**3GPP TSG RAN Meeting #88e *DRAFT* RP-201260**

**June 29th – July 3rd, 2020**

**Electronic Meeting**

**Agenda item:** 9.12

**Source:** Qualcomm Incorporated

**Title:** ***DRAFT*** Summary of email discussion on Rel-17 lower NR UE capabilities

**Document for:** Discussion/Decision

# Introduction

After the discussion of [1] at RAN #88, it was agreed to start a RAN email reflector discussion on the scope of the proposal. The scope of the proposal is given as follows.

* Enable both the following in the Rel-17 NR specifications
  1. For FR1, allow UEs to support a bandwidth of 50 MHz for bands that mandate 100 MHz in Rel-16
  2. For FR1, allow UEs to support 2 Rx in bands that mandate 4 Rx in Rel-16
* Add mechanism to enable the following:

1. Access restriction mechanism, which allows the network to indicate whether it can accept lower capability UEs or not
   * + Lack of signaling means the UEs are not allowed to connect
2. Endorse the use of the maximum data rate determined according to 4.1.2 in 38.306 to label the different tiers of UEs to make the subscribers aware of the capabilities of UEs.

In the following, we ask for comments on the proposed scope.

Note that the only the scope is subject of this email discussion.

# Discussion

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| **Company** | **Comments on proposal scope** |
| ZTE | In general, we are fine with introducing the support of such lower capability UEs.  The major proposed scope is aligned with the scope of Rel-17 RedCap SI, i.e. bandwidth reduction, reduced number of Rx antennas and access restriction mechanism. So it's more appropriate to support this in Rel-17 RedCap item instead of covering this in another Rel-17 WI or TEI. |
| Samsung | We are fine with the proposed scope.  It can be considered in Rel-17 TEI or together with RedCap WI. |
| Intel | In our view, RedCap SI/WI mainly targets on other use cases such as industrial wireless sensor, video surveillance, wearable, etc. We would anticipate further discussion on device type or UE category under RedCap WI, once transitioned. On the other hand, my understanding has been that your target scenario is on reduced complexity for smartphone use case. if smartphone is not targeted, the existing scope in RedCap is sufficient in our view. Therefore, we would not prefer to tangle those aspects under RedCap.  Given the limited impact on mainly RAN4 and possibly relevant signaling in RAN2, we think TEI seems a better place to proceed. If there is a concern on TEI, we would rather prefer to have a separate work item. |
| T-Mobile USA | We have concerns about the wording in the proposal above. The wording “enable” makes it sound like the e-mail discussion will be deciding if the changes will be incorporated in Rel-17. We believe that it would OK to decide via e-mail if these changes could be studied, not if they will be enabled in the Rel-17 specifications. We would prefer the following wording.   * Study the benefits and potential impacts of potentially enabling both the following in the Rel-17 NR specifications and the potentially applicability for various categories of UEs (smartphones, watches and wearables, etc.)   1. For FR1, allow UEs to support a bandwidth of 50 MHz for bands that mandate 100 MHz in Rel-16   2. For FR1, allow UEs to support 2 Rx in bands that mandate 4 Rx in Rel-16 * Study mechanisms that could potentially enable the following:  1. Access restriction mechanism, which allows the network to indicate whether it can accept lower capability UEs or not    * + Lack of signaling means the UEs are not allowed to connect 2. Endorse the use of the maximum data rate determined according to 4.1.2 in 38.306 to label the different tiers of UEs to make the subscribers aware of the capabilities of UEs. |
| DOCOMO | We don’t agree with the proposal. First, as the lower capability UE is targeting low-end smartphone, it is different from RedCap use cases and should not be included in RedCap SI/WI. Second, we have to consider the coexistence between the UE without lower capability (e.g. current 5G smartphone) and low-end smartphone. The reduced BW degrades the system capacity and makes the scheduler complicated. The reduced number of Rx degrades the coverage and affects cell planning. Third, if the lower capability UE is supported in Rel.17 in addition to RedCap UE, at least 2 new UE types will be introduced, which has risk of fragmentation. |
| SoftBank | We share the same view as T-Mobile USA, and support their wording change. Both 1st bullet and 2nd bullet require our very careful assessment. |
