3GPP TSG-RAN #92-e Draft RP-21xxxx  
Online, 14-18 June 2021

Agenda Item: 5.2

Source: RAN2 Chairman (Moderator)

Title: Report of Offline Discussion [25] UE capabilites

Document for: Discussion

# Introduction

This discussion includes RP-211300 [1], RP-211425 [2], RP-211310 [3], RP-211478 [4].

# Contacts

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

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# NR URLLC UE categories/profiles

RP-211300 [1] Discusses the necessity of NR URLLC UE categories/profiles. The goal of the discussion in RAN#92-e is to make an initial decision on whether or not 3GPP RAN takes care of the definition of UE categories/profiles for URLLC, e.g. defining latency and/or reliability target, given the situation where Rel-17 is going to provide a complete set of URLLC functionalities.

Proposal from [1]: RAN to discuss again the necessity of UE category/profile for URLLC.

## Initial Round

Q: Moderator asks companies to Please feedback on whether 3GPP RAN should take care of the definition of UE categories/profiles for URLLC, see explanations in [1]. Can also comment in general on [1].

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| **Company** | **Yes/No** | **Comment / Justification** |
| NTT DOCOMO | No | Although it may be useful for NW to have URLLC UE categories/profiles, it is still unclear how/where to define them. In addition, we have already discussed on the possibility of defining URLLC basic FGs in Rel-16, but there was no consensus to define them even after extensive discussion. |
| Huawei, HiSilicon | Yes | We in general support to define UE type (whether it is a sort of category or profiles can be further discussed) for URLLC. As 3GPP has defined multiple features since Rel-15, with more and more features introduced for Rel16/Rel-17 continuously, it is difficult to leave to the market to choose which features are required to support URLLC services. Therefore we think such definition is very useful and should be defined in Rel-17. |
| OPPO | No | The definition of “essential features” could be different due to different marketing purpose and real deployment of the features. In some sense it could be even a bit subjective. So it is not easy to have consensus in 3GPP to do so, hence becomes extra burden for RAN WGs to work on this. On other hand the updated 38.822 capture the feature list quite well as such that all the relevant UE capability parameters can be easily found in the table for one specific feature like URLLC/IIOT. So we think industry can dig them out from 38.822 to decide which ones should be properly tested and deployed. |
| Futurewei |  | We have sympathy with the need of UE categories/profiles for URLLC. We are, however, also aware of the challenges in reaching consensus on the definition of URLLC categories/profiles. The situation may be even more complicated in Rel-17 given that many URLLC functionalities are optional in Rel-15/16.  We think the discussion may start with operators and vertical industry participants to assess if there is sufficient market interest. |
| Qualcomm Incorporated | No | Very resource consuming exercise without a good prospect of success. |
| Apple | No | URLLC consists of a very diverse set of applications with wide range of requirements on latency, reliability and data rate. It is not quite possible to define a small number of UE categories/profiles for URLLC that match well with different URLLC applications. On the other hand, if we define a large number of UE categories/profiles, it is not meaningful any more. It would be better to leave it to the market to determine which features are most useful for the important URLLC applications, or the topic can be revisited later on when the market need is clearer.  The same issue had been extensively discussed in Rel-16, but there was no consensus. |
| LG | No | There is no common understanding on how to categorize URLLC features, because URLLC applications are very diverse in terms of KPIs and use cases. Given the inherent diversity of URLLC features, we do not clearly understand how to define URLLC categories/profiles and whether such diverse URLLC categories/profiles can better promote URLLC deployments than existing capability signaling framework. |
| Intel | No | We haven’t seen a strong need to define UE category/profile for URLLC as it can be already inferred by UE capabilities themselves |
| Lenovo |  | We are not convinced in re-discussing the necessity of UE category/profile. |
| DENSO | No | Agree with Qualcomm. Most likely, the large amount of discussion time is required, as experienced from the similar discussion in the past. Perhaps, 3GPP is not a proper place to define the use case specific profiles and categories. There might be a proper place outside 3GPP. |
