3GPP TSG-RAN WG2 Meeting #116bis-e R2-22XXXX

Electronic Meeting, 17 – 25 January 2022

**Agenda item: 8.14.4**

**Source: CMCC**

**Title: Report for** **[AT116bis-e]****[031][QoE] UE capabilities (CMCC)**

**WID/SID: NR\_QoE**

**Document for: Discussion and Decision**

# Introduction

This document aims at initiating the discussion on UE capabilities for NR QoE.

* [AT116bis-e][031][QoE] UE capabilities (CMCC)

Scope: Initial discussion on proposals from documents under 8.14.4. Identify agreeable points, points for discussion, if any. Points postponed, if any. Attempt endorsement of Running CR.

Intended outcome: 1 Report 2 Endorsed running CR.

Document deadline: 1 Friday W1, 2 EOM

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|  |  |  |
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# Discussion

***Open issue 1: QoE UE capabilities for each service type***

The following proposals are related to QoE UE capabilities for each service type:

* UE indicates QoE supporting per service type to RAN implies that UE supports service type related general QoE configuration and reporting. [1]
* Introduce QoE UE capabilities for each service type, i.e. streaming, MTSI and VR. [2]
* RAN2 should discuss if UE should indicate the QMC capability service by service. [3]
* Add QMC service type supporting information (include Streaming services, MTSI services and VR services) in UE-NR-Capability in UECapabilityInformation. [4]
* It is proposed for RAN2 to introduce UE capability for each service types for legacy NR QoE and introduce 1 UE capability for RAN visible QoE. [5]
* Define separate UE capability parameters, indicating whether the UE supports the service type supported in R17 for NR QoE. [6]
* Define separate UE capabilities for QoE measurements for Streaming, for MTSI and for VR services respectively. [7]

All companies that make proposals on this issue agree to introduce QoE UE capability for each service type, or to discuss whether to support it at least.

**Q1: Do you agree to introduce QoE UE capability parameters for each service type i.e., streaming, MTSI and VR？**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or no** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Ericsson | Yes |  |
| Nokia | Yes, but | The QMC configuration is one RRC message with list of service type. Having different capabilities would mean that the gNB has to check each time whether the UE has relevant UE capability for a service. |
| Lenovo | Yes |  |
| Apple | Yes |  |
| Qualcomm | Yes |  |
| CATT | Yes |  |
| CMCC | Yes | Reuse LTE is enough. |
| ZTE | yes |  |
| vivo | Yes |  |
| OPPO | Yes |  |
| Samsung | Yes |  |
| China Unicom | Yes |  |
| LGE | Yes |  |

Summary:

All companies agree to introduce QoE UE capability parameters for each service type i.e., streaming, MTSI and VR. And the check by gNB is inevitable regardless of how many parameters are introduced. So we propose that,

**(all) Proposal 1: Introduce QoE UE capability parameters for each service type i.e., streaming, MTSI and VR.**

***Open issue 2: Overview of new sub-features***

Some new features/functionalities have been introduced for NR QoE in R17. And there exists a view that supporting QMC for a specific service type means supporting some sub-features also, as indicated by [2] and [6].

So the moderator would like to firstly check companies views on which sub-features should be supported as long as UE indicates capability parameter(s) for the supported service types. Note that the detailed discussion on the UE capability for each sub-feature is provides in the following open issues, and the question here is just to capture the general overview.

**Q2: what sub-feature do you think should be supported along with the QMC for a specific service type?**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Company** | ***Multiple QoE configurations/reports in one RRC message*** | ***Pause and Resume*** | ***RAN visible QoE*** | ***Per Slice QoE*** | ***QoE report segmentation*** | ***Alignment of MDT and QoE*** | ***Mobility*** |
| (Example) xxx | Yes | Yes | Yes | No | Yes | No | No |
| Huawei, HiSilicon | Yes (for reports it depends on whether we agree to support this which is OK to us) | No | No | Depends (wait for RAN2 progress) | No | No | Yes |
| Ericsson | Yes | Yes | No | Yes | Yes | Yes | Yes |
| Nokia | It should be supported,  But not sure there is a need to define sub0feature. If the UE has QMC capability, it would imply it supports RRC configuration for a few RRC IDs | No strong view | Yes | Too premature to discuss, as the UE AS does distinguish S-NSSAI from the set of slice ids provided by NAS. Rel-17 RAN WI is introducing slice group ids, thus it is not clear what reference for a slice for QMC purposes the UE could use. | Yes | No,  As there is no impact to UE capabilities nor features, the alignment can be handled by the network | Yes |
| Lenovo | Yes | No | No | Wait for RAN3 | No | No | Yes |
| Apple | Yes | No | No | Unclear | No | No | Maybe, but need to see the final solution |
| Qualcomm | Yes | No | No | No, need to wait for RAN3 and SA4 progress | Yes, but no strong view | No, any impact on UE? | Yes for basic mobility, but need to see the final solution  For potential area scope handling, it is No. |
| CATT | Yes | Yes | No.  need separate one for RVQOE | Yes | Yes  if segment for other RRC supported by UE | NO | Yes |
| CMCC | Yes | Yes | No | Yes | Yes | Yes | Yes |
| ZTE | No | No | No | No | No | No | No |
| vivo | Yes | No | No | FFS, wait for further progress | No | No impact for UE if the TCE is responsible for the correlation | FFS, for further progress |
| Samsung | Yes (agree with Huawei) | Yes | No | Wait for RAN3's progress | Yes | No | Yes |
| China Unicom | Yes | Yes | No | Yes | Yes | Yes | Yes |
| LGE | Yes | Yes | No | Yes | Yes | No | Yes |

