**3GPP TSG-RAN WG2 Meeting #117 electronic  *R2-220xxxx***

**Online, Feb 21st – Mar 3rd 2022**

**Agenda item: 8.14.3.1**

**Source: China Unicom**

**Title: Report of [Pre117-e][008][QoE] QoE Open Issues Input (China Unicom)**

**Document for: Discussion and Decision**

# Introduction

This document is the report of the pre-117e email discussion “*[Pre117-e][008][QoE] QoE Open Issues Input (China Unicom)*”, which is based on R2-2202043.

* *[Pre117-e][008][QoE] QoE Open Issues Input (China Unicom)*

*Deadline: Monday 2022-02-14 23:59 UTC.*

This document will collect company inputs and give proposals for the open issues on R17 NR QoE.

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# Discussion

According to the QoE related open issue list [1], the following open issues will be focused on in this document.

Issue 1: Whether and how the data should be retransmitted during HO.

Issue 2: Which SRB (SRB2 or SRB4) to transmit RAN visible QoE measurements.

Issue 3: Which of the following options to choose for RRC segmentation capability:

Option 1: Conditional mandatory without UE capability parameter (no extra bit)

Option 2: Optional without UE capability parameter (no extra bit)

Option 3: Optional with UE capability parameter (one extra bit)

Issue 4: Whether the Pause and resume capability is one of basic sub-features.

Issue 5: Which of the following options to choose for RVQoE capability:

Option 1: One parameter indicating whether UE supports RAN visible QoE

Option 2: Separate parameters indicating whether UE supports RAN visible QoE for each service type.

Issue 6: Whether new UE capability parameters of the alignment of QoE and MDT need to be introducted.

Note that issues 3~5 are related with UE capabilities.

Issue 7: How to handle the further details around session start/stop, e.g. implementation in RRC, handling at pause, if it should be configurable etc.

## Open Issue 1: Retransmission of QoE reports during HO

For issue 1, it's observed in RAN2#116b-e meeting, whether and how the data (QoE reports) should be retransmitted during HO was discussed but no consensus was made. The Chair Notes can be found as follows:

* Except for restarts transmission of QoE reports after handover, The TP in the Annex of R2-2200011 is included in the running CR for QoE measurements.

During the online discussion in RAN2#116b-e, some companies wonder if it’s needed to retransmit the QoE reports during HO, and other companies also propose how and what layer shall retransmit the QoE reports need to be discussed. Thus companies are invited to provide your comments on issue1:

