**3GPP TSG-RAN WG3 Meeting #112-eR3-212641**

**Online, May 17th- 27th 2021**

Agenda Item: 15.3

Source: Ericsson (moderator)

Title: Summary of Offline Discussion on RAN-visible QoE

Document for: Approval

# Introduction

This is the SoD for the following comeback: **CB: # NRQoE5-RAN\_visible**

The deadline for providing replies to Phase 1 is **Friday, May 21st at 23.59 UTC.**

Relevant papers:

1. R3-211736 RAN visible QoE (Qualcomm Incorporated)
2. R3-211839 Discussion on relevant set of RAN-visible QoE parameters (CATT)
3. R3-211840 Discussion on RAN visible QoE configuration and reporting (CATT)
4. R3-211981 Discussion on RAN visible QoE (Samsung)
5. R3-211989 RAN-visible QoE Services and Metrics (Ericsson)
6. R3-211990 RAN-visible QoE - Configuration and Reporting (Ericsson)
7. R3-212325 Analysis of QoE metrics for use by the NG-RAN (Nokia, Nokia Shanghai Bell)
8. R3-212448 Further consideration on RAN visible QoE (ZTE Corporation, China Telecom)
9. R3-212497 RAN visible QoE metrics (CMCC)
10. R3-212515 Further analysis on spec impacts of the potential solutions to QoE visibility (Huawei)
11. R3-212516 [Draft] LS on QoE visibility at RAN (Huawei)

# For the Chairman’s Notes

TBW

# Discussion

## The Support for RAN Visible QoE (RVQOE)

Most papers submitted to this agenda item [1-6] and [9-11] propose various ways to support RAN-visible QoE (RVQOE). Moreover, paper [4] proposes a 3-step approach for the ways of working in this AI: 1) study and determine use cases; 2) determine the useful types of information; 3) determine the relevant metrics and interface impact.

Meanwhile, paper [8] proposes that RVQOE is supported by implementation, i.e. by enabling the RAN node to read and write XML files. Finally, paper [7] proposes to enable RVQOE for currently QoE-supported services by implementation. It is also proposed to discuss the RVQOE support for new services (e.g. URLLC), but at a later time.

***Q1: Please state your view on the above.***

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| **Company** | **Answer** |
| **Ericsson** | We see tangible benefits of RVQOE support for **DASH streaming and VR services, and we propose to focus Rel17 on RVQOE support for these two service types**.We are fine with the 3-step approach proposed by Samsung, with one addition: the work should also address the framework for configuration and reporting, which can be discussed concurrently with the 3 steps.Finally, we agree that URLLC is one of the services that should be investigated in a later release. |
| CMCC | We support RVQOE which is not fulfilled by implementation. Considering the work load, we are also fine to firstly focus on some of the supported service types by NR QoE. |
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## RVQOE Metrics

**Legacy QoE metrics of interest**

Paper [5] proposes:

* For DASH streaming and VR services: Buffer Level, Playout Delay for Media Start-up and a simplified version of the Play List metric, indicating the video representation quality during the session, and the list of stalling events.

Paper [9] proposes:

* For DASH streaming and AR services: Buffer Level.
* For MTSI and MBS services: Corruption Duration.

Paper [10] proposes:

* For the DASH streaming and VR services: Buffer Level.
* For the MBMS service: Rebuffering Duration.

Paper [4] proposes Buffer Level to be one of the RAN visible parameters for scheduling function. It is also proposed to discuss additional metrics, such as Play List and Device Information and so on.

Paper [1] proposes:

* For the MTSI service: Corruption Duration, Jitter Duration, Round-trip time.
* For the MBMS service: Corruption Duration, Jitter Duration, Rebuffering Duration, Initial Buffering Duration, Content Access/Switch Time, Network Resource.
* For the DASH streaming and VR services: Average Throughput, Buffer level, Play List.