Summary:

It seems that most of companies agree that including Multiple QoE configurations/reports in one RRC message and mobility should be supported along with NR QMC.

Since we are going to summarize feature-by-feature in the following issues, and the intention was to capture an overview, so no proposals are provided here.

***Open issue 3: Maximum number of simultaneous QoE measurement***

This issue has been discussed serval times in recent meetings, and no consensus has been reached on an exact number of how much QoE measurement can be processed for one UE simultaneously. Therefore, In [7], proposals to introduce new UE capability parameters on the maximum number of simultaneous QoE measurement are raised.

* Configuration of 16 simultaneous QoE configurations are supported for UEs supporting QoE measurements.
* Configuration of 32 or 64 simultaneous QoE configurations are supported by additional UE capabilities.

And another potential way to go is to achieve consensus on the maximum number of simultaneous QoE measurement for a UE, and no additional UE capability parameter is needed.

**Q3: Do you think it is needed to introduce additional UE capability parameters regarding the maximum number of simultaneous QoE measurement?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or no** | **Comments** |
| Huawei, HiSilicon | No | We suggest that RAN2 can define a specific value, e.g. 16 or 32, and then the UE supporting basic QoE shall support the maximum number of QoE measurement. |
| Ericsson |  | We think we should have a number e.g. 16 included in the basic capability. Additional configurations can be supported with a capability, but not strong view. |
| Nokia | No | Would make things more complex |
| Lenovo | Yes | To conclude this topic and avoid further discussion on a fixed value we suggest to introduce a capability with which the UE indicates the max number of simultaneous QoE measurement configurations it supports. The capability is of type ENUMERATED and contains the values {8, 16, 32, 64}. |
| Apple | Yes | Since discussion does not seem to converging, Lenovo proposal seems reasonable. |
| Qualcomm |  | Needs to further consider the impact of the maximum number of configurations, it only impacts AS layer, or application layer as well. Whether the maximum number should be per service type, that means whether one application layer for a certain service type can support multiple QoE configurations and how many. |
| CATT | No | We should specified the number instead of following the UE capability |
| CMCC | No | We should firstly try to determine the maximum number (we prefer 16), which is expected to be decided during this meeting in another CB, then there’s no need to introduce extra capabilities once the maximum number is decided. |
| ZTE | no | Share same view with HW. |
| vivo | No | Simultaneous QoE configuration and measurements are not equivalent. |
| OPPO | Yes | Agree with Lenovo. The capability of different UEs supporting the number of simultaneous QoE measurement configuration could be distinct, depending on the UE processing capability |
| Samsung | No | No clear benefit is expected |
| China Unicom | No | Share the same view with HW, the max No. of configurations shall be a general feature of QoE capability. |
| LGE | No | Same view as HW |

Summary:

14 companies provide comments, wherein 10 companies support to define a specific value for the maximum number thus no additional capability is needed; while 3 companies support to introduce capability because the maximum number has been discussed for several meetings but no consensus achieved.

The moderator also notice that the maximum number issue is not discussed in other discussions. So as a way forward, we propose to have a last try on the maximum number by following the majority view. And it is the moderator’s understanding that 16 simultaneous QoE measurement are the most supported view.

**(4/13) Proposal 2: Agree that UE supporting NR QMC should support a maximum of 16 simultaneous QoE measurements, and no additional capability is needed.**

Accord to the email discussion, some company wonders if the maximum number needs to be further checked with SA4. However, we notice that SA5 has replied in R2-2111225 (note that SA4 is also CCed) to leave to RAN WGs to decide the maximum number during last RAN2 meeting, but no further comment from SA4 is received since then. Based on that, our understanding is that SA4 has acknowledged the situation, and has no concern on the maximum number for now. So another way forward for RAN2 is to decide a maximum number, and send LS to SA4 to check whether our decided number causes no issue (we also notice that we may send LS to SA4 this meeting regarding AT command, and we can add our decision on the maximum number in the same LS).

**(4/13) Proposal 2: Agree that UE supporting NR QMC is mandated to support a maximum of 16 simultaneous QoE measurements configurations. And send LS to SA4 for confirmation.**

***Open issue 4: Pause and resume capability***

The main controversy is that whether to define a separate UE capability for QoE reporting pause and resume.