**Question 1: Whether the data (QoE reports) should be retransmitted during HO? If the answer is Yes, and how the QoE reports are retransmitted during HO?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Huawei, HiSilicon | Yes | We think this is a useful mechanism which comes at the minimal specifications impact. If the related QoE configuration still exists after the handover, the UE may resend the unacknowledged QoE report. This may lead to duplicate reports, but that is something that can be dealt with during post-processing in OAM system. Dropping the report means that the measurement session is incomplete and such sessions are less useful. |
| Apple | No | It is too much work to specify retransmissions during HO since it is not natively supported for SRBs. We also don’t think the network will miss many QoE reports typically. |
| Qualcomm | Yes | It makes sense to avoid data loss during handover, especially for those QoE sessions which only sends one QoE report at the end of QoE session. If the data is lost during handover, then there is no QoE data for those QoE session.  If there is no time in Rel-17, it should be addressed in Rel-18. |
| Intel | Yes | Agree with HW. Considering the QoE application layer configuration and QoE AS configuration may still exist at the UE side after normal handover if the target also supports the corresponding QoE service, restart transmission of QoE report would be beneficial for the network to understand previous QoE status of the source NG-RAN node.  However, if the application layer measurement is informed to be released (e.g. RRCSetup, mobility with full configuration), restart transmission of QoE report should be not supported. |
| LGE | No | No clear reason to support the re-transmission at HO only for SRB4, and prefer to just drop the report in this case. |
| ZTE | No | We dont prefer to retransmit QoE report if this process is eliminated by HO. Reasons are shown below:   1. Compared with the QoE reporting period(e.g. a few seconds or minutes), QoE reporting which is eliminated by the HO procedure is a low possibility event(rare happen). 2. SA4 LS(R2-2109386) , it explains that “*any QoE container exceeding the size limit is simply discarded, under the assumption that such discards are very rare*”. Considering the LTE mechanism works well, we can believe that drop the QoE report container rarely will not impact the final QoE result. 3. This is the last meeting for RAN2 to discuss the NR QoE. We only have 0.5 TU for the whole NR QoE discussion. We wonder companies have enough time on discussing how to handle the QoE report retransmission. |
| CMCC | Yes, but | We think RVQoE may require different retransmission mechanism, but not strong view. |
| Samsung |  | RAN2 needs to discuss case by case on this issue.  Case 1) When target node supports QoE and does not release the QoE configuration  Case 2) When target node supports QoE but releases the QoE configuration  Case 3) When target node does not support QoE  We think companies have different view on each case. Besides, RAN2 does not have enough time discuss all these in Rel-17. So, we also prefer to address it in Rel-18. |
| OPPO | No | Unnecessary optimization. The network could still optimize the UE QoE based on the QoE measurement reports generated after the HO, i.e., after the UE is connected with the target gNB. Optimization of the current UE QoE based on the QoE measurement reports generated when it is connected with previous gNB (i.e., both gNB capability and/or air-interface situation has been changed ) seems akward. |
| **CATT** | Yes | We think we should retransmission the report when the target gNB doesn’t release the QoE configuration and set up the SRB for QoE. For other cases, the report can be discarded. |
| **Nokia, Nokia Shanghai Bell** | yes | For consistency and data loss avoidance it may make sense to ensure supporting mechanism. Report that are not transmitted during HO could be retransmitted after the HO. Note that to avoid his can create double transmissions additional (maybe step in the ) procedures would be needed to take care of it |
| **Ericsson** | Yes | We think it is a pity to waste the report when the UE has anyway performed the measurements. The report can be retransmitted in the target node if the target node supports QoE. |

## Open Issue 2: SRB selection for RAN visible QoE

For Issue2, In R2-116-e meeting, An LS is sent to RAN3 for decision on RAN visible [2]. And RAN3 has agreed RAN2 can decide which SRB (SRB2 or SRB4) to transmit RAN visible QoE measurements at last online meeting. So the companies are invited to give comments on which SRB (SRB2 or SRB4) to transmit RAN visible QoE measurements?

