3GPP TSG-RAN WG1 Meeting #116e Tdoc R2-21xxxxx

November 1st - 12th 2021

Agenda: 8.14.2.1

Source: Ericsson

Title: Feature summary for 8.14.2.1

Document for: Discussion, Decision

# 1 Introduction

In this document the following offline is discussed:

* [AT116-e][042][eQOE] Configuration and reporting (Ericsson)

      Scope: Items: MeasConfigAppLayerId handling e.g. provided to/from application?, Segmentation further details e.g. can it be mandatory, if not, indicate to application?,

      Whether application need to inform AS session start stop,

      RRC handling at Resume, Handover etc, delta config and fullconfig, can use R2-2108967 as baseline for discussion.

      Intended outcome: Report, RRC TP for agreeable parts.

      Deadline: Tuesday W2

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# 2 Discussion

## 2.1 MeasConfigAppLayerId

The following proposals are related to measConfigAppLayerId and multiple QoE configurations and modification of QoE measurements.

* UE RRC layer forwards RRC *MeasConfigAppLayerId* together with QoE configuration container to applcation layer.[1]
* Application layer forwards the *MeasConfigAppLayerId* together with QoE report container to RRC layer, and RRC layer includes the *MeasConfigAppLayerId for each QoE report container* in MeaReportAppLayer message.[1]
* RAN2 suggests SA5 to support multiple QoE measurement configurations by 1:1:1 mapping between QoE session, QoE reference, and QoE measurement configuration.[2]
* Multiple MeasConfigAppLayerId can be configured simultaneously to support one certain service type with multiple QoE measurement configurations.[2]
* The RRC layer forwards the MeasConfigAppLayerId together with the QoE configuration to UE’s application layer. MeasConfigAppLayerId is also sent to UE’s AS layer together with QoE measurement report container from UE’s application layer.[2]
* QoE configuration modification procedure is supported.[2]
* Reply LS to SA5 to consider QoE configuration modification in NR QoE.[2]
* Forward the measConfigAppLayerId to the application layer.[4]
* Send an LS to CT1 and ask them to add measConfigAppLayerId in the AT commands carrying the QoE configuration and the QoE report.[4]
* The *MeasConfigAppLayerId* should be sent together with the corresponding QMC configuration container from AS layer to the APP layer.[6]
* RAN2 to agree that multiple QoE configuration per service type could be supported by UE simultaneously.[8]
* RAN2 to agree that the RRC layer forwards the MeasConfigAppLayerId together with the QoE configuration to the application layer[8]
* The UE RRC layer forwards the MeasConfigAppLayerId together with the QoE configuration to the application layer. The application layer sends the MeasConfigAppLayerId together with the QoE report to the UE RRC layer.[9]
* RRC layer forwards the MeasConfigAppLayerId together with the QoE configuration to the application layer for further association of the QoE reports.[10]
* Modification of NR QoE configuration is not supported.[11]
* RAN2 shall support to provide multiple QoE measurement configurations for one certain service type in NR QoE.[11]
* RAN2 shall postpone discussion on whether forward the QoE RRC level ID to app layer until SA5 further clarifies the mapping relationship of QoE reference ID .[11]
* Confirm that RRC forwards the MeasConfigAppLayerId to UE APP upon reception of the QoE configuration message over Uu.[13]
* The OAM can provide multiple NR QoE measurement configurations for one certain service type. Detailed procedures can be further discussed.[16]

Based on the proposals above, the following is summarized :

Rapporteur’s comment : RAN3/SA5 replied that there may be multiple QoE configurations for the same service type. The reason for the question from RAN2 was to understand whether the measConfigAppLayerId or the service type should be forwarded to the application layer together with the QoE configuration. Based on the replies, the service type is not sufficient, but the measConfigAppLayerId needs to be used to identify a configuration and report.

So far no reply from other working groups has indicated that modification of QoE configurations is needed.