Paper [2] proposes that the metrics for VR, MBMS and XR are analysed for RAN visible QoE, in particular:

* For the DASH streaming service: Average Throughput.
* For the MTSI and MBMS services: Corruption Duration.
* For the VR services: Interaction Latency.

***Q2: Which services should be supported in the RVQOE framework in Rel17?***

***Q3: Which legacy QoE metrics do you consider useful if exposed to the RAN?***

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| **Company** | **Answer** |
| **Ericsson** | **Q2:** due to limited time, we propose to **focus Rel17 on DASH streaming and VR services**, as these services will likely constitute most of the mobile traffic in the coming years.**Q3:** **DASH streaming/VR** metrics: **Buffer Level, Playout Delay for Media Start-up** and a **simplified version of the Play List** metric. Additional metrics could be discussed. |
| CMCC | Q2: MBS service could be de-prioritized, and firstly to focus on those types that can only be served during CONNECTED mode. But it is also fine to support all NR QoE supported service types if we have time during R17, which depends on our progress in the next one or two meetings.Q3: For DASH streaming and AR services: at least Buffer Level. And we are open to discuss other metrics.For MTSI and MBS services: Corruption Duration. And we are open to discuss other metrics. |
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Paper [4] also proposes that the following types QoE information can be considered in RAN visible QoE:

* QoE information reflecting the overall QoE.
* QoE information reflecting QoE expectations.
* QoE information reflecting current scheduling results.
* QoE information reflecting root causes.

The Moderator’s opinion is that the above proposal requires clarification, which can be provided by the proposing company in the answer to Q2-Q3.

**Derivation of RVQOE metrics**

Paper [9] proposes to liaise the SA4 regarding the feasibility of introducing UE generated QoE score as a RVQOE metric for all supported service types.

Paper [1] proposes to introduce two types of RVQOE:

* **RAN-visible QoE metrics**: a subset of legacy QoE metrics data collected from which are useful for RAN.
* **RAN-visible QoE values**: a set of values derived from QoE metrics data through a model/function defined in collaboration with SA4.

Paper [1] also proposes to send LS to SA4 to check if certain QoE metrics of interest to RAN can be represented qualitatively in terms of a numerical QoE score or objective representation. On a similar note, paper [6] proposes that, after identifying candidates for RAN visible QoE metrics, SA4 should be liaised on how these metrics can be derived.

Paper [10] proposes to introduce simple QoE values, e.g. simple numeric values (from 1 to 5) or simple quality indications (excellent, good, fair, bad, poor).

***Q4: Do you support the specification of:***

* ***RAN-visible QoE metrics: a subset of legacy QoE metrics data collected from UE, which are useful for RAN?***
* ***RAN-visible QoE values: a set of values derived from QoE metrics data through a model/function defined in collaboration with SA4?***

The moderator thinks that a more appropriate term than RVQOE *value* should be considered, since even the legacy QoE metric value is reported.

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| **Company** | **Answer** |
| **Ericsson** | **Yes,** we think that reporting of both RVQOE metrics and RVQOE values should be supported. |
| CMCC | Yes. We support reporting both. |
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## RVQOE Configuration and Reporting

**RVQOE configuration**

Paper [9] proposes that RVQOE metrics are configured and reported as per service type.

***Q5: Do you agree that RVQOE metrics should be configured and reported per service type?***

Paper [3] proposes that the RVQOE measurement configuration can be generated by the OAM or the RAN. In the former case, the configuration is in the XML format, while in the latter case the RAN2 should define the format. On the other hand, paper [6] proposes that only RAN can assemble the RVQOE configuration, whereas the OAM/CN may inform the RAN about the availability of RVQOE metrics.