| CHTTL | We share the same view as DOCOMO. The reduced number of Rx will degrade the coverage and impacts the already planned deployments. In addition, currently there is no bandwidth combination set for inter-band EN-DC, mandatory support in the single band is also extended to EN-DC configurations including that band, reduced BW will impact the relevant EN-DC combinations. |
| OPPO | We are supportive for the proposal into the Rel-17. It can be considered both with another WID or in the RedCap SID/WID.  For Rel-17 SID, we may not have enough time to set a dedicated one. Thus, TEI would be an reasonable choices. The introducing of lower capability UE is try to created good levels of economic scale for NR. The current NR is somehow too high end.  For network side performance, it could be clearly stated that phone may have some performance loss to the consumer. For sure the coverage will be reduced, but it will not be unusable. In some band, only 2RX is required even in Rel-15. Study is not needed for the low capability UE.  In that sense Rel-17 TEI should be fine.  If we have to do an assessment, which may not mean we have to compensate the loss, it can be put in RedCap items. |
| vivo | We support the proposed scope and believe it is feasible to be included in RedCap as a separate use case, i.e. lower capability smartphone |
| LG | In general, we are fine with including this discussion in Rel-17 REDCAP SI. This is because REDCAP discussion already includes all the major topics such as reduced bandwidth, reduced number of antennas, access barring mechanisms, potential coverage shortage problem, etc. Creating another WI/SI for this discussion seems to lead to overlapping work. On the other hand, it doesn’t seem to be appropriate to agree supporting a special type of UE at this stage in REDCAP SI discussion. Therefore, we think Qualcomm’s proposal can be treated as one of the proposals among many other proposals in REDCAP SI. |
| MotorolaMobility | We support this proposal. We believe the proper way to address this is through a separate WI since this proposal targets smartphones, distinct from UE types addressed by RedCap. |
| CMCC | We are fine to consider the current proposed scope in R17 RedCap or R17 TEI. Regarding some comments that considering lower capability UE in RedCap SI/WI will increase the UE types, we have a clarification question on the understanding of RedCap UE(s). Do we assume that there will be finally one or several explicitly defined RedCap UE categories, or it is up to the UE implementation and based on the different UE capability combinations to realize the so called RedCap UE. In our understanding there is no consensus currently which will be adopted for defining the RedCap UE. If the RedCap UE(s) are just implemented based on some combinations of reduced UE capabilities, the current proposed scope (i.e., reduced bandwidth, reduced Rx number, and potential signalling) of lower capability UE targeting the low end smartphone could also be considered together in the RedCap SI/WI since there will be no specific RedCap UE anyway.  If majority view is to consider the proposed scope in R17 TEI, we think it would be better to make a conclusion in this RAN plenary meeting to state clearly that it is in the scope of R17 |
| Spreadtrum | We are fine with the wording provided by T-Mobile USA. The responsible WGs for the study work should include RAN1/2/4. We prefer to include it in REDCAP SI because the scope is similar to that in REDCAP objective and the specification work is not so small to be a TEI. |
| MediaTek | Similar to the comments made by T-Mobile, this work would require at minimum some study and for this reason (but not only) this cannot be a TEI17 item. We also question the work could be done in a single meeting cycle in any case.  If included as part of RedCap, we request that the RedCap timeline be extended by at least another quarter,  Impact on VoNR will need to be studied as we expect the coverage loss in bands that otherwise require 4Rx will severely hamper the migration from LTE.  We also suggest to address the fact that enabling 2Rx UEs to operate in bands where 4Rx is required does not necessarily imply the Rel-15 2Rx UE definition can be reused; and that is specifically because we are talking about a degradation of performance - this would need to be carefully investigated. |