Question 1 : Do you agree that the measConfigAppLayerId is forwarded from the AS layer to the application layer together with the QoE configuration ?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | Yes but | The AS layer and the APP layer need to unambiguously identify a QoE configuration. The measConfigAppLayerId seems to be the natural choice. But this seems to be a level of detail that can be left to UE implementation without the need for any specification. |
| vivo | Yes | As multiple QoE measurement configurations for one certain service type will be supported, it is not feasible to distinguish different QoE configurations or reports using only service type.  Besides, SA4 should be informed to introduce the ID during the information exchange between AS layer and LPP layer. |
| Huawei, HiSilicon | Yes | Once RAN2 agrees on it, SA4/CT1 needs to be informed as there may be some specifications impacts. |
| LGE | Yes |  |
| Qualcomm | Yes |  |
| ZTE | ... | We share the similar view with APPLE.  This should be based on UE implementation and depend on the mapping relationship between QoE reference ID and QMC job. |
| OPPO | Yes | When the QoE measurement report is generated, the AS layer has to know such report is related to which QoE measurement configuration. The measConfigAppLayerId serves for such purposes. |
| Ericsson | Yes | Agree with Huawei. |
| Nokia | Yes | AN RRC id has to be passed to Application layer for further association with reporting back to RRC layer |
| Intel | Yes | We have one comment regarding to the summary above on “So far no reply from other working groups has indicated that modification of QoE configurations (container) is needed.”.  Regarding to the QoE modification, in R2-2109384\_S4-211248, SA4 replied Yes to the question “will the requirement for configuration changes of ongoing MQC session to be applicable also for NR QMC”. This indicates that QoE modification is at least needed from SA4 point of view. |
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Question 2 : Do you agree that the measConfigAppLayerId is forwarded from the application layer to the AS layer together with the QoE report ?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | Yes, but | See previous comment |
| vivo | Yes, | Same as above, SA4 should be informed. |
| Huawei, HiSilicon | Yes | Once RAN2 agrees on it, SA4/CT1 needs to be informed as there may be some specifications impacts. |
| LGE | Yes |  |
| Qualcomm | Yes |  |
| ZTE | .. | Check our answer in Q1. |
| OPPO | Yes |  |
| Ericsson | Yes | Agree with Huawei. |
| Nokia | Yes | An RRC id that enables to associate report with AS configuration |
| Intel | Yes |  |
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## 2.2 Container size and RRC segmentation

The following proposals are related to RRC segmentation and container size.

* Multiple QoE measurement reports can be included in one SRB 4 message.[1]
* RAN2 concludes which option as following should be adopted.
  + Option 1: RRC segmentation is not applied for SRB4
  + Option 2: RRC segmentation is applied for SRB4 with optional support by the UE. The UE RRC layer indicates to application layer SRB4 segmentation capability, and application layer determines whether to deliver QoE container larger than 8000bytes to AS layer.[1]
* RRC segmentation of the MeasurementReportAppLayer message is supported when the message size exceeds the 9000 bytes size limit. Each segment of the message is then carried on the ULDedicatedSegment message.[3]
* Only event-triggered reporting of QoE reports is supported.[3]
* In case QoE reporting is triggered and multiple QoE reports are available, then those QoE reports are processed in order and are concatenated into a single MeasurementReportAppLayer message. If the resulting size of the MeasurementReportAppLayer message exceeds the 9000 bytes size limit, the message is segmented.[3]
* Support UL RRC segmentation for transmission of QoE reports.[4]
* RRC segmentation should also apply to *MeasurementReportAppLayer* message.[6]
* RAN2 to agree that the size limits and/or the minimum periodicity for each QoE measurement configuration should be set by the RAN.[8]
* Support the RRC segmentation for MeasReportAppLayer message.[9]
* The maximum size of the QoE configuration container should be 8 kBytes to ensure all UEs are able to receive it.[9]
* QoE report container can be specified as OCTET STRING with no maximum size in RRC signalling.[9]
* Application layer should be informed by the UE whether UE supports sending QoE reports with the size exceeding the previous limitation of 8 kBytes (which depends on whether UE supports RRC segmentation).[9]
* Simultaneous QoE configurations over RRC do not exceed 8188 octets. RAN2 discuss which option is selected.[10]
* It is proposed for RAN2 to support for removing the limitation of NR QoE container size. How to perform the NR QoE data segmentation can base on lower layers implementation.[11]
* Add the report of QoE measurements by means of list to enable report of multiple simultaneous measurements.[12]
* Apply the RRC segmentation for QoE report and configuration transmitting.[12]
* RAN2 is requested to accept SA4's request to remove QoE container size limit in QoE configuration and QoE report.[15]
* RAN2 is requested to study RRC segmentation for MeasurementReportAppLayer (named in running CR) message.[15]
* RAN2 can discuss NR QoE configuration and reports size limits based on the below options:[16]
  + Option 1: RAN2 keeps the size limits for NR QoE measurements configuration and single QoE report.
  + RAN2 reuses from LTE the maximum container size of 1000 bytes for QoE measurements configuration and the maximum container size of 8000 bytes for one QoE report.
  + RAN2 reuses from LTE the maximum container size of 1000 bytes for QoE measurements configuration and to redefine the maximum container size for one QoE report (e.g. 9000bytes).
  + Option 2: RAN2 removes the size limits for NR QoE measurements configuration and single QoE report.
* RAN2 sends an LS to inform SA4 if RAN2 decide the NR QoE configuration and single report size limits.[16]

