**I3GPP TSG-RAN WG3 Meeting #109-eR3-205480**

**Online, August 17th – 27th 2020**

Agenda Item: 15.2

Source: Ericsson (moderator)

Title: Summary of Offline Discussion on NR QoE Management Solutions

Document for: Approval

# Introduction

**CB: # NRQoE3-Solutions**

**Main part:**

**- LTE-based solution can be used as a baseline?**

**- QoE configuration and report are delivered by RAN as transparent containers or real-time RAN side optimization should be considered? QoE metrics are visible to RAN for NR QoE management?**

**- both management-based and signalling-based solutions should be supported? Reusing Trace mechanism or introducing newly defined procedures? MDT user consent for management based QoE?**

**- a threshold-based and/or event-based mechanism to trigger the start and stop of QoE measurement collection?**

**- NR QoE reports from UE are delivered over a newly defined dedicated SRB type or via UP solution?**

**- The QoE measurement and reporting is supported in RRC\_CONNECTED state only?**

**- Mobility impact: whether inter-RAT and inter-system QoE measurement continuity should be supported? only signalling based QoE measurement is propagated to target node? support of QoE measurement under MR-DC scenario?**

**Additional part:**

**- the enhancement of QoE measurement reports with DC or CA indication of the UE for the measured application session? (E///)**

**- the enhancement of QoE measurement reports with mobility history information? (E///)**

**- network slices should be taken into account? (Samsung, ZTE)**

**- the segmentation of large QoE reports into multiple smaller QoE reports? RAN2 related? (E///)**

**- study a time-based event for activation of QoE measurement to enable the flexibility of QoE measurement activation within a certain predefined period of time? (E///)**

**- Capture agreements as TP for TR, revise/merge and check details, split work, if needed**

**- List open issues for next meeting in the summary**

(E/// - moderator)

Relevant papers:

1. R3-204706 QoE Configuration and reporting (Qualcomm Incorporated)
2. R3-204851 Framework for QoE measurement collection (Nokia, Nokia Shanghai Bell)
3. R3-205181 Initial Consideration On Study of NR QoE (ZTE)
4. R3-205182 TP for FS\_NR\_QoE (ZTE)
5. R3-205200 pCR for TR 38.8xx: NR QoE Management Framework (Ericsson)
6. R3-205201 pCR for TR 38.8xx: NR QoE Measurement Triggering, Configuration, Collection and Reporting (Ericsson)
7. R3-205281 NR QoE measurement overview (Huawei)
8. R3-205283 Potential RAN3 impacts about QoE measurement (Huawei)
9. R3-205359 Discussion on NR QoE solution for various service (CATT)
10. R3-205360 Discussion on NR QoE solution architecture and interface impact (CATT)
11. R3-205370 Some Considerations on QOE Collection in NR (China Telecommunications)
12. R3-205402 Discussion on NR QoE requirements and potential solutions (Samsung)
13. R3-205403 Discussion on NR QoE interface impact and solutions (Samsung)
14. R3-205439 NR QoE management (CMCC)
15. R3-204708 Interworking with LTE QoE (Qualcomm Incorporated)
16. R3-205183 Consideration on slice QoE measurement (ZTE)
17. R3-204707 QoE handling in handover (Qualcomm Incorporated)

# For the Chairman’s Notes

TBW

# Discussion

## The high-level solution

A clear majority of contributions propose to agree/discuss the specification of both the management- and signalling-based solution. On the other hand, paper [9] proposes a completely new solution for time-critical services. Meanwhile, paper [2] proposes to use MDT as baseline for NR QMC.

**Q1-1: Should both the management-based and signalling-based solutions be specified for NR QoE management?**

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| **Company** | **Answer** |
| Ericsson | Yes. We further think that we should consider enhancing the management-based solution so that it should be possible to configure measurements for specific UEs.  In our view, the “LTE solution as baseline”:   * Implies specification of signalling and management-based solution; * Implies QMC delivery over SRB1; * Implies QoE report transport over SRB4; * Does not imply the reuse of Trace messages for signalling-based solution.   In addition, both the SID and paper [8] make a distinction between the LTE-based solution (including management-based and signalling-based solution) and the MDT-based solution, meaning that LTE as a baseline does not imply the reuse of Trace messages for NR QoE. |
| Qualcomm | Yes.  Application layer measurement should be RAT agnostic. So, we should make NR QoE similar to LTE for easier interworking.  MDT and LTE QoE are based on trace. If NR QoE continues to be based on trace, it is easier for correlation with radio measurements (MDT). |
| China Telecom | Yes. Both management-based and signalling –based solution shall be supported. |
| ZTE | Yes.  Share the view with QC. |