As proposed in [1] and [2], QoE reporting pause and resume deserves a separate UE capability parameter; but in [6], some companies believe that the capability for pause and resume QoE reporting is indispensable and basic which ought to be supported if UE supports NR QMC.

**Q4: Do you think it is needed to define a separate UE capability parameter for pause and resume?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or no** | **Comments** |
| Huawei, HiSilicon | Yes | This feature imposes some extra requirements on the UE, e.g. on its memory requirements, especially in case AS layer is chosen for storing the reports. We believe this feature should be optional for the QoE UE. |
| Ericsson | No | Not so complex, can be part of the basic capability. |
| Nokia | No | If the mechanism is developed for Rel-17 it should be part of the Rel-17 QMC |
| Lenovo | Yes | We have not reached yet an agreement on which layer (AS or application layer) the UE should store the QoE reports during pause. Furthermore, there are still some doubts on the value of the pause/resume functionality. |
| Apple | Yes | We are unsure this functionality really needs to be supported and prefer to keep it optional for UE to support. |
| Qualcomm | Yes | Same comment as HW, Lenovo and Apple. |
| CATT | No | It should be basic function of the QMC in UE |
| CMCC | No | According the Thurs, W1 online session, AS layer is responsible for the QoE report storage, and a minimum of 64kB storage is used to store QoE reports.  In addition, we agree that there’s no interaction between UE APP and AS layers from perspective of pause/resume.  Based on above agreements, we assume pause/resume mechanism is not expected to be complex, and it could be supported without additional capability. |
| ZTE | No | Similar view with Ericsson. This can be part of basic capability. |
| vivo | Yes | Agree with HW, this capability should be optional especially in the case that the report is buffered in AS layer. |
| OPPO | Yes | Agree with Huawei |
| Samsung | No | Agree with CMCC |
| China Unicom | No | Agree with Ericsson, it can be part of the basic capability. From other side, if pause and resume is an optional capability, UE not supporting pause and resume functionality will discard QoE reports at RAN overload, which will compromise the integrity of the QoE report. |
| LGE | No | Not so complex, can be part of the basic capability. |

Summary:

8 out of 14 companies support to treat Pause and resume as one of the basic sub-features; while 6 companies support to introduce additional UE capability. There’s no clear majority. So the moderator would like to leave this open issue FFS.

Note that we’ve agreed to support Pause and resume functionality according to last RAN Plenary meeting, so the discussion on the usefulness of pause and resume should be avoided.

In addition, we achieved some agreements on Pause and resume during online discussion on Thurs, W1, and companies are encouraged to provide comments based on the existing agreements.

**(8/14) Proposal 3: (To be discussed online) FFS on whether the Pause and resume capability is one of basic sub-features.**

***Open Issue 5: RAN visible QoE capability***

The following proposals are related to QoE UE capabilities for each service type:

* QoE capable UE indicates whether to support RAN visible QoE to RAN per service type. [1]
* RAN visible QoE capability is specified as a single capability (i.e. not per service type or per QoE metric). When UE indicates RAN visible QoE capability, the service types for which the UE supports RAN visible QoE are the same as the ones for which the UE is capable of application layer QoE (with the restriction that RAN visible QoE is applicable to DASH and VR only). [2]
* There is a UE capability for the support of RAN visible QoE in NR. FFS what it implies in terms of interaction with upper layers. [3]
* Add service type supporting information for RAN-visible QMC (include Streaming services and VR services) in UE-NR-Capability in UECapabilityInformation. [4]
* Define a UE capability parameter, indicating whether the UE supports RAN visible QoE measurement collection for NR QoE. [6]
* Define a separate UE capability for RAN Visible QoE. [7]

Based on the above proposals, there are generally two options of introducing RVQoE UE capability parameter:

**Option 1**: One parameter indicating whether UE supports RVQoE for service types that are supported by legacy QoE of the same UE.

**Option 2**: Separate parameters indicating whether UE supports RVQoE for each service type, i.e. streaming and VR.

So we’d like to check which option companies prefer.

**Q5.1: Do you agree to introduce UE capability parameter(s) for RVQoE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or no** | **Comments** |
| Huawei, HiSilicon | Yes | This feature is an extra feature on top of application layer based QoE, so should be a separate UE capability. |
| Ericsson | Yes |  |
| Nokia | Not necessarily | Depends on the discussion on shared measID for RAN-visible QoE and regular QoE. If there are dependencies, one single capability is simpler |
| Lenovo | Yes | RVQoE is a separate feature. |
| Apple | Yes |  |
| Qualcomm | Yes | RVQoE impacts both AS layer and application layer. |
| CATT | Yes |  |
| CMCC | Yes | And RAN3 has investigated and requested to introduce RVQoE capability. |
| ZTE | Yes |  |
| vivo | Yes |  |
| OPPO | Yes |  |
| Samsung | Yes |  |
| China Unicom | Yes |  |
| LGE | Yes |  |