Based on the proposals above, the following is summarized :

SA4 replied that they would like to remove the size limitations for the QoE configuration and report. RAN2 agreed to support RRC segmentation for the transmission of the QoE report. It is the rapporteur’s understanding that RRC segmentation is already supported for the RRCReconfiguration message, i.e. it can be used for transmission of the QoE configuration, if needed.

Some companies raised the question whether support for RRC segmentation of MeasurementReportAppLayer should be mandatory or optional.

Some companies proposed to forward the capability of segmentation to the application layer. It is the rapporteur’s understanding that the application layer sends the reports according to what is indicated in the QoE configuration. Therefore, information about capability of RRC segmentation is of no use, as the application layer anyhow cannot impact how the reporting is done.

In general, UE capabilities are sent to the network to help the network to prepare a correct configuration. A capability about support of RRC segmentation can be used by the network to prepare QoE configurations that generates sizes of the reports that can be transmitted by the UE. A capability for RRC segmentation is known by the network in the same way as a capability for support of QoE.

Question 3 : Do you agree to reply to SA4 that the size limitations can be removed ?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | Yes | We should inform SA4 and other groups (SA5, RAN3, CT1) of RAN2 decision to support RRC segmentation. We think it is also important to spell out the consequences of this decision. If the OAM expects that QoE measurements/configuration is likely to trigger RRC segmentation, then it should be aware of the capability of the UEs and gNBs that are involved. We agree with the rapporteur that applications cannot take into account the UE’s support of RRC segmentation. |
| vivo | Yes | The corresponding description in SA4 may need to update. |
| Huawei, HiSilicon | Yes for QoE repot  No for QoE configuration | As summarized by the Rapp, lots of companies proposed to use RRC segmentation for large QoE report, and we think it is one candidate solution. Details can be further discussed and decided by RAN2.  However, we think a single QoE configuration should never exceed the limit allowing it to be included in the non-segmented RRC message. Otherwise, there could be QoE configurations which cannot be provided to UEs not supporting RRC segmentation, which would be limiting. Therefore, for QOE configuration we propose to a size limitation to 8kBytes which is anyway 8 times larger than in LTE and should be sufficient. |
| LGE |  | Though RRC segmentation is supported, the upper bound still needs to be specified for QoE configuration/reporting, since the maximum number of the segmentation is not infinite. |
| Qaulcomm | Yes | The size limitation for QoE report can be removed, and no need to send UE segmentation capability to application layer.  We want to keep FFS whether RAN2 needs to provide another relaxed recommended size considering we don’t expect so many segmentations for one RRC message. |
| ZTE | Yes |  |
| OPPO | Yes | Agree with Rapporteur that UE capabilities could help the network for preparing a correct QoE configuration. |
| Ericsson | Yes |  |
| Nokia | Yes, but | Simultaneous QoE configurations over RRC should not exceed 8188 octets.  For detailed realization:   1. either a maximum value is doubled and fixed for e.g.   Configuration container = 2000bytes, maxNrofQoE-r17=4 (previous RAN2 agreement kept but RAN2 agreement on container size and multiple configurations range revised to 4), or   1. Configuration container – 8000bytes, maxNrofQoE-r17=1 (no multiple configurations allowed, RAN2 agreement revised), or 2. maximum value is increased to 8000bytes, maxNrofQoE-r17=4 (matching to one message is left to implementation) |
| Intel | See comment | For QoE configuration, we agree with HW’s comment that segmentation should be avoided if the size is acceptable. We can check with SA5 whether 9kB as max size of QoE configuration is acceptable or not.  Assuming RRC segmentation is supported for QoE report, there’s still a limit on the RRC segment number can be supported in UL.  As defined in TS38.331, RRC layer is expect to obtain each segment from lower layer in the correct order of the segment, which is identified by “*segmentNumber-r16*”. For ULDedicatedMessageSegment, the maximum segment can be supported is 16.  Hence, even RRC segmentation is supported for QoE measurement report, there’s still a limitation to application layer. We suggest to reply to SA4 the size of limitation is 144kB for QoE measurement report. |
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Question 4 : Do you agree that multiple QoE reports can be included in the same message ?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | Yes |  |
| vivo | No strong motivation to support | - The probability of different reports reaching the AS layer at the same time is relatively low  - The reports themselves are quite large, with a small percentage of overhead in the packet headers. Therefore, the gain of sending multiple QoE reports in the same message is limit. |
| Huawei, HiSilicon | No | Firstly, we think that the application layer independently generates the QoE reports, so it is very likely that the UE will send the QoE reports at different time.  Secondly, one potential benefit of combining multiple QoE reports into one message is to save the uplink signalling overhead, but we wonder how much gains would be got. For example, if one QoE report is thousands of bytes, it may not be a big difference whether multiple QoE reports are sent jointly or separately.  Thirdly, if yes to this question, how the UE do the “combination” is FFS. If it is totally up to UE implementation, it may happen that a “big” QoE report will be generated and the report may experience a long time for transmission (due to segmentation in lower layer). If no to this question, one message contains only one QoE report, the whole transmission time may be equal to “combination” approach, but for each QoE report, the transmission performance will be different.  In summary, we prefer to keep LTE design, i.e. single QoE report is included in a message. |
| LGE | Yes, for QoE resume case | During pause, multiple QoE reports would be stored, and these need to be reported in the same message.  For normal case, i.e. not paused, the chance of receiving multiple QOE report from APP layer at once would be very small. |