The QMC in the LTE signalling-based solution is piggybacked in Trace messages. In that respect, paper [5] proposes to define a dedicated signalling-based solution for NR QoE management, that does not reuse Trace messages. Paper [10] proposes that RAN creates the measurement configuration and sends it to the OAM. Based on the critical mass in the proposals, the following question is formulated:

**Q1-2: What is your view on specifying a dedicated procedure for signalling-based solution?**

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| **Company** | **Answer** |
| Ericsson | We think that **a dedicated set of procedures** should be defined for signalling-based NR QoE. Trace/MDT and QoE management are two different features and the QoE signalling should not be piggybacked on Trace messages. Moreover, the signalling design for Trace messages is Trace-centric so thee would need to be more than a few “bug fixes” to invalidate the mandatory Trace-specific IEs in the existing messages. We should not mandate that the Trace Collection Entity and the entity collecting QoE measurements are the same. |
| Qualcomm | As answered in last question, we think trace based architecture is easier for interworking with LTE and correlation with radio measurements (MDT). |
| China Telecom | Agree with Qualcomm |
| ZTE | The same view as QC. |

Papers [3], [10] and [14] argue that is preferable that QoE measurement configuration and reports are visible at the RAN. The same seems to be preferred by paper [12]. Meanwhile, paper [1] expresses a preference towards sending the two transparently over the RAN.

**Q1-3: Should the NR measurement configuration and QoE reports be visible at the RAN?**

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| **Company** | **Answer** |
| Ericsson | Yes, we believe that this is beneficial. |
| Qualcomm | For the services (MTSI, Video, AR, MBMS) with SA4 define QoE metrics, it should be up to gNB implementation to understand the SA4 defined QoE containers.  It should be possible for RAN2/RAN3 to define new QoE containers which are understandable for RAN. |
| China Telecom | Yes. In our understanding, RAN can configure visible measurement/report configuration for some QOE metrics to UE.  The reasons are as follows:   1. some QOE metrics for traffic quality have been defined in SA4 related specifications. XML based QOE configuration/report has good scalability for new traffic. In LTE system, the QoE configuration will be delivered via RRC to the UE as a container according to "measConfigApplicationLayer". For these metrics, the content of QOE measurement/report is invisible at RAN.   S4-180xxxx CR 26  In order to optimize wireless network performance, it is beneficial to define new QOE metrics for radio layer. Therefore, the NW could configure visible measurement/report for some QOE metrics to UE via RRC message. |
| ZTE | It is beneficial, depends on how to define the QoE reports. |

## Transport of QoE measurement report

The majority of companies propose the reuse of LTE solution, where the QoE reports are carried over SRB4. This may be understood as an implicit preference towards carrying the QoE reports over a dedicated SRB4. Companies behind the papers [5], [11] and [14] are somewhat more concrete, explicitly capturing the preference towards CP solution in their proposals. Meanwhile, paper [13] discusses the QOE report transport over both CP and UP.

**Q2: Do you agree that NR QoE reports should be carried over CP, and, more specifically, over a newly defined dedicated SRB type, e.g. SRB4?**

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| **Company** | **Answer** |
| Ericsson | Yes. |
| Qualcomm | Yes, over CP. As to SRB type, it is up to RAN2 to decide. |
| China Telecom | Yes. The NR QOE reports shall be carried over CP. In our understanding, The current QOS framework defined in TS23.501, any DRB shall associate with a PDU session in CN side. Therefore, the current mechanism cannot support to configure a dedicated DRB for QOE measurement |
| ZTE | Yes. Share the view with QC. |

## Measurement configuration and reporting

Paper [1] proposes that UE Application layer measurement capability is included into UE Radio Capability Info Indication message.

**Q3-1: Should the UE Application layer measurement capability be included into UE Radio Capability Info Indication message?**

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| **Company** | **Answer** |
| Ericsson | Yes, this is in line with the LTE approach. |
| Qualcomm | Yes, 5GC needs the information to configure signalling based QoE. |
| China Telecom | yes |
| ZTE | YES. the UE Radio Capability Info Indication procedure has been supported in current specification. |

Papers [3], [6] and [14] propose to consider in NR QoE measurements the radio network layer measurements and radio layer configuration information. Some examples include mobility history information, CA and DC configurations, HO type used during the application session etc.

