**3GPP TSG-RAN WG3 #111-e R3-211016**

**25 January – 4 February 2021**

**Online**

Agenda Item: 15.3

Source: Qualcomm (moderator)

Title: Summary of Offline Discussion on NRQoE6-Features\_ranking

Document for: Approval

# Introduction

**CB: # NRQoE6-Features\_ranking**

**- RAN3 to discuss the ranking and decide the priority for plenary to decide normative work plan?**

**- The feasibility and value of slice based QoE measurement need to be verified by CT1, SA2, SA4, and SA5?**

(QC - moderator)

Summary of offline disc [R3-211016](https://ericsson-my.sharepoint.com/personal/filip_barac_ericsson_com/Documents/WORK/3GPP.exe/Meetings/RAN3%23111-e.exe/2%20QoE/QOE%20CBs/CB%20%23%20NRQoE6-Features_rankin/Inbox/R3-211016.zip)

Note:

The first round email discussion plan to be end at end of Friday of the first week (Friday 17:00 UTC 2021-1-29)

The second round email discussion plan to be end 2 hours before the on-line session (Thursday 11:00 UTC).

# For the Chairman’s Notes

Propose the following:

**Proposal 1:** Following features are to be treated with **high priority** in the normative phase of QoE WI:

* Multiple QMC support
* Intra-RAT mobility and QoE continuity
* QoE config/report handling during RAN overload for SA scenario

**Proposal 2:** Following features are to be treated with **medium priority** in the normative phase of QoE WI:

* QoE measurement in RRC\_INACTIVE (RRC\_IDLE is FFS)
* Alignment of MDT and QoE measurements

**Proposal 3:** Following features are to be **studied further** and can be supported if minimal spec impact exists across WGs and feasible solutions are identified:

* RAN visible QoE
* Per-slice QoE measurement

**Proposal 4:** Following features are to be deprioritized for Rel-17 and to be treated only if other high priority features are complete:

* QoE support for MR-DC
* QMC for Inter-RAT and Inter-system mobility

Propose to capture the following:

The above proposals are to be captured and used as TP input to section 8 (conclusion section).

# Discussion

In [1], it is noted that a lot of enhancements and optimizations have been proposed for NR QoE in the SI phase and it is not a simple extension of LTE QoE.

Considering the TU constraints, it is proposed to prioritize/rank the QoE features if possible, to capture the conclusions at the end of SI phase and aid the RAN in R17 normative phase.

## 3.1 Multiple QMC (source: SA5)

**Please provide your companies’ view of the need for this functionality (and whether it should be supported in R17 normative phase).**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Conditional yes, but technical details need first to be clarified in other CB. |
| ZTE | As request by SA5, it is needed for NR QoE. |
| CATT | It should be supported in R17 |
| **Ericsson** | **High prio,** should be supported in Rel17 |
| **Qualcomm** | **High priority. Details can be figured out in WI.** |
| Huawei | Yes, we support the functionality in R17 normative phase. |
| Samsung  | High priority. |
| CMCC | High priority to support SA5 requirement in normative phase. |
| China Unicom | High priority. |

**Conclusion 1**: All companies agree that Multiple QMC support should be **High priority** in the normative phase.

## 3.2 Mobility and QoE continuity (source: SA5)

**Please provide your companies’ view of the need for this functionality (and whether it should be supported in R17 normative phase).**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | We think the Mobility is already covered in LTE’s framework. The QoE continuity could be achieved by allowing the Netwotk to configure the Radio reporting of the Report without any configuration sent to App Layer. |
| ZTE | The function is needed for Rel-17.Although Mobility for LTE QoE is supported, but the detail are not fulfill the scenarios in NR. The complex of the function also need to take into account RAN2 ‘s progress. |
| CATT | It should be supported in R17 |
| **Ericsson** | **High prio,** should be supported in Rel17. The LTE framework is lacking proper mobility support. Besides, we **have SA4 requirements on measurement continuity.** |
| **Qualcomm** | **High priority. Mobility (QoE context transfer for s-based QoE and decision on whether to context transfer for m-based QoE) should be supported in R17.****QoE continuity (to decide whether or not to start new application sessions upon area change) based on a WithinArea indication or entire area configuration should be supported in R17.** |
| Huawei | For this topic, inactive and connected mode are involved.For inactive mobility, there may be some interactions between RAN nodes regarding QoE configuration. For connected mobility, there are some candidate solutions, and it may or may not have conclusions during SI.Generally, we support the functionality in R17 normative phase. |
| **Samsung**  | **High priority.** |
| **CMCC** | High priority to support SA5 requirement in normative phase. |
| **China Unicom** | High priority. |

**Conclusion 2**: All companies seem to agree that Mobility and QoE continuity support should be **High priority** in the normative phase.