**Q5.2: If the answer to above Q is yes, which option do you prefer?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | Option 1 seems straightforward. It is unclear why the UE supporting multiple service types for application layer QoE would only support RAN visible QoE for one of these service types. |
| Ericsson | Option 1 is sufficient. |
| Lenovo | Option 2. RVQoE still requires some implementation efforts for the UE, so we would like to have some flexibility in implementation. |
| Apple | Option 2 |
| Qualcomm | Option 2. RVQoE impacts not only AS layer, but also application layer. It should allow some applications for certain service type only support legacy QoE. |
| CATT | Option2, the RVQOE may support different service from legacy QoE as RAN3 has defined. |
| CMCC | Option 1 is sufficient. And we do not think supporting RVQoE would introduce any service type specific efforts for the UE. |
| ZTE | Opt1 |
| vivo | Option 2, shall confirm with SA4/CT1. |
| OPPO | Option 2 |
| Samsung | Option 2 is preferred. Option 1 seems enough to AS layer, but each application layer may have different capability on it. |
| China Unicom | We support option1. RAN visible QoE measurements will be aligned with legacy QoE measurements, so it’s not needed to define per service type capability for RAN visible. |
| LGE | Option 1 is sufficient. |

Summary:

13 of 14 companies agree to introduce UE capability parameter(s) for RAN visible QoE.

For the question Q5.2, 5 companies understand that one parameter is enough; while 7 companies support to introduce separate parameters for each RVQoE supported service type. Since there’s no clear majority on which option to adopt, the moderator suggests to leave the further discussion online.

**(13/14) Proposal 4: Introduce UE capability parameter(s) for RAN visible QoE.**

**Proposal 5: (To be discussed online) FFS on which of the following option to choose,**

* **(6/13) Option 1**: One parameter indicating whether UE supports RVQoE.
* **(7/13) Option 2**: Separate parameters indicating whether UE supports RVQoE for each service type.

P5 is reworded as follows to be made more clear:

**Proposal 5:  FFS on which of the following option to choose for RVQoE capability,**

* **(6/13) Option 1: One parameter indicating whether UE supports RVQoE.**
* **(7/13) Option 2: Separate parameters indicating whether UE supports RVQoE for each service type.**

***Open issue 6: Per Slice QoE***

Per Slice QoE is an additional sub-feature for QoE in R-17. The main content of this feature is to make QMC perform with per slice granularity. Since this feature is newly introduced, some company would like to define a separate capability parameter for per slice QoE. [1]

However, RAN3 is discussing per slice QoE as well, some company suggests RAN2 to wait for more inputs before deciding whether additional capability is need. [2]

In addition, as indicated by some companies [6], per slice QoE should be naturally supported as long as the UE supports NR QMC.

**Q6: Which of the following options would you prefer on per slice QoE UE capability?**

**Option 1: Wait more information from RAN3.**

**Option 2.a: Define a separate UE capability parameter to indicate whether to support per-slice QoE.**

**Option 2.b: No need to define a separate UE capability parameter, and per-slice QoE should be supported as long as UE supports NR QMC.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Which option do you prefer** | **Comments** |
| Huawei, HiSilicon | Option 1 (including RAN2 progress) | If per slice QoE solutions are more concrete, we can further check the relevant capabilities. |
| Ericsson | Option 2b, but open to Option 1 also. |  |
| Nokia | Option 1: Wait for RAN3 |  |
| Lenovo | Option 1 |  |
| Apple | Option 1 |  |
| Qualcomm | Option 2a, but open to Option 1 also. | UE QoE radio capability should also reflect application layer capability. We should allow some applications only support legacy QoE without slice information. |
| CATT | Option 2b | Slice is mandatory feature of the UE in 5G. it should be supported |
| CMCC | Option 2b, but open to Option 1 |  |
| ZTE | Option 1 |  |
| vivo | Option 2a, but open to Option 1 | The UE impact is foreseen but ok to wait for RAN3 further progress. |
| OPPO | Option 2a |  |
| Samsung | Option 1 |  |
| China Unicom | Option 2.b | As we know, RAN3 suggest RAN2 to make decision on the UE capabilities of each features in the offline discussion. So option 1 is not suggested. And we see no reason to distinguish per-slice feature with from NR QMC feature. |
| LGE | Option 1 |  |

Summary:

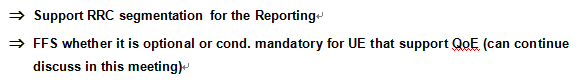
11 of 14 companies support to wait for more progress from RAN3, so the moderator suggests to wait.

However, it should also be noted that no matter whether RAN3 could provide some additional information regarding per slice QoE during the next meeting cycle, we have to make the decision on this open issue next meeting.