| Spreadtrum | No | There are diverse URLLC features, and applications. It can be predicated that it is still very difficult to achieve the consensus on how to categorize URLLC features as in Rel-16 we have tried to do so. Features can be selected based on 38.822/38.306 by industry as it has done for diverse eMBB services. |
| SoftBank | Yes | As a proponent of RP-211300, we would like to repeat that UE categories/profiles for URLLC are definitely necessary to accelerate the implementation of URLLC features. It seems that some companies believe that the discussion among operators and verticals can solve this issue, but we bring up this issue here because it was not the case so far.  On the other hand, we agree that huge amount of time is required in RAN, and this is the valid concern. This aspect should be taken into account when we make a decision. |
| Nokia, NSB | Yes | We agree with the proposal, as after a couple releases it is clear that there is lack of clarity in the market about the features that are really relevant for URLLC UEs. In earlier discussions it has been indicated that it may be difficult to arrive to a single agreement on what is a URLLC UE, but in our understanding this can be simplified by decoupling the task into reliability and latency aspects, as suggested by the proponent. Such activity can be carried out in RAN level, as it is not expected to introduce new features in WGs. |
| Samsung | No | We are not preferable to define UE categories/profiles due to following reasons.  1) There have not been UE categories/profiles for URLLC even after the completion of Rel-15 and Rel-16 eURLLC/IIoT  2) URLLC includes so many use cases and related different/various requirements e.g., UR, LL and UR&LL with different values of latency and reliability according to use cases.  3) It is expected that there will be lots of evaluation campaigns to see what a combination of feature/functionality can meet a certain requirement or not. Furthermore, potential evaluation results would be various since it might be depending on evaluation assumptions. So, it is not easy to define UE categories/profiles for URLLC considering many functionalities of URLLC. |
| ZTE | Yes | From our perspective, we see the need and benefits of defining UE categories/profiles for URLLC. As pointed out also by other companies, there are too many different combinations for URLLC UE features. Without any UE categories/profiles or without any recommendation from 3GPP and just leave it to market, UE fragmentation issue will be serious, which is not beneficial to the entire eco-system.  In addition to URLLC, we also see the necessity and benefits to define UE categories/profiles for other WI, e.g., Redcap. |
| Ericsson | No | It was discussed in Rel-15 whether categories should be introduced for NR. The agreement was that no categories should be introduced.  The motivation provided in RP-211300 for adding categories for URLLC is that it would reduce market fragmentation and to ensure some minimum level of performance.  We think that the arguments against adding categories discussed in Rel-15 holds true also for URLLC UEs. For example, there is no technical use of a category since the UE's capabilities non-ambiguously describe which features the UE is capable of. Regarding the aspect of market fragmentation, we believe that 3GPP is not the place to define a minimum set of features for this purpose.  We think it would consume a significant amount of time in 3GPP to attempt defining categories. |
| Vodafone | Yes | Agree with SoftBank and Nokia |
| CMCC | Yes | We have faced some setbacks when we introduce URLLC features to our customers, it is quite hard for us to tell them what basic functionalities are almost ready, and how long the additional features will require for the industry to offer it, which means we have to negotiate with our partners from scratch for each application/scenario. We admit this work is not easy, but it is worthwhile that we do something more from standard to help the development of 5G. |

**Initial Discussion Summary**

a) There seems to be full agreement that defining URLLC profiles / UE categories will consume a lot of time and is not easy, e.g. it is commented that there are different diverse URLLC applications with different requirements.

b) The proponents seems to be in agreement that the purpose of defining URLLC profiles / UE categories is to bring clarity to the market as to which features are relevant for URLLC, and to avoid market fragmentation.

b) The need is questioned by several companies. From technical perspective UE capabilities are unambiguous, now also the TR38.822 has been updated for easier navigation.

c) It is questioned that 3GPP is not the right place to address issues such as market fragmentation.

d) A majority of companies think such effort is not worthwhile in 3GPP, while some major operators support this.

**Initial Moderator Conclusion**

Based on the initial discussion there is no consensus.

**Proposed Way Forward**

Continue the discussion one round, to see if there is possibility to find middle ground.