| Telecom Italia | We do not agree with the proposal for the same reasons expressed by T-Mobile USA and DOCOMO. The impact of introducing this feature must be assessed and therefore a study phase is required to evaluate the system impacts in terms of reduced capacity, coverage and VoNR support. Moreover, procedures to bar access to this kind of devices must be implemented, performance requirements defined. Definitely this cannot be a TEI activity.  In summary we do not see any need to specify this feature and are strongly against. In any case, before a possible normative phase, a study phase is required. |
| ORANGE | We are sharing similar views as TIM, DoCoMo and T-Mobile US. Reducing the number of antennas will have a significant impact on network capacity. Orange submitted a contribution at the last RAN1 meeting illustrating such impact (R1-2004270). In any case, a study phase would be required before any normative work can be attempted on the proposals. Such study shall include network capacity simulations. We are opposed to any TEI activity on this matter. |
| Apple | We are supportive of the proposed scope and OK with either include it as part of the R17 RedCap WI or a separate TEI. |
| Nokia | We agree with the views expressed by T-Mobile USA, Docomo, and others that the introduction of such lower capable UEs would require proper study of the consequences and what kind of specification changes would be required. Even though in the surface the topic seems to have similarity with RedCap SI, in practice we see that those are targeting different types of devices with different constraints. For example, RedCap SID includes further constraints that are not in scope of the proposals here, and hence it is unlikely that the conclusions will be directly applicable and specific evaluations would need to take place anyway. Hence, we do not support adding such study to RedCap SI, but we can consider a dedicated SID if needed, for example as a RAN-led study item. |
| BT | We do not agree with this proposal for the same reasons as those expressed by T-Mobile USA, DOCOMO, CHTTL, Telecom Italia and Orange. We believe that reducing the number of antennas will significantly impact on the network capacity, to the detriment of all users. Furthermore we believe that the NR UE market is already developing sufficiently fast without the introduction of such lower capability UEs. |
| Deutsche Telekom | Supporting ORANGE and the other operators here |
| Telenor | We share the same view as T-Mobile US, TIM, DoCoMo, BT, DT, Mediatek and Nokia. Low capability smartphones will reduce overall system capacity and impact on all users. A study of the consequences would be required. We oppose any TEI activity on this matter. |
| Huawei | From our side we said multiple times that this is not the direction to go now. We can have a look at this again once REDCAP SI is finished, earlier than that will not make sense (no TEI17, no new WI, in WGs or RAN TSG, no inclusion in REDCAP SI for now).  If the above is clear to everybody hopefully by now, still the proposals that we are discussing are not clear.  This email discussion is only supposed to discuss the proposals for clarification, so here are our questions/comments.   * Enable both the following in the Rel-17 NR specifications   1. For FR1, allow UEs to support a bandwidth of 50 MHz for bands that mandate 100 MHz in Rel-16   2. For FR1, allow UEs to support 2 Rx in bands that mandate 4 Rx in Rel-16 * Add mechanism to enable the following:  1. Access restriction mechanism, which allows the network to indicate whether it can accept lower capability UEs or not    * + Lack of signaling means the UEs are not allowed to connect 2. Endorse the use of the maximum data rate determined according to 4.1.2 in 38.306 to label the different tiers of UEs to make the subscribers aware of the capabilities of UEs.   1) There is a typo in the proposals, it should be Rel-17 everywhere, please fix this. No Rel-16 anymore.  2) For FR1, allow UEs to support 2 Rx in bands that mandate 4 Rx in Rel-16 => which bands are we discussing? ALL the bands that mandate 4 Rx? Some? Which ones?  3) Endorse the use of the maximum data rate determined according to 4.1.2 in 38.306 to label the different tiers of UEs to make the subscribers aware of the capabilities of UEs  => is the above re-introducing UE categories for NR (which we decided NOT to do after a very long RAN debate)?  If yes, why?  If not, can you then clarify the proposal?  4) As commented by somebody else before me, all the above proposals should be anyway for STUDY. We need to discuss the impacts on the networks and ecosystem before agree on any changes. |

# Conclusions

To be updated after completing the email discussion

# References

1. RP-200867, “WF on lower NR UE capabilities”, Qualcomm