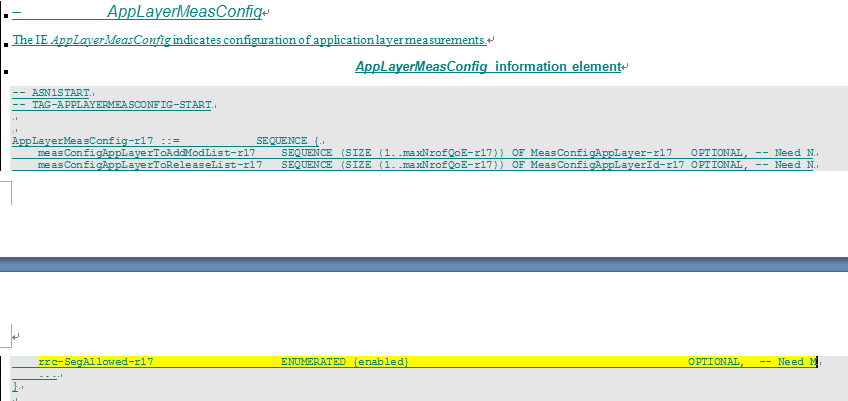
As commented by companies, P6 can be removed. But the intention we provided this proposal was to remind us that there will be only one meeting left if we do not make any decision regarding per slice QoE capability this meeting. So we need to bear in mind that the next meeting we have to make the decision regardless of whether we can get more information from RAN3.

***Open issue 7: RRC segmentation for QoE reporting***

In RAN2#116-e, we have discussed whether the support for RRC segmentation in [8] and agree to support RRC segmentation for QoE reporting.



In [1][2][9], UE capability of segmentation of MeasReportAppLayer is discussed as well, And the latest endorsed RRC running CR in [10] has defined the rrc-SegAllowed-r17, indicating whether the RRC segmentation of QoE reporting is allowed, in AppLayerMeasConfig as follows,



As a result, the moderator observes that it is the majority view that whether the segmentation of QoE reporting can be performed by a UE is under the control of the network, and there is no need to define UE capability parameter for segmentation of QoE reporting.

So the remaining issue is whether the segmentation of QoE reporting is optional without UE capability parameter, or conditionally mandatory without UE capability parameter. According to the contributions submitted to this meeting, companies still have different understandings on such issue, and there’s no clear majority. So the moderator would like to collect more opinions on this FFS.

**Q7.1: Do you agree that there’s no need to introduce UE capability parameter for the RRC segmentation of QoE reporting, according to the status quo?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or no** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Ericsson | Depends | The rrc-SegAllowed indicates whether the network supports RRC segementation and that the UE can use it. The network needs to know that the UE is capable of it also as it may impact the configuration that the network prepares. For UE Capability transfer the network doesn’t need to know if the UE supports segmentation as no configuration related to UE capability transfer is prepared depending on that, so it is different than QoE. If the capability is conditionally mandatory, it is fine if the UE doesn’t signal it, but if it is optional the network needs to know. |
| Nokia | Yes (there is no need) |  |
| Lenovo | No | The situation for QoE is different compared to UE capability signaling. For good reason no UE capability for indicating support of UL segmentation of UE capability information was introduced. The reason was that when gNB did not receive UE capability information from AMF upon INITIAL CONTEXT SETUP, then it has to retrieve the information from the UE. However, in this case the gNB does not know whether the UE supports UL segmentation or not.  The QoE feature will be only activated by gNB when it retrieves all QoE related capabilities from the UE. To be en par with DL segmentation, it is a straightforward solution that the UE also indicates whether it supports UL segmentation of QoE measurement reports or not. |
| Apple | No |  |
| Qualcomm | Yes | The handling should be same as segmentation of *UECapabilityInformation.* |
| CATT | Yes |  |
| CMCC | Yes |  |
| ZTE | Yes |  |
| vivo | Yes |  |
| OPPO | Yes |  |
| Samsung | Yes |  |
| China Unicom | Yes |  |
| LGE | Yes |  |

**Q7.2: If the answer to the above Q is yes, then which option would you prefer for the segmentation of QoE reporting, optional without UE capability parameter or conditionally mandatory without UE capability parameter?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | We prefer “**optional without UE capability parameter**”, i.e. if the UE supports basic QoE functionality, it is optional for the UE to support the segmentation for QoE reports and there is no UE capability signalling.  It follows the logic of existing support segmentation of UECapabilityInformation and we only need the following change in in section 5.4 of TS 38.306:  “It is optional for UE to support segmentation of UECapabilityInformation and/or MeasurementReportAppLayer as specified in TS 38.331 [9].” |
| Ericsson | Conditional mandatory to the QoE functionality. If the capability is optional, it needs to be signalled to the network, see above. |
| Nokia | Optional |
| Qualcomm | Conditional mandatory to the QoE functionality, then no need further AT command enhancement. |
| CATT | Share with HW |
| CMCC | We share view with Ericsson, i.e. conditional mandatory without UE capability parameter, or optional with additional UE capability parameter. |
| ZTE | Optional |
| vivo | Optional |
| Samsung | Conditional mandatory to the QoE functionality |
| China Unicom | We share the same view with Huawei, ‘optional’ will be less impacts on specification. |
| LGE | Conditional mandatory to the QoE functionality |

Summary:

11 of 14 companies support the point that there’s no need to introduce capability for RRC segmentation, and 3 companies prefers to introduce capability.