**Question 2a: Which SRB (SRB2 or SRB4) to transmit RAN visible QoE measurements?**

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| --- | --- | --- |
| **Company** | **SRB2/SRB4** | **Comment** |
| Huawei, HiSilicon | SRB2 | In the latest incoming LS R3-221465 LS, RAN3 mentions the following:  *RAN3’s understanding is that RAN visible QoE reports, which include the related RAN visible QoE metrics, could be utilized by the NG-RAN node for radio network optimization during an ongoing application/QMC session. However, there is no consensus in RAN3 with respect to whether the delivery of RAN visible QoE reports is with a higher priority than legacy QoE reporting, and the final decision with respect to which SRB should be used for RAN visible QoE reporting can be made by RAN2.*  In our paper R2-2110607, we proposed to use SRB2 for transmitting RAN visible QoE reports due to the following observations:  **Observation 1: If both QoE reporting container and RAN visible QoE report are put in SRB4, the priority of SRB4 may be hard to set as the priority and size of the application layer reports and RAN visible reports is different.**  **Observation 2: If the RAN visible QoE report is used for real-time optimization for RAN, it may be inappropriate to consider SRB4 for transmitting the report.**  **Observation 3: SRB2 can be a good candidate for carrying RAN visible QoE reports, considering its relatively high priority, but lower than critical SRB1 signalling.**  We think using SRB2 is the best compromise to give RAN visible QoE higher priority than application layer QoE reports without impacting high priority signaling carried by SRB1. |
| Apple | SRB4 | The act of reporting QoE measurements should not have a major impact on UE performance. We don’t see the point of sending RVQoE reports using high priority SRB2 at the expense of high priority DRBs. |
| Qualcomm | SRB4 | As indicated in RAN3 reply LS, RAN3, there is no consensus in RAN3 with respect to whether the delivery of RAN visible QoE reports is with a higher priority than legacy QoE reporting. Then RAN2 don’t need to repeat the same discussion as RAN3, propose to use SRB4 as baseline. |
| Intel | SRB4 | As replied in RAN3 LS, RVQoE is used for radio network optimization, it does not imply to require real time QoE measurement. RVQoE should have the same priority as the application layer QoE. Hence, SRB4 for application layer QoE should also be used for RVQoE. |
| LGE | SRB4 | Agree with Apple. |
| ZTE | SRB4 | Share the same view with above companies. We do not see clear motivation that RVQOE has higher priority than QoE data. |
| CMCC | SRB2 | We assume that comparing with legacy QoE, RVQoE is more latency sensitive, therefore the relatively low priority of SRB4 may not be appreciated for the transmission of RVQoE. |
| Samsung | SRB4 | We agree RAN visible QoE report can be used for real-time optimization for RAN, as Huawei mentioned. However, we don't think this function is essential for NW maintenance and operation. So, RVQoE report should not affect other essential messages. |
| OPPO | SRB4 | Agree with Apple |
| CATT | SRB4 | Share with Apple and Intel |
| Nokia, Nokia Shanghai Bell | SRB4 | It should be the same SRB |
| Ericsson | SRB2 | Agree with Huawei. |

**Question 2b: Based on the answer of Q2b, do companies have any other issues if SRB2 or SRB4 are selected?**

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| --- | --- |
| **Company** | **Comment** |
| Nokia, Nokia Shanghai Bell | It allows the simultaneous transmission of QoE and RVQoE Reports, |
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## Open Issue 3~6: UE capabilities for QoE

RAN2 has discussed UE capabilities for NR QoE in the R2#116b-e meeting, but some FFSs are left for discussed and decide. Such as the following Issue 3~Issue 5 listed at [1]:

Issue 3: Which of the following options to choose for RRC segmentation capability:

**Option 1:** Conditional mandatory without UE capability parameter (no extra bit)

**Option 2:** Optional without UE capability parameter (no extra bit)

**Option 3:** Optional with UE capability parameter (one extra bit)

Issue 4: Whether the Pause and resume capability is one of basic sub-features.

Issue 5: Which of the following options to choose for RVQoE capability:

