | We show similar view as Futurewei early identification of the number of Rx branches is useful. However, since RAN1 already had conclusion on early identification of the number of Rx branches in Rel-17, it can be considered in later release. |
| CATT | We don’t support the proposals. As commented by DOCOMO, RAN WGs have already made the conclusion/agreement. |
| Qualcomm | We agree with Ericsson and LG. |
| Spreadtrum | For P1, we share with Ericsson’s view. In addition, according to RAN1’s agreements, the early identification of RedCap UEs (e.g., in Msg1) is configurable, so introducing additional early indication of number of Rx branches is not clear so far. .For P2, in the last RAN1 meeting, we had already discussed the pros and cons of the early indication of number of Rx branches in summary R1-2106333. |
| MediaTek | We do not support the proposal.As highlighted by companies above, this has already been discussed in RAN1 and RAN2 and has been concluded as not needed. In addition, RAN2 has already agreed that an operator can bar 1 RX UEs from the network altogether using SIB1. Therefore, we do not see sufficient motivation to reopen this discussion here. |
| Thales | RAN2 discussed the topic and concluded that from RAN2 perceptive there is no need to support Rx branch-specific early identification and final decision is up to RAN1. (1Rx, 2RX different treatment can be achieved by SIB1 indications). RAN1 has not yet come to a consensus whether number of RX branches is needed in early identification. |
| Intel | As mentioned by LG and others, RAN2 concluded there is no need to support early indication of # of Rx branches while RAN1 concluded there is no consensus to introduce such feature. Thus, procedurally, we do not see it appropriate to reopen the discussions.Technically, we do not think that the potential benefits (that are marginal at best) merit the increased partitioning of PRACH preambles and/or increased UL OH from PRACH. First, non-RedCap UEs are still identifiable from RedCap UEs (per RAN1 working assumption from RAN1 #105-e meeting), and thus, scheduling of non-RedCap UEs should not be impacted. Also, the network can still bar 1Rx UEs if it wants to restrict access, per RAN2 agreement on support of access barring via SIB with separate indication for 1Rx and 2Rx UEs being possible.With the above in place, but without support of early indication of # of Rx branches, gNB will likely treat all RedCap UEs as having 1Rx. Considering that (1) relative numbers of RedCap UEs with 2Rx is not likely to be significantly larger than either non-RedCap UEs or RedCap UEs with 1Rx, and (2) the affected channels being PDCCH/PDSCH prior initial access (Msg2/Msg4/5), the impact to system spectral efficiency would be negligible. Thus, early indication between RedCap and non-RedCap is sufficient.  |
| Vivo | According to the current agreement in RAN1#105-e meeting,**Conclusion:**No consensus to support early identification of the number of Rx branches in Msg1/Msg3/MsgA for Redcap UE in Rel-17We donot see the motivation for these proposals. |
| OPPO | We think the situation would also need the WID clarification. The concern of earlier identification of 1 RX or 2 RX is the PRACH resource limitation. But the requirement of earlier identification is also justified by RedCap UE scenarios.There is definitely impact for 1 RX cases, e.g. much higher PDCCH aggregation level for RAR response and so on.If the PRACH resource overhead is concern, we can considering compact indication – assuming 1RX as baseline. |

### 4.2 Summary from Initial Round

A large majority of companies do not support the proposals. A number of companies referred to RAN1 having had extensive discussion on this topic and concluding that they were not able to reach consensus to support the indication of the number of receive branches in Msg1/3/A.

Concern was raised by some of the proponents that the WGs did not follow RAN#91e guidance that came from the compromise at the last meeting. The moderator observes that RP-211492 slide 2 has 2 sentences highlighted in yellow. The first sentence relates to the gNB have means to know the number of Rx branches of the UE and this can be provided by the normal UE capability framework. The second sentence relates to RedCap UEs being identifiable via Msg1 and/or Msg3. To the moderator's understanding, these sentences do not necessarily imply that 1Rx/2Rx (distinct from RedCap UE identification) must be identifiable via Msg1 and/or Msg3, and hence it would not be fair to conclude that the WGs agreements so far are going against the RAN#91e guidance.

Based on the comments received, it is the moderators view that the proposals are not agreeable, and further discussion of open aspects should continue in the WGs.

**Moderator's proposal from Initial Round**:

The proposals are not agreed and RP-211492 can be noted.

### 4.3 Intermediate Round

Companies may provide comment to the moderator's conclusion from the initial round.

|  |
| --- |
| **Companies are invited to provide comments to the moderator's conclusion from the initial round** |
| **Company** | **Comments** |
| Spreadtrum | Agree with moderator's proposal. |
| Apple  | We support moderator’s conclusion.  |
| DOCOMO | We agree with moderator’s proposal. |
| Deustche Telekom | Early indication in msg 1 and/or msg 3 were already part of the WID review in RAN#91 and agreed. Hence no new agreement is needed, but the RAN#91 decision needs to be enforced in the RAN1/2 process. There is absolutely no need to re-open agreements from RAN in the WGs ! |
| Samsung | Support moderator’s proposal |
| ZTE | We are fine with moderator’s proposal. |
| Huawei, HiSilicon | We are OK with the way forward.  |
| OPPO | OK for the way forward. |
| Telecom Italia | Same view as DTBut the current agreements are reverting the RAN decisions, which must be enforced |

## Annex: Contacts

Please provide a company contact that the email discussion moderator can contact if required.

|  |  |
| --- | --- |
| **Company** | **Contact name and email** |
| Ericsson | Mattias Bergström (mattias.a.bergstrom@ericsson.com) |
| LG | Sunghoon Jung (Sunghoon.jung@lge.com) |
| NordicSemi | Karol Schober (karol.schober@nordicsemi.no) |
| FUTUREWEI | Brian Classon (brian@classonconsulting.com) |
| Apple  | Hong He (hhe5@apple.com) |
| T-Mobile USA | John.J.Humbert2@T-Mobile.com |
| Huawei, HiSilicon | zhaoyang@huawei.com |
| DOCOMO | Shinya Kumagai (shinya.kumagai@docomo-lab.com) |
| DENSO | Hideaki Takahashi (hideaki.takahashi.j6e@jp.denso.com) |
| Deutsche Telekom  | Axel.Klatt@telekom.de |
| Telecom Italia | Giovanni Romano (Giovanni.romano@telecomitalia.it) |
| Samsung | Feifei Sun (Feifei.sun@samsung.com) |
| Vodafone | Diogo Martins (diogomartins.martins@vodafone.com) |
| BT | Johnny Dixon (johnny.dixon@bt.com)  |
| Nokia | Sari Nielsen (sari.nielsen@nokia.com) |
| ZTE | Huiying Fang (fang.huiying@zte.com.cn) |
| CATT | Yanping Xing (xingyanping@catt.cn) |
| Qualcomm Incorporated | mkitazoe@qti.qualcomm.com |
| Spreadtrum | Sicong Zhao (sicong.zhao@unisoc.com) |
| MediaTek | Pradeep Jose (pradeep[dot]jose[at]mediatek[dot]com) |
| Thales | Volker Breuer (Volker.breuer@thalesgroup.com) |
| SONY | Martin Beale (martin.beale@sony.com) |
| Intel | Debdeep Chatterjee (debdeep.chatterjee@intel.com) |
| vivo | Chenli (Chenli5g@vivo.com) |