For 11 companies who think no need, 6 supports optional without UE capability parameter, and 5 supports conditional mandatory without UE capability parameter.

Since such discussion has been carried out since last meeting and no consensus has achieved yet, the moderator would like to propose to follow the option with most votes.

**(6/11) Proposal 7: Agree that UE capability of RRC segmentation for QoE reports is optional without UE capability parameter (by following the majority view).**

We realize that it may be too premature to conclude anything according to the email discussion, since there’s no clear majority on the support of three directions. As collected by the comments,

(1)     Conditional mandatory without UE capability parameter. No extra bit (5 companies support)

(2)     Optional, and an extra bit (3 companies support)

(3)     Optional, and no extra bit (6 companies support)

Note that two companies are fine with both (1) and (2) but prefers (1), so the moderator only count them once as the supporter of (1). And we suggest to reword as follows and move P7 to ‘To be continued online’ part.

**Proposal 7: FFS on RRC segmentation capability for QoE report, and the following three directions are considered:**

* **(5/14) Option 1: Conditional mandatory without UE capability parameter (no extra bit)**
* **(6/14) Option 2: Optional without UE capability parameter (no extra bit)**
* **(3/14) Option 3: Optional with UE capability parameter (one extra bit)**

***Open issue 8: Alignment of QoE and MDT & Mobility***

As observed and indicated by [2], there’s little RAN2 impact on alignment of QoE and MDT, and the mobility aspect should be naturally supported if UE supports NR QMC.

So the moderator assumes that there’s no need to introduce new UE capability parameters regarding these two sub-features.

**Q8: Do you think there’s no impact on TS 38.306 regarding mobility and alignment of QoE and MDT?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or no** | **Comments** |
| Huawei, HiSilicon | Depends | Mobility and state transitions handling for QoE should be part of basic QoE capability. For QoE and MDT, so far no major RAN2 impacts are observed. We think that after this RAN3 meeting, this feature may have more progress and then we can further check the impact on UE capabilities. |
| Ericsson | Yes | Agree it can be included in the basic capability. |
| Nokia | Yes | There is no impact |
| Lenovo | Yes | QoE and MDT are different features so alignment of QoE and MDT can only be supported if UE supports both features. |
| Apple | Yes |  |
| Qualcomm | Yes | So far, QoE and MDT alignment has no impact on UE. |
| CATT | Yes |  |
| CMCC | Yes | Mobility can be regarded as the basic capability so no impact; and alignment of QoE and MDT will be supported if UE supports both features (QoE and MDT), so no additional 38306 impact. |
| ZTE | Yes |  |
| vivo | Yes |  |
| OPPO | Yes | The alignment is done in the network |
| Samsung | Yes |  |
| China Unicom | Yes |  |
| LGE | Yes |  |

Summary:

All companies agree that sub-features including mobility and alignment of QoE and MDT has no 38.306 spec impact, at least temporarily no impact is identified.

**Observation: Temporarily no spec impact on UE capability is identified for sub-features including mobility and alignment of QoE and MDT.**

However, in case there could be some progress made in RAN3 this meeting which may impact UE capability, we can wait for the next meeting to confirm such observation.

***Open issue 9: Other Issues (potential impact on TS 38.306)***

This section discusses those remaining issues which potentially have impact on TS 38.306.

The first remaining issue is whether to introduce a sub-section for NR QoE, or reuse the current sub-section such as 4.2.9 *MeasAndMobParameters.* Companies may still have different preferences.

**Q9.1: Which option would you prefer, add a new sub-section or reusing the existing one in TS 38.306?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | In our opinion, this is not an appropriate place to capture QoE capabilities as they are not related to radio measurements. We think it would be better to have them specified in a QoE dedicated sub-section. |
| Ericsson | New subsection is preferred. |
| Nokia | QoE dedicated |
| Lenovo | Strictly speaking QoE measurements are not radio measurements so we have a slight preference to introduce all QoE capabilities in a new sub-section, e.g. Application layer measurements. |
| Apple | No strong preference, but new sub-section seems cleaner. |
| Qualcomm | New sub-section seems cleaner |
| CATT | New subsection is preferred. |
| CMCC | New sub-section is preferred. |
| ZTE | New subsection |
| vivo | New sub-section is preferred. |
| OPPO | New sub-section is preferred. |
| Samsung | New subsection |
| China Unicom | New subsection. |
| LGE | New sub-section seems cleaner |

One contribution [2] observes that there’s no difference between FDD/TDD and FR1/FR2 for QoE UE capabilities.