**Option 1:** One parameter indicating whether UE supports RAN visible QoE

**Option 2:** Separate parameters indicating whether UE supports RAN visible QoE for each service type.

**Question 3: For issue 3, which of the options to choose for RRC segmentation capability?**

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| --- | --- | --- |
| **Company** | **Option** | **Comment** |
| Huawei, HiSilicon | Option 2 | Since QoE configuration is included in the RRCReconfiguration message, there is no additional UE complexity in supporting QoE configuration segmentation, on top of the already existing dl-DedicatedMessageSegmentation-r16 capability. When it comes to QoE report segmentation, this can be handled in a way similar to how UECapabilityInformation message segmentation is possible, i.e. we can specify it as an optional feature without capability signalling, e.g. by having the following change 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].”  This way this capability can be handled in exactly the same way as for UECapabilityInformation and there is no need to introduce two different UE/network behaviours.  Option 3 is also acceptable to us, but this extra signaling is not really useful. |
| Apple | Option 3 |  |
| Qualcomm | Option 1 or 2 | Open for option 1 or option 2. Option 3 is not needed, gNB does not need to know UE capability for segmentation. gNB can enable RRC segmentation based on its capability or local configuration, when UE receives RRC segmentation enable indication, UE can determine whether to apply segmentation according to its capability. This is same handling as *UECapabilityInformation* segmentation. |
| Intel | Option 3 | As agreed in previous RAN2 meeting, the network will configure RRC segmentation for QoE reporting. Therefore, the network should know whether the UE supports UL segmentation. It is different from UE capability segmentation, as it cannot be indicated in UE capability itself since it’s too late.  Hence, we prefer “Option 3” Optional with UE capability parameter (one extra bit). |
| LGE | Option 1 or 2 | Agree with QC. |
| **ZTE** | Opt1 or 2 |  |
| CMCC | Option 1 | If RRC segmentation capability is optional and no extra bit to signal the network, the App layer should be indicated to avoid oversized QoE report. Therefore, an AT command is necessary implicitly in Option 2.  So, we prefer Option 1, Option 3 is also acceptable to us. |
| Samsung | No strong view |  |
| OPPO | Opt2 | The methods of indicating the RRC segmentation capability towards the UE AS layer require further enhancement to the standard, either a new AT command or a new IE in the QoE measurement configuration is required, which should be avoided at this late stage.  When the APP layer generates a reporting packet larger than the AS processing limitation, it should be OK for the AS layer to simply discard it. |
| **CATT** | Option 2 | Option 2 is enough, other option also is accepted |
| Nokia, Nokia Shanghai Bell | Option 1 |  |
| Ericsson | Option 1, but option 3 is also acceptable. Option 2 is not acceptable | The important thing is that the network has the information about whether the UE supports segmentation or not. In UE capability signalling, the network doesn’t take any actions depending on whether the UE supports it or not and then the UE doesn’t have to indicate the support. However, for QoE the network needs to know whether the UE supports it in order to make proper configuration of QoE and also for selecting UEs for QoE. A UE which doesn’t support segmentation is e.g. not suitable to select for QoE for VR as the amount of data may be large and thereby the reports very large. |

**Question 4: For issue 4, whether the Pause and resume capability is one of basic sub-features?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Huawei, HiSilicon | No | 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. |
| Apple | No |  |
| Qualcomm | No | Same comment as Huawei, and pause and resume is optimization to basic QoE feature, it should be optionally supported for both UE and gNB. |
| Intel | No | As agreed in RAN2 #116bis-e meeting, there’s a minimal memory size requirement of QoE paused measurement report. The UE may choose not to support QoE pause by considering its own memory cost and status. Therefore, QoE pause/resume should be considered as a separate UE capability which is optional to UE. |
| **ZTE** | No & may need some clarification. | We do not think the QoE buffer will give AS layer a large burden. And if this feature is not treated as a basic sub-feature,we wonder whether the following scenario will happen:  If pause/resume QoE reporting is set as a optional UE capability in Rel-17, then this feature may not work normally. More specifically, a UE supports legacy NR QoE but does not support pause/resume QoE reporting(if this is optional). Then when RAN overload occurs, the RAN side can only send the paused indicator to the UE which supports this function. In other words, if a UE does not support pause/resume QoE reporting, the UE can have higher priority to send its QoE reports during RAN overload period regardless of the QoE measurement types. Frankly, we do not think this is a fair result for all UEs that support NR QoE. |
| CMCC | Yes | According to the agreements on R2-116bise that AS layer is responsible to store QoE reports when QoE pause and the minimal 64KB memory for paused QoE reports, we assume pause and resume mechanism is not expected to be complex, and it could be supported as a basic capability. |
| Samsung | No |  |
| OPPO | No | Agree with Huawei |
| **CATT** | No |  |
| **Nokia, Nokia Shanghai Bell** | Maybe | Since Pause/Resume is developed to handle overload, from the network side the Pause/Resume would make sense to be complementary component of the QoE to handle. Thus, if the “basic” sub-feature means it is part of basic QoE, we think this could be a part of it. |
| **Ericsson** | Yes |  |