## Intermediate Round

Further comments (if you don’t comment here it is assumed that your initial round comment still applies)

Q: Is there any room for / benefit of compromises that can be considered from start? Can we e.g. restrict or focus the scope/the task somehow to make the work more feasible? E.g. does the supporting operators have the same view on which types of URLLC UEs that need such profiles? Could a profile just be a minimum requirement profile with add-on or are there other ways to make the work more feasible.

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| **Company** | **Comment / Justification** |
| Nokia, NSB | One approach to make the effort feasible and meaningful is to limit the work to Rel-15 features only, and to separate between “reliability” and “latency” impacting features. This would give clarity on which features are relevant for those functionalities, as in Rel-15 there is not always a clearly identifiable “URLLC” label to those. From Rel-16 onwards this is more evident from the WIs generating the features, and the need for Rel-16 to be included in the activity can be assessed later. |
| Telecom Italia | Sorry for entering the discussion only now. We think a characterization is needed for the reasons raised by Softbank and other operators. The lack of implementation of URLLC features is clearly a failure of 3GPP standards, and hopefully defining a minimum set of capabilities can help accelerate the availability of devices.  Said that, we tend to agree with Nokia on a possible compromise: i.e., differentiating between “reliability” and “latency”. However, Rel 16 features are the most important, since Rel 15 only poses the baseline for URLLC, with very limited capabilities. |
| vivo | Technically, we think it is hard to define URLLC profiles / UE categories. Some features are not easily to be classified to serve reliability only, latency only, or both purposes, e.g. pusch repetition type B, UL cancellation, multiple active configured grant configurations for a BWP of a serving cell, etc. |
| Qualcomm Incorporated | Just to clarify our position, we are not saying having some sort of profiles is not useful. We however believe that it is very difficult for 3GPP to even come to a good set of use cases for which profile or category should be defined. It won’t be as simple as just defining “reliability” or “low latency” profiles, if one would want something useful. Such exercise will need expertise from industry players. We do not think 3GPP is a right forum. |
| Huawei, HiSilicon | We think the approach suggested by Nokia can be a starting point for URLLC UE categories/profiles. We can start with Rel-15 features, but in the end we need to do the same thing for the later releases also, since the main features for URLLC/IIoT mainly come from later releases. If we follow this way to define the URLLC UE profiles, we can discuss and agree on a minimum set of feature groups for achieving low latency and high reliability respectively. |
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# Handling of TR 38.822 for Rel-16 and related handling of R1 and R4 feature lists.

As reported in the R2 report to RP-92-e, RP-210931, the current RAN2 agreements is to treat TR38.822 the same way for Rel-16 Contents as for Rel-15 Contents, i.e. the **Approach 2** below.

RP-211425 [2] proposes the following:

RAN discuss which approach should be taken to handle TS38.822 and notify RAN WGs to have common understanding on the future update on Rel-16 feature lists.

**Approach 1**: update the TR 38.822

An update is allowed to include new feature groups but not for any small “corrections” etc. Instead, the small “corrections” should be made directly to TS 38.306 if applicable.

**Approach 2**: not update the TR 38.822

RAN1/4 can continue with updated feature lists but they reside only in RAN1/4 Tdocs.

Any correction/new features will be introduced only in TS 38.306 directly.

**Approach 2a**: not update the TR 38.822 and RAN1/4 does not update feature lists

Any correction/new features will be introduced only in TS 38.306 directly

## Initial Round

Q: Moderator asks companies to feedback on the proposals above, which approach would be preferred and justification, and whether any of the approaches above would not be acceptable. In particular if to deviate from current RAN2 decisions (approach 2), explicit opinions with justifications should be provided.