## 3.3 QoE report suspending when RAN is overloaded (source: SA5)

**Please provide your companies’ view of the need for this functionality (and whether it should be supported in R17 normative phase).**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | This is needed, and can be based on the LTE solution (report deactivation in the AS layer with loss of reports). |
| ZTE | If my understanding is correct, this requirement come from SA5.e.g section 5.4.6 in TS 28.404 ?From RAN3 point of view, it is feasible. The function need to take into account RAN2 ‘s progress. |
| CATT | It should be supported in R17.  |
| **Ericsson** | **Medium prio** for Rel17. We do not think that report deactivation is sufficient, we should, for example, be able to use the merits of MR-DC by sending the report over the other leg when one leg is served by an overloaded node. Also, we should use consider the possibility to pause reporting (not collection) and deliver the reports later, after overload is over. |
| **Qualcomm** | **High priority. Support this in R17 pending clarification from RAN2/SA4 on solution support. QoE for MR-DC in general (and hence for overload in MR-DC as well) can be deprioritized in R17.****For SA, this feature can be supported but needs decision from RAN 2 (whether to discard or suspend QoE reports at UE). If RAN 2 chooses to suspend at UE APP and not support caching at UE AS , need to check with SA4 whether they can support caching at UE APP. We propose to send LS to SA4 (if RAN2 is not sending) to check this at the earliest.** |
| Huawei | We think that suspend/pause/resume handling may be considered together, and we think they are beneficial for QoE.Generally, we support the functionality in R17 normative phase. |
| **Samsung**  | **High priority.** |
| **CMCC** | High priority to support SA5 requirement in normative phase. |
| **China Unicom** | High priority. |

**Conclusion 3**: If we don’t consider the MR-DC scenario, all companies seem to agree that QoE report/config handling during RAN overload for SA scenario should be **High priority**in the normative phase.

## 3.4 QoE measurement in RRC\_IDLE/INACTIVE (source: RAN2/RAN3)

**Please provide your companies’ view of the need for this functionality (and whether it should be supported in R17 normative phase).**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | QMC is only for RRC Connected mode. Reports received by UE AS in idle / Inactive are lost. (also when UE AS is switched off). |
| ZTE | Consider so many enhancements and new features, this function may be de-prioritied in Rel-17 when mechanism for RRC\_CONNECTED is stable. |
| CATT | Set it as low priority |
| **Ericsson** | Support for **RRC INACTIVE is high prio** and has already been agreed. The feasibility of support for **RRC\_IDLE is in RAN2 scope**. |
| **Qualcomm** | Medium/High priority. We already agreed to support MBS service type which can run in RRC\_IDLE/RRC\_INACTIVE. We should be able to support QoE easily for all RRC states if SA4 confirms they can support caching at UE APP (same solution as overload in 3.3). |
| Huawei | We think the main discussion here is that whether the UE should keep QoE configuration when going to RRC inactive state (for future use in RRC Connected). If so, we support the feature in R17 normative phase.In addition, regarding QoE collection for MBS when the UE is in RRC IDLE/INACTIVE, we think it would be useful, but requires additional work, e.g. area scope configuration at the UE, sending the report after connecting to the network etc (in general, similar to logged MDT). So we are neutral, maybe mdedium. |
| **Samsung**  | Medium/Low priority.Most QMC happens when UE is in connected state. At this stage, only broadcasting services can run in idle mode, we don’t think those services are important, maybe we need consider operators’ advice, whether they care about those kind of services. |
| **CMCC** | Medium/high priority to support QoE management for MBS in R17. |
| **China Unicom** | Medium/Low priority. |

Out of the 9 companies responded, 6 companies think supporting QoE measurement in RRC\_INACTIVE should be **medium/high priority** and 3 companies think this can be **low priority** (or deprioritized). 1 company replied that QoE measurement in **IDLE** mode is still FFS and is under RAN2 scope.

Considering there is some interest to support QMC in RRC\_INACTIVE mode and we already agreed to support QoE for services such as MBS, it is proposed the following:

**Conclusion 4**: Support QoE measurement in RRC\_INACTIVE with medium priority (RAN2 to decide solution in normative phase). QoE measurement in IDLE mode is still FFS and RAN2 to decide.