**Question 5: For issue 5, which of the following options to choose for RVQoE capability?**

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| --- | --- | --- |
| **Company** | **Option** | **Comment** |
| Huawei, HiSilicon | Option 1 | In our opinion, option 1 is simpler than option 2 and would make the RAN visible QoE feature most useful. |
| Apple | Option 1 or 2 | No strong view. |
| Qualcomm |  | Whether RVQoE should be per service type supported mainly impact on application layer.  Should ask SA4. |
| Intel | Option 1 | The support of RV QoE depends on whether the corresponding service type is supported in the application layer QoE. The network knows whether RV QoE for certain service type is supported by the UE or not by receiving one UE cap for RVQoE and UE cap for the corresponding service type in application layer. Therefore, Option 1 is preferred. |
| ZTE | Opt1 | Prefer simpler one. |
| CMCC | Option 1 | Agree with Huawei, Option 1. |
| Samsung | Option1 | Generally, UE capabilities are determined by abilities of AS layer.We think the same principle should apply to UE capability for NR QoE. So, there is no need for AS layer to obtain application capability for UE capability for NR QoE. Therefore, we prefer Option 1, not depending on service type of application layer. |
| OPPO | Opt2 | When the UE is configured with RAN visible QoE, the UE needs to reserve additional processing resource to send the RVQoE measurement report to the RAN, which enforces higher requirements on the UE. In addition, the features such as XR may demand high-frequent real-time RVQoE measurement reporting towards the RAN. As a result, from our perspective, rather than one parameter indicating whether UE supports RVQoE, we prefer using separate parameters indicating whether UE supports RVQoE for each service type. |
| **CATT** | Option 2 |  |
| **Nokia, Nokia Shnaghai Bell** | Option 1 | For simplicity |
| **Ericsson** | Option 1 | No strong view, option 2 could be acceptable also. |

Issue 6 is discussed in the [AT116bis-e][031][QoE] UE capabilities (CMCC) email discussion [3]. And the conclusion is proposed as below:

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

Since RAN3 has agreed session start/stop indication related with MDT and QoE alignment, companies are invited to discuss UE capability for this sub-feature again.

**Question 6: For issue 6,** **whether new UE capability parameters of the alignment of QoE and MDT need to be introduced?**

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| **Company** | **Yes/No** | **Comment** |
| Apple | Yes | We think start/stop is not really essential for MDT alignment, so it should be optional. |
| Qualcomm | Yes | Same comments as Apple, without UE session start or end indication, gNB can configure MDT measurement by implementation, e.g. configure MDT measurement when QoE measurement is configured. |
| Intel | No | We don’t think there’s a need to introduce a new UE capability for the alignment of QoE and MDT. |
| ZTE | No |  |
| CMCC | Yes | We don’t think all QoE measurements need time alignment with MDT. |
| Samsung | No | Transferring session start/stop indication is very simple ability for UE, so this feature should be conditional mandatory without UE capability parameters. |
| OPPO | Yes |  |
| CATT | No | Share with SS |
| Nokia, Nokia Shanghai Bell | No | Simple forwarding of the indication from APP layer should not impose an extra capability |
| Ericsson | No | Agree with Samsung. |

## Open Issue 7: Details around session start/stop

According to the RAN3 agreement in the LS R3-221243, session start/stop indication is agreed for purpose of MDT and QoE alignment. So for issue 7, further details around session start/stop, e.g. implementation in RRC, handling at pause, if it should be configurable etc. can be discussed.

**Question 7a: How to support session start/stop implementation in RRC?**

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| --- | --- |
| **Company** | **Comment** |
| Apple | Can be a bitmap ranked in order of measId of active QoE configurations, sent in QoE measurement report. |
| Qualcomm | 1-bit flag is enough for UE to indicate there is session start or end to assist gNB activating or deactivating MDT measurements.  UE does not send redundant session start indication to gNB; UE does not send session end indication if there is an ongoing session for a QoE configuration requiring MDT-QoE alignment. |
| LGE | Wonder if UE knows which QoE requires the MDT-QoE alignment. If not, UE should indicate the session start/stop and the corresponding QoE ID for all configured QoE. |
| CMCC | If the sole purpose of session start/end indication is to assist MDT and QoE alignment, we think a one-bit indication is enough. |
| Samsung | 1-bit indication with the corresponding measID seems enough |
| OPPO | 1-bt flag |
| CATT | Share with CMCC. But in 28.405, SA5 specified the session start use sending the session ID to network. We should consider the session start indication from different team requirements. |
| Nokia, Nokia Shanghai Bell | Requires coordination with CT1/SA4. For LTE there is only start (no stop) and depending on what is forwarded from App layer to AS, we can discuss further |
| Ericsson | A 1-bit indication is enough for each QoE configuration. We think it should be configurable by the network, so that the UE doesn’t always have to send it. |