| Qualcomm | Yes | Can save SRB signalling |
| ZTE | No | We do not think there is much benefit to support this. One obvious disadvantage to support this feature is that, compared with 1 report in 1 message, RRC segmentation may be performed more frequently for multiple reports in 1 message. |
| OPPO | No | Agree with Huawei. The benefit of combining multiple QoE report into one is questionable. |
| Ericsson | Yes | We don’t see the reason to restrict the UE in this case. If it has multiple reports to send, it would be easier to have the option to include them in the same message. The UE can also choose to send multiple messages if that is preferred. |
| Nokia | No | Agree with Huawei |
| Intel | No | Considering including multiple QoE reports in the same message would increase the size of RRC message, and even it can be supported by RRC segmentation for large size of QoE reports, extra latency will be introduced. Even for smaller QoE reports, there is not much benefit in this concatenation compared to sending separate RRC messages as these are not frequent or many.  Hence, we prefer single QoE report in a message and not introduce the structure to report many in one RRC message. |
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Question 5 : Do you think the support for RRC segmentation should be mandatory or optional ?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | Optional | In downlink, the existing UE capability for (downlink) RRC segmentation suffices since QoE configuration is part of the RRCReconfiguration message (which is one of the DL messages that can be segmented).  In uplink, segmentation of the *MeasurementReportAppLayerMessage* is not currently supported*.* Also we do not have a UE capability for segmentation in the uplink. |
| vivo | Optional |  |
| Huawei, HiSilicon | Optional | We think UL segmentation for QoE will put extra complexity for both UE and network side, so we prefer to keep it optional (on top of basic QoE capability).  Furthermore, segmentation for QOE reports should only be used if allowed by the network, similarly as for UE capability message (see *rrc-SegAllowed* parameter). |
| LGE | conditional mandatory | APP layer should be allowed to forward QoE results larger than the upper bound only when the UE support RRC segmentation, but APP layer doesn’t know whether RRC segmentation is supported or not. Therefore, QoE supporting UE should support RRC segmentation also. |
| Qualcomm | Conditionally mandatory for QoE reporting | Can be conditionally mandatory for UEs supporting QoE then we don’t need to do enhancement for AT command.  For DL signalling for QoE configuration, we don’t see the requirements and motivation from SA4 LS. |
| ZTE | Optional |  |
| OPPO | Optional |  |
| Ericsson | Optional | We think optional is fine. |
| Nokia | Optional |  |
| Intel | Optional |  |
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Question 6 : Do you agree that it is sufficient that a UE capability for RRC segmentation is sent from the UE to the network ?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple |  | We didn’t fully understand the question. Segmentation is optional for both the UE and the gNB, and the OAM needs to know the capability of both.  Note that the gNB is already aware of whether the UE supports RRC segmentation in the downlink (this is part of UE NR capability). For the uplink, a new capability is needed. |
| vivo | Yes | I guess the question is about whether the APP layer should be informed about the capability for segmentation.  We think there is no need, the AS layer that does not support the RRC segmentation can just discard the oversize QoE report from APP layer. |
| Huawei, HiSilicon | No | As explained in our paper, we think both network and UE app need to know whether QoE report segmentation is enabled. For example, UE may be capable but the network may not allow segmentation (e.g. because the network does not support it).  For network, there will be extra complexity on this new functionality so it needs the information in order to decide whether or not to allow such handling.  For UE, as we analyzed in our discussion paper, if UE AS does not support UL segmentation for QoE but UE APP is not aware, it will happen that UE APP generates and provides oversized QoE report, but UE AS will anyway discard the report In LTE, we do not have such problems because the QoE report is limited (maximum size) and UE APP will anyway follow the restriction. For cases when segmentation is not enabled, we prefer to reuse legacy app layer behaviour, i.e. discard the reports instead of forwarding them to upper layers. In addition, APP layer may stop gathering additional QoE measurements if the size of the report already exceeds the limit and not waste UE processing power. |
| Qualcomm | Reuse existing capability signalling. | Not quite understand the question, we already define UE indicates whether to support DL RRC message segmentation; for UL segmentation, it is optional without UE capability parameters. Then no additional capability indication is needed. |
| ZTE | No | As mentioned in SA4 LS, there is little impact if the UE discard the oversized QoE reporting container in LTE. We do not think the UE capability is necessary. |
| OPPO | Yes | The network needs to know whether or not the UE supports the RRC segmentation for the network to send proper QoE configuration towards UE, for example, enable the UE APP layer to generate a QoE measurement report larger than 9k Bytes |
| Ericsson | Yes | No need to forward the application layer as the application anyhow needs to perform measurements according to the configuration. |
| Nokia | See comment | No need for agreement on that point as the question isn’t clear. |
| Intel | See comment | For UL RRC message, as currently UL RRC Segmentation is only used for UE capability, UE capability only includes “*Segmentation for UE capability information*” in the field, a new UE capability to indicate UL RRC segmentation will be needed.  Additionally, we also agree with HW’s comment that legacy application behavior should be used if UE/network does not support UL segmentation, i.e. stop gathering additional QoE measurement and stop forwarding to AS layer.  Hence, UE’s AS layer still needs to indicate application layer the max size it supports for a QoE report, no matter if UL segmentation is supported or not. If UL segmentation is supported, the max size is 144kB, if not, the max size is 9kB. |
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## 2.3 Fulfilment of SA4 requirement at mobility