**Q9.2 Do you agree that there is no differentiation for FDD/TDD and FR1/FR2 for QoE capabilities?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or no** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Ericsson | Yes |  |
| Nokia | Yes | No need to differentiate |
| Lenovo | Yes |  |
| Apple | Yes |  |
| Qualcomm | Yes |  |
| CATT | Yes |  |
| CMCC | Yes |  |
| ZTE | Yes |  |
| vivo | Yes |  |
| OPPO | Yes |  |
| Samsung | Yes |  |
| China Unicom | Yes |  |
| LGE | Yes |  |

Summary:

All companies support to introduce a new sub-section to capture QoE related capability, and confirms that there is no differentiation for FDD/TDD and FR1/FR2 for QoE capabilities.

**(all) Proposal 8: Agree to introduce a new sub-section to capture QoE related capability.**

**(all) Proposal 9: Agree that there is no differentiation for FDD/TDD and FR1/FR2 for QoE capabilities.**

P8 and P9 are reworded as follows to make them more clear:

**(all) Proposal 8: Introduce a new sub-section in TS 38.306 to capture QoE related capabilities.**

**(all) Proposal 9: Agree that no differentiation for FDD/TDD or FR1/FR2 is needed for QoE related capabilities.**

***Open issue 10: Other remaining Issues (little impact on TS 38.306)***

This section discusses those remaining issues which could be helpful for further discussion, but may have little impact on TS 38.306.

Note that the issues captured in this section are provided by contributions submitted under UE capability sub A.I., but may overlap with other offline discussions, and companies are invited to provide comments here in case they are not discussed in other discussions, and we are also fine that some of the remaining issues will be eventually discussed in other offline/online discussions if necessary.

As proposed by [9],

* When UE AS is able to use RRC segmentation for QoE report, UE AS signals this availability to application layer.
* If the availability of RRC segmentation is signalled from AS layer, application layer limits the size of QoE reports up to (16 x 9)kbytes (i.e., max number of RRC segments x max PDCP SDU size). Otherwise, the size limitation is 9Kbytes (i.e., max PDCP SDU size).

And the moderator expects such proposals could be discussed in Open Issue offline discussion during this meeting. But in case the following Q10.1 and Q10.2 are provided.

**Q10.1: Do you agree that UE AS needs to indicate availability of RRC segmentation for QoE reporting to APP layer?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or no** | **Comments** |
| Huawei, HiSilicon | Yes | Informing APP layer about the segmentation capability allows avoiding oversized QoE reports from being provided from application layer to the AS layer. To be specific – what APP layer needs to understand is the maximum size of the report that it can provide (i.e. either 8kBytes which is a legacy maximum size or more than that, e.g. as calculated above based on maximum number of RRC message segments). |
| Ericsson | No | Discussed in offline-30 also. We don’t see a strong need to forward the capability to the application layer. The purpose would be that the application layer can discard large reports directly if the UE doesn’t support segmentation, but the reports could be discarded by RRC also, not such a big issue in our view. |
| Nokia | No |  |
| Lenovo | No | We wonder about the value for such indication to APP layer. The APP layer will create QoE reports in accordance with QoE measurement configuration received from NW. That means it depends on the configured reporting criteria, e.g. after the end of a session or periodically after X minutes.  So, if UE does not support segmentation then AS layer can simply drop QoE reports which exceed the max PDCP SDU size limit. And if UE supports segmentation then it can segment the QoE report if it exceeds the max PDCP SDU size limit. Is there a real use case that the size of a QoE report can be 144 kBytes? |
| Apple | No |  |
| Qualcomm | No |  |
| CATT | Yes with comments | The app layer can create the report base on this function if the report size in larger than 9k |
| CMCC |  | Prefer to discuss in QoE Offline-30. |
| ZTE | No |  |
| vivo | No |  |
| OPPO | Yes | If the result is the AS simply drops the QoE reports larger than the max PDCP PDU SDU size limit, when reception of such QoE reports from the APP layer, then it is better that APP layer recognize that AS layer cannot support segmentation and do the segmentation itself. |
| Samsung | Yes | To avoid drop QoE report in AS layer, we expect this signalling. Based on the signalling, application layer can define different behaviour. (e.g. Q10.2) |
| China Unicom |  | Prefer to discuss in QoE Offline-30. |
| LGE |  | If the capability on the segmentation is conditional mandatory to the QoE functionality, the SA indication is not needed, but if it is optional, AS should inform NAS of the capability.  This is why we prefer the conditional mandatory in Q7.2. |

**Q10.2: If the answer to the above Q is yes, then do you agree to limit the size of QoE reports up to *max number of RRC segments* by *max PDCP SDU size* for the APP layer? And which spec do you expect to be impacted if we could decide such limitation?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | We agree to put a limit in specs, and TS 38.331 can capture it (e.g. this could be captured in ASN.1 as the maximum size of the container field). |
| Ericsson | Yes. Discussed in offline-30 also. It could be captured in a field description in 38.331 as it is the maximum size of the message that cannot exceed the limit, not the size of the container. |
| Qualcomm | Yes, can be captured in TS 38.331. |
|  |  |
| CATT | Yes, 38.331 should capture the agreements |
| CMCC | Prefer to discuss in QoE Offline-30. |
| OPPO | Yes |
| Samsung | Agree and should be captured in 38.331 and SA4 specs. |
| China Unicom | Prefer to discuss in QoE Offline-30. |

And as proposed by [3],

* There is a UE capability for the support of RAN visible QoE in NR. FFS what it implies in terms of interaction with upper layers.