## 3.5 RAN visible QoE (source: RAN3)

**Please provide your companies’ view of the need for this functionality (and whether it should be supported in R17 normative phase).**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | We think that this can this doesn’t need any standardization in Rel-17 unless a clear use case is identified. gNB can read the XML-encoded report. Or OAM can inform gNB about the QoE status. |
| ZTE | Share the view with Nokia. |
| CATT | It should be supported in R17 |
| **Ericsson** | **High prio**, should be supported in Rel17, especially since the **operators** have shown a strong interest in this. We have **given more than a few use cases in our paper,** so we do not understand what more is needed? Is it expected that we do a detailed elaboration in the TR? From our paper:Observation 1: There exist more than a few **use cases for QoE visibility at the RAN**, including:* **Time-critical applications**, including applications for which QoE metrics are not yet standardized, where timely reactions to QoE deterioration are essential;
* **QoE-aware mobility and traffic steering;**
* **Link adaptation;**
* **Reinforcement learning** – for instance, after mobility, the performance at the target is reported – the learning is whether the handover decision was good or not.

Observation 2: **3GPP is studying mechanisms to support AI/ML models** in the RAN, **and QoE measurements are a good input for RAN** to predict QoE/QoS. **Closing the door today by precluding QoE visibility** at the RAN **would certainly not be future proof.** |
| **Qualcomm** | **Medium priority. We also support the need of a framework for RAN visible QoE in R17 which can be later extended if needed. At the very least, a new container that contains a subset of application QoE metrics or derived QoE metrics.****This can be medium priority as there are still lot of questions pending:*** **Identify the RAN visible QoE metrics and define them if they are derived**
* **How will multiple QoE and mobility work together with RAN visible QoE?**
 |
| Huawei | Different solutions are being proposed while the usefulness of this information has not been sufficiently clarified. Very high specifications impact is expected, e.g. RAN2, and also SA2/SA5/SA4.So we are hesitate to support the feature in R17 normative phase, we could continue to discuss. |
| **Samsung** | **High priority.****In our paper, we have same observations as E///. QoE visibility is beneficial for scheduling, mobility management, load balance and AI functions, it can also help operators to identify network issues more efficiently and quickly.****And there are three types of QoE visible solutions, some of them may not have that much impact on the specs and other groups, why not consider it especially we found that it’s beneficial.****Besides, in SA4 specs, it says whether QoE metrics is RAN aware or RAN transparent is up to RAN decision.**  |
| **CMCC** | **High priority. We share similar view with Ericsson and Samsung.** |
| **China Unicom** | **High priority. We share the views with E/// and Samsung.** |

Out of the 9 companies responded, 5 companies think supporting RAN visible QoE is high priority, 1 company think it is medium priority and 3 companies think this can be low priority (or deprioritized).

Concerns raised by companies in supporting RAN visible QoE:

* RAN visible QoE metrics is FFS
* How to support multiple QoE and mobility for RAN visible QoE is FFS
* Usefulness of RAN visible QoE information not clear completely
* Potential high spec impact across WGs (RAN2, SA2, SA5, SA4)

**Conclusion 5**: Considering there is a lot of interest to support RAN visible QoE but still concerns on the solutions/usefulness for RAN visible QoE, it is proposed to discuss the solutions further and support a basic framework (if feasible) for RAN visible QoE that can be extended in future releases.

## 3.6 Per slice QoE measurement (source: RAN3)

**Please provide your companies’ view of the need for this functionality (and whether it should be supported in R17 normative phase).**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | This is needed |
| ZTE | This is needed, however not all the scenario listed need normative work. Refer to the result of CB4. |
| CATT | Set it as low priority |
| **Ericsson** | **Low prio** |
| **Qualcomm** | **Low priority. Deprioritize in R17.** |
| Huawei | Firstly, we understand that this functionality is preferred by some operators.Secondly, slice feature may involve RAN, CN and OAM, so it may need coordination among these WGs in order to fully justify solutions.Thirdly, we see that some solutions may involve UE, so there may be some RAN2 work.Generally, if per slice QoE measurement can limit scope to only RAN side impacts, it is acceptable for us to have it in R17 normative phase. However, the workload mentioned above should be carefully checked. |
| **Samsung**  | **High priority.****Slice is a basic feature in NR, operators need to know per slice QoE to optimize slice configuration and identify slice issues, and finally to provide a well-designed slice to serve different services of UEs.** **And in the discussion of CB QoE slice in last meeting, operators said that “**From operators’ point of view, it’s quite essential to confirm that the SLA is fulfilled and to statistics the QoE of services for different users with the same service type running on different slices to show the significantly superiority of customized slice.**” All of the companies agreed, so it should be set as high priority.** |
| **CMCC** | **High priority. Per slice QoE is one of the key enablers to fulfill SLA associated with specific end-to-end slice.****In addition, we’ve already had some feasible solutions on the table, which can be treated as a good starting point.** |
| **China Unicom** | **High priority.** |