The following proposals are related to mobility and fulfilment of SA4 requirement.

* gNB does not need to know the QoE configurations for which there are ongoing QoE session to enable QoE configuration handling upon mobility.[1]
* Specify Session Start Indication and Session End Indication.[5]
* Send an LS to CT1 group to specify Session Start indication and Session End Indication in their specification.[5]
* The gNB provides explicit out-of-area indication to the UE while releasing QoE measurement configuration.[7]
* For signaling based QoE activation, the configuration propagates during Handover.[10]
* For management based QoE activation, the configuration does not propagate during Handover and can be removed at Handover.[10]
* The recording session start indication should be sent to RAN from UE via report message e.g. MeasReportAppLayer.[12]
* Introduce a specific modification operation instead of release/setup for QoE configurations to satisfy the service continuity requirement from SA4.[13]
* P1, P2, P3, P4. [17]

Based on the proposals above, the following is summarized :

SA4 have replied in R2-2109384 that the SA4 requirement described in TS 26.114 clause 10.1, TS 26.247 clause 16.3, which was defined for QMC in UMTS and LTE, regarding configuration changes of ongoing QMC sessions is still applicable. Therefore, a solution for ensuring that the measurements are not interrupted in the middle of the session when e.g. the UE comes to an area border, needs to be implemented.