Regarding the discussion of interaction between UE AS and UE APP, the moderator assumes it could be discussed in RVQoE offline discussion during this meeting, but in case the following Q10.3 is provided.

**Q10.3: What interactions between UE AS and upper layers are expected to support RVQoE?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | We are not clear about the question. If it is about UE capability, we think there may be no need for such interactions, because the UE supporting RAN visible QoE will anyway support the function in both AS and APP layers. If it is about configuration/reporting, once more RAN2 progress are made, we can review the cross-WG impacts. |
| Ericsson | No need to exchange the UE capability to the application layer. The AS layer will forward the configuration of RVQoE to the application layer only if the UE is capable of it, same as for legacy QoE. |
| Nokia | For RAN(3)-driven feature, RAN2 specification should not impose new requirements on Application layer. We are not clear what else can be expected than leaving to UE implementation, with no proper WG tasked in the WID/WI objectives. |
| Lenovo | We suggest to discuss this in the RVQoE offline discussion. |
| Qualcomm | Not quite understand the question. For sure, RVQoE configurations and measurement reports need to be forwarded between AS layer and applications if supports. |
| CATT | Share with Len |
| CMCC | Prefer to discuss in RVQoE Offline. |
| ZTE | Prefer to discuss this part in RVQoE offline. |
| vivo | Agree with HW and E///, the capability exchange between AS and APP is not essential. |
| OPPO | Upper layer needs to convey the reports of the RVQOE metrics in the format that is understood by the AS layer |
| Samsung | Not clear understanding for question, and can be discussed in RVQoE offline. |
| China Unicom | Suggest to discuss this in the RVQoE offline discussion. |

Summary:

Since above questions has already been covered in other offline discussions, the moderator suggest to discuss these questions in other offline discussions.

And one company indicate by email that it is an issue on how AS knows application layer QoE capabilities for e.g. P1, P4 and potentially P2. The moderator understands it is an open issue which has not been covered by the discussion but needs to be solved,

**Proposal 10: FFS on how AS layer knows application layer QoE capabilities.**

# Summary

The summary provides the following proposals:

**Easily agreeable:**

**(all) Proposal 1: Introduce QoE UE capability parameters for each service type i.e., streaming, MTSI and VR.**

**(13/14) Proposal 4: Introduce UE capability parameter(s) for RAN visible QoE.**

**(all) Proposal 8: Introduce a new sub-section in TS 38.306 to capture QoE related capabilities.**

**(all) Proposal 9: Agree that no differentiation for FDD/TDD or FR1/FR2 is needed for QoE related capabilities.**

**Not easily agreeable:**

**(4/13) Proposal 2: Agree that UE supporting NR QMC is mandated to support a maximum of 16 simultaneous QoE measurements configurations. And send LS to SA4 for confirmation.**

**To be decided online:**

**(8/14) Proposal 3:  FFS on whether the Pause and resume capability is one of basic sub-features.**

**Proposal 5:  FFS on which of the following option to choose for RVQoE capability,**

* **(6/13) Option 1: One parameter indicating whether UE supports RVQoE.**
* **(7/13) Option 2: Separate parameters indicating whether UE supports RVQoE for each service type.**

**Proposal 7: FFS on RRC segmentation capability for QoE report, and the following three directions are considered:**

* **(5/14) Option 1: Conditional mandatory without UE capability parameter (no extra bit)**
* **(6/14) Option 2: Optional without UE capability parameter (no extra bit)**
* **(3/14) Option 3: Optional with UE capability parameter (one extra bit)**

**Proposal 10: FFS on how AS layer knows application layer QoE capabilities.**

# References

1. R2-2200707 UE capability for QoE Qualcomm Incorporated
2. R2-2200821 Discussion on UE capabilities for NR QoE Huawei, HiSilicon
3. R2-2201048 UE Capabilities for QMC Nokia
4. R2-2201420 Discussion on UE capabilities for NR QoE CATT
5. R2-2200267 Discussion on QoE configuration ZTE
6. R2-2200852 Discussion on UE capability for NR QoE CMCC, China Unicom
7. R2-2200997 Configuration and reporting of QoE measurements Ericsson
8. R2-2111536 Feature summary for 8.14.2.1 Ericsson
9. R2-2200547 RRC segmentation for QoE reports Samsung
10. R2-2111650 Running CR for Introduction of QoE measurements in NR Ericsson