Out of the 9 companies responded, 5 companies think supporting per slice QoE is high priority, 1 company support only RAN based solution in Rel-17 i.e. only if there are no UE impacts (no RAN2 work) and 3 companies think this can be low priority (or deprioritized) in Rel-17.

**Conclusion 6**: Considering there are some concerns on the UE/spec impact (across WGs) for supporting per-slice QoE but still few operators’ interest to support per-slice QoE, it is proposed to discuss the solutions further and support per-slice QoE in Rel-17 only if minimal spec impacts are identified.

## 3.7 Interworking with LTE QoE (source: RAN3)

**Please provide your companies’ view of the need for this functionality (and whether it should be supported in R17 normative phase).**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | No strong view – will depend on decisions taken for NR QMC e.g. support of multiple QMC. In principle NR QoE should be close enough to LTE to allow interworking. No or minimal updates of LTE QoE are foreseen. |
| ZTE | NR QOE need to design independently. When mechanism is stable, consider how to keep in line with LTE QoE. |
| CATT | Set it as low priority |
| **Ericsson** | **Medium/high prio,** but the first step is to make intra-RAT mobility work. The interworking is also quite connected to the issues of **support for multiple QMC** (which may include services valid for both LTE and NR, as Nokia seems to suggest), **but may also just include NR-only services**. It is also connected to the mobility handling in general. For m-based approach, **configuring an area scope that spans both LTE and NR RAT** is not supported today and I’m not sure that a single OAM would be able to configure both. What happens if **LTE is managed by an OAM from vendor 1 and NR is managed by an OAM from vendor 2**? |
| **Qualcomm** | **Medium priority. Agree with Ericsson.** |
| Huawei | This functionality is interesting, and we understand that the intention is to let UE continue QoE measurement collection during inter-RAT mobility.On one hand, we see the benefits as the network can collect more QoE reports. On the other hand, considering that we have already had the above functionalities (much more than LTE QoE baseline solutions), we are not sure whether we still have time to work on this functionality.Generally, we do not have strong opinion on it. If operators have interests on it, it can be open even if R17 normative phase. |
| **Samsung** | **Medium priority**  |
| **CMCC** | **No strong view, maybe medium priority.** |
| **China Unicom** | **Medium priority.** |

Out of the 9 companies responded, 4 companies think supporting QMC during inter-RAT mobility is medium priority, 3 companies have no strong view and 2 companies think it can be low priority.

Also, most companies seem to agree that the support for QMC during inter-RAT mobility can be considered once solution for intra-RAT mobility scenario is complete and if time permits.

**Conclusion 7:** Support for QMC during inter-RAT mobility is low priority and can be considered once solution for intra-RAT mobility scenario is complete and if time permits.

## 3.8 Other

If companies have any other comments or other QoE features to prioritize to aid the normative phase and capture as part of conclusions in the SI phase, please provide your comments below.

|  |  |
| --- | --- |
| Company | Comments |
| **Ericsson** | We should think with **high/medium priority** how to align MDT and QoE measurements, which is discussed in the CB#3. |
| **Qualcomm** | QoE for MR-DC should be low priority in R17 |
| Huawei | For QoE and radio measurements/information association, we think it would be actually useful if not so much additional work needed (if we just assume to reuse current measurements), so might be worth having in WI if work load is not high, or we could save for further enhancements. |
| Samsung | Agree with E///, align MDT and QoE measurements should be supported in R17 with high priority. In our paper, we have analysis and conclusion that if we don’t align MDT and QoE measurements, the radio measurement means nothing to QoE. If we would like to use MDT to assist QoE, anyhow, there will be spec impact.For MR-DC, similar view as QC, low priority. |
| CMCC | Share similar view with Ericsson and Samsung that correlation of MDT and QoE should be set as high priority, which can potentially bring real benefits to RAN. |
| China Unicom | Share the same view with CMCC. |

2 companies think that QoE for MR-DC should be low priority in R17

**Conclusion 8**: QoE support for MR-DC is not supported in Rel-17

4 companies think that alignment of MDT and QoE measurements should be high/medium priority while 1 company prefers to resuse existing radio measurements without much spec impact

**Conclusion 9:** Alignment of MDT and QoE measurements is medium priority and should be considered in normative phase. Exact solution FFS.