***Q6: Which entity(-ies) should generate the RVQOE measurement configuration?***

Regarding the reporting of individual RVQOE metrics, paper [1] proposes that only a fixed set of RVQOE metrics can be reported from the UE, i.e. that the RAN is not allowed to explicitly ask the UE to report certain RAN-visible QoE metrics. Paper [10] proposes that either CN/OAM informs the RAN which metrics, or RAN3 specify a fixed set of metrics, to be visible at RAN. Paper [9] proposes that, upon RVQOE measurement activation, UE AS indicates to UE NAS that RVQOE measurement has been triggered, potentially with RVQOE metrics needed to be collected at UE NAS as requested by RAN. Meanwhile, paper [6] proposes that RAN3 should consider the following options:

* A RAN node receives, outside the application layer measurement configuration container, one indication, per service type, that all RVQOE metrics can be requested from the UE(s) for the service type.
* A RAN node receives, outside the application layer measurement configuration container, one indication, per service type, and per QoE metric, of the RVQOE metrics that can be requested from the UE(s) for the service type.

***Q7: Should the RAN be able to collect only a fixed set of RVQOE metrics from the UE, or should the RAN be able to request a subset of RVQOE metrics supported by the UE?***

Paper [6] proposes that the UE can indicate to the RAN its capability with respect to providing RAN visible QoE metrics. When the RAN receives from the OAM the QoE measurement configuration for the UE, the RAN can configure the UE with RAN visible QoE measurements.

***Q8: Should the UE be able to indicate to the RAN its capability with respect to providing RVQOE metrics? In this case, when the RAN receives from the OAM the QoE measurement configuration for the UE, the RAN can configure the UE with RVQOE measurements.***

Paper [1] proposes that the UE should ignore the RAN visible QoE configuration if RAN visible QoE is configured without configuring application layer QoE for the same service type.

***Q9: Do you agree that the RVQOE collection can be configured only if QoE measurements are configured for the same service type?***

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| **Company** | **Answer** |
| **Ericsson** | **Q5: Yes****Q6: Only RAN** should be able to generate the RVQOE configuration. but RAN needs to be informed about the possibility of collecting RVQOE. The role of OAM should be limited to indicating to the RAN which RVQOE metrics may be collected, based on which the RAN assembles the configuration. The **OAM should not assemble the QoE configuration**.**Q7:** We think that **both options should be discussed** in RAN3.**Q8: Yes****Q9: Yes** |
| CMCC | Q5: Yes.Q6: RAN is the generator and consumer of such report, so RAN should generate the RVQOE measurement configurations.Q7: Fixed set as starting point, and FFS on subset method.Q8: Yes.Q9: Yes. |
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**RVQOE configuration details**

Paper [3] proposes to discuss the following RVQOE aspects in the NR QoE WI:

* Activation, and deactivation procedures
* Multiple simultaneous QoE measurements
* QoE measurement handling at RAN overload
* QoE measurement handling in RRC\_INACTIVE
* Mobility
* Per-slice QoE
* Alignment with radio-related measurement

It is also proposed to define the RVQOE measurement ID, to enable report post processing.

***Q10: Do you agree to set the RVQOE WI scope as follows:***

* ***Activation, and deactivation procedures***
* ***Multiple simultaneous QoE measurements***
* ***QoE measurement handling at RAN overload***
* ***QoE measurement handling in RRC\_INACTIVE***
* ***Mobility***
* ***Per-slice QoE***
* ***Alignment with radio-related measurement?***

***Q11: Should an RVQOE measurement ID be defined, to enable report post processing?***

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| **Company** | **Answer** |
| **Ericsson** | **Q10: Yes****Q11: Perhaps**, or maybe we can simply use the same legacy ID as the legacy QoE measurements. |
| CMCC | Q10: Yes.Q11: It may also depend on which SRB RVQOE is configured and reported, and how to distinguish legacy QoE and RVQOE if transmitted on the same SRB4. Besides, RAN2 is discussing using a shorten ID over Uu instead of legacy ID. Further check with RAN2 may be needed. |
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**RVQOE reporting**

Papers [1] and [9] propose that the RVQOE report is provided from UE NAS to UE as separately from the legacy QoE report container. Paper [4] proposes to ask for confirmation from RAN2 and CT1. Meanwhile, paper [3] proposes that the RVQOE report is delivered as a separate RRC IE, which should be specified by RAN2.