**Q3-2: Should radio network layer measurements and radio layer configuration information be considered in NR QoE measurements?**

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| **Company** | **Answer** |
| Ericsson | Yes. We think that the inclusion of information and measurements pertaining to the radio network layer is necessary in order to provide to the recipient of the measurements a complete view about the causes of QoE deterioration. |
| Qualcomm | No. The QoE and MDT (with radio measurements) can be correlated based on timestamp, location info, trace ID etc. |
| China Telecom | Yes, see our view in Q1-3 |
| ZTE | Yes, it is benefit for post-process analysis in the server. However, the detail RAN measurements (both RAN node side and UE side) need to be further investigated, which is related to Issue3 in CB # NRQoE2-Services. |

Papers [6], [10] discuss measurement triggering and stopping. For example, event- and time-based triggering, as well as triggering by RAN are considered.

**Q3-3: Should RAN3 discuss/introduce event- and time-based measurement triggering and stopping, as well as measurement triggering by RAN?**

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| **Company** | **Answer** |
| Ericsson | Yes. We think it is beneficial to monitor the QoE metrics at certain events. Since the RAN has a close view on the radio situation, we think that RAN should also be able to trigger the QoE measurements. |
| Qualcomm | Yes. |
| China Telecom | The event- and time-based measurement triggering and stopping is applicable only to the QOE metrics for radio network layer measurements |
| ZTE | Yes. |

Papers [6] and [7] discuss measurement release, as well as reporting handling at RAN overload.

**Q3-4: Should RAN3 discuss/introduce the mechanisms for releasing QoE measurements and QoE report delivery at RAN overload?**

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| **Company** | **Answer** |
| Ericsson | Yes. We think that the network should be able to e.g. release a measurement or pause the reporting at overload. This is essential for measurement flexibility. |
| Qualcomm | Yes |
| China Telecom | Yes. The NW could release the QOE measurement based on its RRM policy. |
| ZTE | Yes for releasing a measurement with signalling based mechanism.  For QoE delivery at RAN overload (e.g. via SRB4 with suspend action), we would prefer to wait for RAN2’s progress. |

Papers [7], [8] and [11] discuss the QoE management support for SA, NSA and MR-DC.

***Q3-5: Should RAN3 discuss/introduce the QoE management support for SA, NSA and/or MR-DC?***

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| **Company** | **Answer** |
| Ericsson | Yes, we think this is beneficial. Multi-connectivity has an impact on QoE and this should be considered in QoE management. |
| Qualcomm | Yes |
| China Telecom | Yes. NR QOE shall consider the support for MR-DC. |
| ZTE | Application layer QoE measurements is agnostic to SA/NSA/MR-DC.  If we support QoE related RAN measurements, the measurements should be supported for SA/NSA/MR-DC. |

Paper [7] proposes that QoE measurement and reporting is supported in RRC\_CONNECTED state only.

**Q3-6: How should QoE measurements and reporting be handled in different RRC states?**

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| **Company** | **Answer** |
| Ericsson | We think that QoE measurement and reporting should of course be supported in CONNECTED state. We also think that the measurement configuration should not be released during the INACTIVE state, because we should avoid configuring the UE again and again every time it switches back to CONNECTED state. |
| Qualcomm | Application runs in AP (application processor) and is agnostic to RRC states. RRC state is managed by modem. QoE is measurement in application layer and therefore should be independent of RRC states. |
| China Telecom | Agree with Ericsson. Both Connected and inactive state should be supported |
| ZTE | QoE measurement configuration and reporting should of course be supported in CONNECTED state. Whether UE needs to record during INACTIVE state is pending to RAN2 discussion. |

## NR QoE management at mobility

Paper [6] proposes that RAN3 should study the required information to be exchanged between RAN nodes to support QoE measurement handling upon mobility. Papers [8] and [17] propose mobility support only for signalling-based solution.

**Q4: Should RAN3 specify mobility support for both signalling- and management-based NR QoE management?**

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| **Company** | **Answer** |
| Ericsson | Yes. The mobility impact on QoE is very important, regardless of QoE management solution agreed. |
| Qualcomm | Yes. |
| China Telecom | Yes. In addition, the NR QOE management during 4G/5G HO should be also supported. |
| ZTE | Yes. |

## Other non-essential issues – to be discussed at a later stage

* Interface impact - as proposed by [10], the interface impact (proposals in e.g. [13]) should be discussed only after the solution(s) have been chosen, and the rapporteur will follow that approach.
* Proposals regarding real-time NR QoE management, discussed in [10] and [13].
* Inter-RAT mobility discussed in papers [6] and [15].
* Slice-related proposals from [3], [12] and [16].
* Segmentation of QoE reports over RRC in [6].

# Conclusion, Recommendations

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