# Conclusion, Recommendations [if needed]

**Conclusion 1**: All companies agree that Multiple QMC support should be **High priority** in the normative phase.

**Conclusion 2**: All companies seem to agree that intra-RAT mobility and QoE continuity support should be **High priority** in the normative phase.

**Conclusion 3**: If we don’t consider the MR-DC scenario, all companies seem to agree that QoE config/report handling during RAN overload for SA scenario should be **High priority**in the normative phase.

**E///: this makes no sense** – MR-DC enables more efficient handling of reporting due to overload, since we can use the other leg to pull the reports.

**Conclusion 4**: Support QoE measurement in RRC\_INACTIVE with **medium priority** (RAN2 to decide solution in normative phase). QoE measurement in IDLE mode is still FFS and RAN2 to decide.

**E///:** We already agreed the following, meaning that the **support for INACTIVE should be high prio**: **NR** **QoE measurement configuration is maintained in the RRC INACTIVE state.**

**Conclusion 5**: Considering there is a lot of interest to support RAN visible QoE but still concerns on the solutions/usefulness for RAN visible QoE, it is proposed to discuss the solutions further and support a basic framework (if feasible) for RAN visible QoE that can be extended in future releases.

**E///:** We **disagree** – most companies, **including all operators in the discussion are in favor of this**, so even if it is too early for details, we should conclude that RAN-visible QoE is supported. In any case, the main discussion is in the CB#5 on RAN visible QoE.

**Conclusion 6**: Considering there are some concerns on the UE/spec impact (across WGs) for supporting per-slice QoE but still few operators’ interest to support per-slice QoE, it is proposed to discuss the solutions further and support per-slice QoE in Rel-17 only if minimal spec impacts are identified.

**Conclusion 7:** Support for QMC during inter-RAT mobility is low priority and can be considered once solution for intra-RAT mobility scenario is complete and if time permits.

**E///:** We **disagree** – some applications are supported in both NR and LTE, so what do we do e.g. at an inter-RAT HO of a UE running a streaming session/MTSI?

**Conclusion 8**: QoE support for MR-DC is not supported in Rel-17

**E///:** We **disagree –** the moderator has drawn this conclusion from the section 3.8 where companies added extra issues. In that section, two companies have mentioned MR-DC, which does not reflect the opinion of the entire group. Besides, this **comeback has no mandate to decide about MR-DC support.**

**Conclusion 9:** Alignment of MDT and QoE measurements is **medium priority** and should be considered in normative phase. Exact solution FFS.

**E///:** without alignment, the use of radio-related measurements for QoE purposes is not possible. Besides, please consider operator view.

Based on the above conclusions, here are the proposals recommended:

**Proposal 1:** Following features are to be treated with **high priority** in the normative phase of QoE WI:

* Multiple QMC support
* Intra-RAT mobility and QoE continuity
* QoE config/report handling during RAN overload for SA scenario

**E///:** according to the support received, **RAN-visible QoE and Alignment of MDT and QoE measurements should be added to the list of high-prio topics.**

**Proposal 2:** Following features are to be treated with **medium priority** in the normative phase of QoE WI:

* QoE measurement in RRC\_INACTIVE (RRC\_IDLE is FFS)
* Alignment of MDT and QoE measurements

**E///: disagree – the alignment of MDT and QoE measurements** and **RRC\_INACTIVE support** should be added to the list of **high-prio topics.**

**Proposal 3:** Following features are to be studied further in the WI phase and can be supported if minimal spec impact exists across WGs and feasible solutions are identified:

* RAN visible QoE
* Per-slice QoE measurement

**E///: disagree for RAN-visible QoE,** it should be high-prio

**Proposal 4:** Following features are to be deprioritized for Rel-17 and to be treated only if other high priority features are complete:

* QoE support for MR-DC
* QMC for Inter-RAT and Inter-system mobility

**E///: disagree,** at least regarding the **MR-DC and inter-RAT mobility support**

# References

1. R3-210358 - Ranking and prioritization of QoE enhancement features