***Q12: Should the RVQOE report be provided from UE NAS to UE separately from the legacy QoE report container?***

Paper [1] argues that RAN should not be allowed to define specific periodicity or event trigger for RVQOE. It is also proposed that the UE should report RAN visible QoE together with application layer QoE, if configured. Conversely, paper [10] proposes that RVQOE reporting should be upon request from the RAN.

***Q13: Should the RVQOE reporting be upon RAN request?***

Paper [9] proposes that RAN3 discusses how UE AS handles the collected RVQOE report. The Moderator thinks that this is a RAN2 issue, which can be mentioned in an LS to RAN2, once progress in the RAN3 discussion has been made.

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| **Company** | **Answer** |
| **Ericsson** | **Q12: Yes****Q13: Yes,** otherwise the usefulness of some of the metrics of interest for QoE, such as Playout Delay, for example, would be limited. We acknowledge that RVQOE should be collected only if legacy QoE measurements are configured, but the RAN should be able to decide at what pace it should receive the RVQOE reports and what should the reporting triggers be. |
| CMCC | Q12: Yes.Q13: RAN is able to decide the reporting interval and reporting triggers for RVQOE, and configure such parameters to UE through RRC signalling. |
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## The Entity Generating RVQOE

Paper [4] proposes to discuss which entity should generate the RVQOE. Three options are considered:

* RVQOE generated by UE
* RVQOE generated by gNB
* RVQOE generated by QoE server

***Q14: Which entity should generate the RVQOE?***

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| **Company** | **Answer** |
| **Ericsson** | The **UE** should generate RVQOE, because the end user is the most “competent” to do so.  |
| CMCC | Both RVQOE metrics and RVQOE value should be generated by UE. |
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## Mobility Support for RVQOE

Paper [6] proposes that, at inter-NG-RAN node mobility, the RAN visible QoE measurement configuration may be passed from the source to the target node. Paper [1] is somewhat more concrete, proposing that RAN visible QoE configuration transfer is supported on the Xn and NG interface by including a *RAN visible QoE Configured* IE in *UE Application Layer Measurement Configuration* IE inside the *Trace Activation* IE.

It is also proposed that RVQOE report is signaled from the target node back to the source node over Xn in HANDOVER REPORT or a new Xn message.

***Q15: Should the transfer of RVQOE configuration to the target be supported?***

***Q16: Should the RVQOE report be signalled from the target to the source at handover?***

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| **Company** | **Answer** |
| **Ericsson** | **Yes, to both Q15 and Q16**. The QoE performance at handover is of particular interest and the source should be informed about the performance at handover. |
| CMCC | Q15: Yes.Q16: Maybe beneficial. OK to further discuss. |
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## The Consumers of RVQOE

Papers [1] and [6] propose that the gNB-DU may be a consumer of RVQOE. In addition, paper [6] proposes that the gNB-CU may also be a consumer. In [4] it is proposed that the Buffer Level can be transmitted over F1 interface (message used FFS).

***Q17: Should the gNB-CU and gNB-DU be consumers of RVQOE reports?***

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| **Company** | **Answer** |
| **Ericsson** | **Yes,** both. |
| CMCC | Yes for both. |
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## LSs for Informing Other Groups

Papers [5] proposes to send an LS to RAN2 informing about the conclusions on RVQOE. Paper [10] proposes to send an RAN3 agree to send agreements on QoE visibility at RAN to at least RAN2, SA4 and SA5 (draft LS in [11]). Paper [6] proposes to send an LS asking RAN2 to discuss signalling support for RAN visible QoE configuration and reporting towards the UE.

The LSs can be sent to the respective groups once progress has been made.