**Question 7b: How to handle session start/stop at pause?**

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| --- | --- |
| **Company** | **Comment** |
| Apple | If application session starts/stops during pause, then it seems to make sense to send start/stop as resume. If an application starts and stops during pause, there is nothing for the UE to do. |
| Qualcomm | Since during pause, the application layer continues to measure QoE, then for MDT alignment purpose, UE should send session start or end indication. |
| LGE | Same view as QC. |
| CMCC | As RAN3 reply, App layer will continue QoE measurement at pause. Therefore, there is no need to send the stop indication. Also, only if it is necessary to start a session when QoE pauses, a start indication should be sent. |
| Samsung | Agree with Apple. During pause of QoE reports, session start/stop indication is also paused. |
| OPPO | Agree with CMCC |
| CATT | At pause time point, if the start indication has been sent to network, the stop indicator needs to be sent to network during pause. If the start indication has not been sent to network, the start/stop indicator can be sent to network during pause. The network can decide if configure the MDT based on the indicator and overload situation. |
| Ericsson | Up to network to decide. If the sending of session start/stop is configurable, the network can decided whether the transmission should continue during pause. |

**Question 7c: If session start/stop should be configurable?**

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| --- | --- |
| **Company** | **Comment** |
| Apple | Should be per QoE configuration |
| Qualcomm | AS RAN3 agreed, only part of QoE configurations need MDT alignment.  *UE assisted solution can be used for MDT-QoE alignment. UE can indicate to NG-RAN via a flag whether a QoE measurement session started/ended. If the NG-RAN knows there is an MDT configuration associated with a QoE configuration (e.g., upon receiving NG-RAN Trace ID in the QoE configuration from OAM),*  RAN can indicate to UE which QoE configurations require MDT-QoE alignment, and UE only needs to consider these QoE configurations to send session start or end indication. |
| LGE | The session start/stop needs to be reported only when there is the MDT configuration associated with the QoE configuration, so it should be configurable. |
| CMCC | Agree with QC. |
| Samsung | It depends on whether session start/stop indication is used for area scope. If this indication is needed for area scope, UE should support this indication for all QoE configurations (i.e., mandatory). Otherwise, it can be configurable per QoE configurations. |
| OPPO | Agree with QC |
| CATT | if the start/stop is only used for MDT triggered, the network should indicate the UE per configuration. As SS said, if it is also used for area scope handling, the start indicator always sends when the session start as SA5 specified. |
| Nokia, Nokia Shanghai Bell | Session start/stop require coordination with App layer, thus, configuration on RRC level may not be fully workable - it should not be configurable, but handled by regular QoE configuration |
| Ericsson | Yes, it should be configurable per QoE configuration. Then the sending of the indication can be limited to the cases where it is actually needed. |

**Question 7d: Do companies have any other issues related with session start/stop need to be further discussed?**

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| **Company** | **Comment** |
| Apple | We are yet to hear SA4’s reply to our LS in R2-2111665. A final decision on how mobility in QoE is supported with respect to area scope management should wait for SA4 reply. |
| Qualcomm | We think the following issues need to be discussed  - Which message and which SRB should be used to transmit session start or session end indication  - How to avoid signalling overhead for session start/end transmission  - Whether session start or end indication can be used for area scope control should be further evaluated, and also need SA4 reply on the requirement confirmation. |
| CMCC | We suggest to wait more information from SA4. |
| Nokia, Nokia Shanghai Bell | Requires support from SA4 and CT1 |

# Conclusion

TBD

# References

[1] R2-2202043 QoE related open issue list China Unicom

[2] R2-2111603 LS on QoE visible QoE RAN2 Lsout

[3] R2-2201855 Report for [AT116bis-e][031][QoE] UE capabilities CMCC