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| **Company** | **Preference** | **Comment / Justification** |
| NTT DOCOMO | Approach 1 | Allowing “essential” update (if any) for the TR38.822 is beneficial as this TR has been a good reference for 3GPP discussion (e.g., next release UE feature discussion, CR discussion, etc.) and also for development. |
| Huawei, HiSilicon | Either Approach 1  Or approve TR 38.822 only when RAN1/RAN4 becomes stable | In Rel-15 we have had a one short approval for 38.822 without subsequent updates. If RAN1/RAN4 continues updating the feature list, and 38.822 is approved at this plenary without any update, it may bring the risks that misalignment was found later and causes confusion. So either we go for Approach 1, or we only approve 38.822 once RAN1/RAN4 feature list becomes stable enough as a snapshot. |
| OPPO | Approach 1 | Basically we agree with NTT DOCOMO. Plus it could be helpful to resolve the 1st issue |
| Futurewei | Approach 1 | We see the value of keeping TR 38.822 as a good reference to overall UE features. Approach 1 seems a good balance between relevance of TR 38.822 in newer releases and the required maintenance work. |
| Qualcomm Incorporated | Approach 1 | 38.322 has become a good reference providing the linking among WI, sub-features, and UE capability parameters. |
| Apple | Approach 1  (Approach 2 as 2nd preference) | We think updating the TR 38.822 is quite useful.  Approach 2a should be avoided because we should not interfere with the current good practice in RAN1/RAN4. |
| LG | Approach1 | 38.822 is a valuable reference to industry. We think the minimization of discrepancy between 38.822 and 38.806 is always beneficial at least for Rel-16. |
| Intel | Approach 1 | We think that the TR provides a quick reference on the feature list and is used outside of RAN2 in other working groups and wider in the industry. It is in a format that is much easier to track than TS38.306. For it to be properly useful, the TR should reflect the full feature list. The update doesn’t necessarily have to be every quarter. |
| Lenovo | Approach 2a | Referring to RAN4 SR there are no outstanding open issues on Rel-16 feature list. And referring to RAN1 SR the status of the RAN1 features list seems stable, but tbc.  In general, RAN2 should spend time on critical corrections and R17 work and not on a nice-to-have TR. Furthermore, when the R16 CR to the TR was discussed only few companies made comments. This can be interpreted as a sign that the rapporteur did a very good job. On the other hand, it can mean that many companies didn’t care of it. |
| DENSO | Approach 1 | Agree that TR 38.822 is useful in practice to find out the other information than in TS 38.306, e.g. relevant WI, as Qualcomm noted. |
| Spreadtrum | Approach1 | We think 38.822 is a good reference for 3GPP and the industry. Updating 38.822 to keep consistence with 38.306 is worthy. |
| SoftBank | Approach 1 | We believe 38.822 is very useful, and means to avoid the discrepancy between 38.822 and 38.306 are necessary. |
| MediaTek | Approach 2 or 2a | We believe that there is no need to spend too much time on the TR. Everything should be clear from TS. If there is conflict between TR and TS, the UE implementation should follow TS. So, we suggest to maintain the correctness of TS only to reduce R2 effort (as we currently did).  Whether to update the R1/R4 feature table could be up to WG decision. |
| Nokia, NSB | 1, with corrections | It might be difficult to make a clear judgement on which corrections are too small to be captured, and which ones are worth a revision of the TR. Hence, it makes more sense if RAN1/4 are allowed to make CRs to TR38.822 directly when there are relevant updates. An outdated TR is not a reliable reference, and TR38.822 is used often by RAN1. |
| Samsung | Approach 2 or 2a | We also think that there is no need to spend too much time on the TR, which was the view from RAN2 chairman as well.  Between 2 and 2a, it can be left to each WG's decision. |
| ZTE | Approach 1 | RAN1/RAN2/RAN4 has separate UE feature list and they are finally merged together into 38.822. If we only update RAN1/RAN2/RAN4 feature list and don’t update 38.822, it may cause inconsistence between them, which may cause confusion for readers and for future discussion.  Besides, updating 38.822 doesn’t require big effort, e.g., RAN2 can update it on a per-quarter basis. On technical discussion, TR38.822 is very useful especially for people outside 3GPP. Thus, we believe it is worthwhile to update 38.822 regularly. |
| Ericsson | 1, with comment. | RAN2 agreed to update 38.822 with the Rel-16 features. But this TR (technical report) is not expected to be kept up to date but instead only captures a snapshot of the capabilities. We are fine to add Rel-16 features to this TR, however we should not attempt to keep this specification up to date. Probably no further update would be needed until perhaps after Rel-17 has been frozen. |
| Vodafone | Approach 1 | Agree with Intel |
| vivo | Approach 1 | This have been agreed in RAN2 to update TR 38.822. The TR could provide the reference for product development and for future.  But this TR only needs to provide some high level description, the details should be captured in TS 38.306. We should avoid frequent update for this TR when some small change on the corresponding feature. |