One solution is to send the area scope to the UE, but that option has already been excluded by RAN3 in earlier discussion.

Two more solutions have been proposed :

* The UE sends an indication when the session in the application layer starts and when it stops, so that the network knows when it can release the measurements.
* The network sends an indication to the UE when the measurements should be released and the UE releases the measurements when the session is completed.

A comment on the first solution is that the session start/stop indications can be used for other purposes also, like e.g. alignment with MDT. However, it generates more signalling than the pending release indication.

A comment on the second solution is that it is not sufficient to just send the release indication to the UE, as the UE may perform handover before the session is completed. Therefore, the QoE configuration still needs to be forwarded at handover to the target gNB together with an indication that the there is a pending release in the UE. There must also be a possibility to cancel the pending release, in case the UE comes back to the area again before the session has ended.

Question 7 : Do you prefer session start/stop indication or pending release indication as solution to fulfill the SA4 requirement ?

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| **Company** | **Solution** | **Additional comments** |
| Apple | Explicit out-of-area scope indication | This is not the same as sending area scope to the UE which was excluded |
| vivo | No | We have different understanding on the LS reply from SA4.   |  | | --- | | *Q2: Does “QoE configuration changes” also include a QoE configuration release scenario i.e. should logging and reporting criteria for ongoing session be unaffected even if the client receives a release of the QoE configuration?*  Answer2: No. For QoE configuration change, the network still wants the QoE reports from the UE side, but for QoE configuration release, the network does not want the UE to perform QoE measurements and reporting. The QoE configuration release has been defined in RAN2/RAN3, and it depends on network when to send the indication to the UE. Based on the difference, the logging and reporting criteria for ongoing session should be affected when the client receives a release of the QoE configuration. |   Based on the above reply from SA4, the QoE configuration can be released even when there is an ongoing QoE session. Therefore, no need to indicate from UE to gNB on whether there is an ongoing QoE session. |
| Huawei, HiSilicon | Yes | We prefer session start/stop indication, which is needed to meet the mobility requirements. The other solution does not work, as commented by the rapporteur.  On the comments towards the LS, e.g. from vivo. It seems companies misinterpret the reply from SA4. SA4 confirmed the requirement to continue the ongoing QoE measurements outside the area scope, but at the same time, they indicate that in case the network sends QoE release, then app layer should follow this indication. This does not change the fact that QoE release of ongoing sessions should only be used in exceptional cases, e.g. RAN overload. Normally, they should be kept. |
| LGE | No | We have the same understanding as vivo. The QoE configuration can be released even when there is an ongoing QoE session. |
| Qualcomm | No | Same comments as vivo. We don’t see the requirement from SA4 that we need to maintain the QoE session continuity for release scenatio. As vivo indicates, the “QoE configuration changes” does not include release scenario. And the SA4 indicate that gNB can release QoE for an on going session as following.  *Q3: If the answer to Q2 is no, can RAN3 assume that QMC configuration release can be used to stop QoE measurement collection and reporting, even in the middle of an application session?*  Answer3: Yes.  We also notice the area scope information is provisioned to UE application layer inside of QoE configuration container, and application layer can determine whether to initiate a new QoE session or continue a ongoing session based on the area scope information. That means area scope control is already implemented by application layer. And RAN does not need to do anything for this.  We have strong concerns about letting the UE indicates application layer behavior to the gNB node, gNB should be agnoistic to application layer behavior and there could be many QoE sessions running the UE, a large of signalling overhead will be increased if notifying RAN each QoE session start or stop.  Overall, for this issue, we don’t see any motivation to do it and on the contrary the the drawback is very obvious. |
| ZTE | No | We share the same view with VIVO. |
| OPPO |  | Agree with vivo. SA4 has said that the release operation will terminate the ongoing QoE measurement session in their reply. SA4 needs to further clarify their demands and positions. |
| Ericsson | Session start/stop | SA4 have already replied that the requirement is applicable also in NR for configuration changes, but not for the release case where the measurements should be released directly. The reply copied above by QC is related to the question 3 about the stop of measurements. The first question in the LS was the one related to configuration changes:  From R3-212953:  RAN3 is discussing, in the context of NR QMC, the following SA4 requirement described in TS 26.114 clause 10.1, TS 26.247 clause 16.3, which was defined for QMC in UMTS and LTE.  *“The QoE configuration shall only be checked by the client when each session starts, and thus all* ***logging and reporting criterias******for an ongoing session******shall be unaffected by any QoE configuration changes received during that session****. This also includes evaluation of any filtering criterias, such as geographical filtering, which shall only be done when the session starts. Thus changes to the QoE configuration will only affect sessions started after these configuration changes have been received.”*  RAN3 is also aware that QMC support for NR is not yet defined in SA4 via the LS R3-210041 (S4-201576): "*Currently SA4 has only specified QMC functionality (for QoE configuration and reporting) for UMTS and LTE. When the RAN3 NR QoE work has concluded, SA4 will also expand the specified QMC support to include 5G NR accordingly*."  RAN3 have the following questions:  Q1: Will the requirement for configuration changes of ongoing QMC sessions be applicable also for NR QMC?  From the reply LS S4-211248:  *Q1: Will the requirement for configuration changes of ongoing QMC sessions be applicable also for NR QMC?*  Answer1: Yes.  The area scope in the container is not used if the gNB keeps track of the area, and that has already been agreed by RAN3.  We prefer the session start/stop indication as it can be used also for MDT alignment. |
| Nokia | No | We share vivo’s observation.  *i.e. should logging and reporting criteria for ongoing session be unaffected even if the client receives a release of the QoE configuration?*  Answer2: No  We dont see there is urgent need to optimize the handling. |
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## 2.4 Handling of delta and fullConfig