**Initial Round Discussion Summary:**

**There is support for Approach 1**: update the TR 38.822. An update is allowed to include new feature groups but not for any small “corrections” etc. Instead, the small “corrections” should be made directly to TS 38.306 if applicable.

**Initial Round Moderator Conclusion**

Confirm that approach 1 is the approved way forward: For R16, keep the TR 38.822 updated. An update is allowed to include new feature groups but not for any small “corrections” etc. Instead, the small “corrections” should be made directly to TS 38.306 if applicable.

## Intermediate Round

1. Can comment on initial Round conclusion.

2. The proponent is asked to propose more details on how to work with TR 38.822 for Rel-16, suitable for confirmation at RP, e.g. expectations in WGs, expectations of consistency etc.

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| **Company** | **Comment / Justification** |
| Intel (proponent and TR 38.822 rapporteur) | We would suggest the following guidelines on updating the TR for Rel-16 features:   1. For 38822, updates to R1 and R4 features shall be initiated in the respective group and communicated to RAN2 by LS (as today) 2. 38822 shall be kept consistent with 38306, e.g. in case there is discrepancy between R1 and R4 feature list and the corresponding final 38306 CR.  An update is allowed to include new feature groups but not for any small “corrections” etc. Instead, the small “corrections” should be made directly to TS 38.306 if applicable. 3. For the R2 work: 38822 is updated following agreed changes to 38306, and received LSes with updates to R1 and R4 feature lists, CR for such updates are (only) initiated by the rapporteur. Any other CRs should be limited (up to RAN2 chair on how this is done) to reduce workload in RAN2. |
| Nokia, NSB | Confirm the conclusion from moderator. The guidelines above are mostly fine for us, but it is a bit unclear what is a small correction (with and without quotation marks), and what is a relevant correction to be captured in the TR. In addition we would like to remind that FG numbering needs to be the same as that in the RAN1/4 feature lists for consistency. |
| Lenovo | OK to go with majority view to further update the TR if needed. But it should be clarified what the targeted final date for updating the TR should be. As commented in the initial round, RAN4 may not send any further feature lists (there are no outstanding open issues on Rel-16 feature list acc. to RAN4 SR). And RAN1 feature list seems stable acc. to RAN1 SR.  Agree with Nokia, NSB that it is unclear what is meant with “small corrections”. |
| vivo | We are fine with summarized conclusion from moderator and the guidance from Intel. In general, we should avoid frequent update for this TR. Regarding the “small correction”, we think any clarification but doesn’t impact the scope of the feature could be small correction. |
| Qualcomm Incorporated | We support the TR 38.822 rapporteur’s proposal. And we would like to thank the rapporteur for his effort until now and also going forward! |
| Huawei, HiSilicon | We are fine with Approach 1. Regarding what to be updated to the TR, we understand at least whether it is mandatory or optional, the granularity of whether it reports per BC, per band etc., and the value ranges for the capability should be kept consistent with the feature lists. May be also makes sense that we check these inconsistencies per quarter instead of per meeting cycle, to avoid too much work load for the rapporteur. |
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# Capability for per FR gap

RP-211310 [3] discussed Capability of per-FR gap and proposes the below:

Q: Moderator asks companies to feedback on the following proposal: Introduce a new A new “per-BC based per-FR gap capability” in Rel.16. If the feature cannot be introduced from Rel.16 because it is “too late”, it should be introduced from Rel.17

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| **Company** | **Yes/No/Rel** | **Comment / Justification** |
| NTT DOCOMO | Rel-17 | This issue should be discussed as part of Rel-17 RRM enh. (as discussed in [92-e-23-RRM-Enh]). |
| Huawei, HiSilicon | Yes  prefer Rel-16 | We support the idea of having finer granularity of per FR gap for Rel-16 as also proposed in RP-211392. If companies think it is too late, to have signaling change for Rel-17 with early implementation since Rel-16 is also acceptable for us. |
| OPPO |  | Wait a bit for the progress of [92-e-23-RRM-Enh] |
| Futurewei | Yes/Rel-17 | We can see“per-BC based per-FR gap capability” may ease UE implementation. But we also share concern that it is a bit “too late” for Rel-16. It can be specified in Rel-17 with early implementation in Rel-16. |
| Qualcomm Incorporated | Yes, prefer Rel-l6 | This was discussed in RAN4 but consensus could not be reached even though opposing companies didn’t present any technical reasons. No significant impact to RAN4 specs so this can be handled just as a capability.  To NTT Docomo and Oppo, this is just about introducing a capability, there are no changes to RAN4 requirements. this topic does not need to be handled in RRM enhancements as there is nothing left to study in RAN4. |
| Apple |  | RAN4 had already concluded not to introduce it in Rel-16.  The issue should be further discussed as part of [92-e-23-RRM-Enh]. |
| LG | Yes, Rel-17 | But, we also think this issue should be discussed under [92-e-23-RRM-Enh]. |
| Intel | - | RAN4 can work on this in Rel-17 timeframe, however, we think this discussion should be considered better with discussions in #23. |
| Lenovo |  | We should wait for RAN4 progress. |
| DENSO |  | Better to be discussed under [92-e-23-RRM-Enh] |
| Spreadtrum |  | This issue could be discussed under [92-e-23-RRM-Enh]. |
| MediaTek | Rel-17 | We also understand that RAN4 had already concluded not to introduce it in Rel-16.  This issue should be discussed in [92-e-23-RRM-Enh] |
| Nokia, NSB | No | It is way too late to introduce such feature for Rel.16, which has been closed already one year ago, as reminded during GTW yesterday. In our understanding, such “per-BC based per-FR gap capability” would require and increase work in RAN4, which is overloaded at the moment. Possible RAN2 impacts need to be considered as well. |
| Samsung |  | Given no agreement to introduce it in Rel-16 timeframe. We do not think we can apply such capability signaling in Rel-16.  For whether to handle it in Rel-17, we also recognize this issue was also discussed in e-mail thread 23. It is too early to decide whether to have REl-17 signaling. |
| ZTE |  | We also think this issue should be discussed under [92-e-23-RRM-Enh]. |
| Ericsson | No | RAN4 agreed in last RAN4 meeting in May that this capability will not be in Rel-16.  RAN4 is further discussing whether this can be included in Rel-17 under [92-e-23-RRM-Enh]. We suggest to wait for RAN4 agreements. |
| vivo |  | We think it is better to wait for RAN4 progress. |

**Initial Round Discussion Summary**

There seems to be some support, but a clear majority of companies think this is not for Rel-16, and that RAN4 decision to not have this for Rel-16 shall be followed. To what extent to have this for Rel-17 is discussed in [92-e-23-RRM-Enh]

**Initial Round Moderator Conclusion**

There is no consensus to have this for Rel-16, and whether to have this for Rel-17 is determined in the offline discussion [92-e-23-RRM-Enh]. This discussion can be closed.

# RAN2 CR Pack in RP-211478

Any other comments on [4] RAN2 CR Pack in RP-2114768 (assume this was flagged)

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| **Company** | **Comment** |
| Apple | We are fine with the RAN2 CR Pack. |
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**Initial Round Moderator Conclusion**

There are no comments, so the CR pack can be approved.

# References

[1] RP-211300 Introduction of NR UE categories/profiles for URLLC SoftBank

[2] RP-211425 Handling of TR 38.822 for Rel-16 Intel Corporation

[3] RP-211310 Capability for per FR groups Qualcomm Inc.

[4] RP-211478 RAN2 CRs to NR UE capabilities RAN2 CR pack