The following proposals are related to handover, resume and reestablishment and the use of delta and fullConfig.

* gNB should be able to resume all QoE configurations using one-bit flag e.g.*restoreQoE* indication in *RRCResume* message.[1]
* gNB should be able to resume parts for QoE configurations using *fullconfig* configurationin *RRCResume* message.[1]
* If the network uses delta signalling at Resume, only possible differences compared to the latest configuration are indicated. The network does not indicate anything in Resume for QoE configurations that remain the same as in the latest UE configuration.[5]
* When the UE resumes the connection in a gNB supporting QoE, the target gNB should explicitly indicate which QoE measurement configurations should be kept by the UE during RRC resume procedure if full configuration is used, e.g. in RRCResume message. The UE shall release all QoE measurement configurations not indicated by the gNB for restoration.[5]
* In case the UE resumes the connection in a gNB not supporting QoE, i.e. in case RRCSetup is received in response to RRCResumeRequest, the UE should release all QoE measurement configurations.[5]
* Similar to resume, if full configuration is triggered after re-establishment, the network indicates the measConfigAppLayerId’s of the QoE measurements that should continue after the re-establishment.[5]
* In case the UE reestablishes the connection and RRCSetup is received in response to RRCReestablishmentRequest, the UE should release all QoE measurement configurations.[5]
* The QoE configuration file is optionally included in RRCReconfiguration.[5]
* Similar to resume, at handover with full configuration, the network indicates the measConfigAppLayerId’s of the QoE measurements that should continue and the measConfigAppLayerId’s of the QoE measurements that should be relased after the handover.[5]
* The UE releases the QoE configurations if no measConfigAppLayerId is indicated in the Handover Command.[5]
* R2-2109105 (RAN2#115e):[14]
* Select one option regarding QoE handling upon receiving full configuration[14]
* When the UE resumes the connection in a gNB supporting QoE, the target gNB indicates whether UE should keep or release each QoE configuration (i.e., per QoE configuration).[14]
* During the handover to target gNB which supports QoE, the target gNB indicates whether UE should keep or release each QoE configuration (i.e., per QoE configuration).[14]
* One common indicator can be used to keep all QoE configurations during the RRC Resume procedure.[11]
* For the indication that indicates which QoE configurations should be kept,[13]
  + If the QoE configuration has already been stored at UE and no modification/release is required, even at full configuration, it is enough to just provide the indication (i.e. no QoE configuration container is needed to be provided) for QoE configuration within RRC Resume or RRC Reconfiguration message.
  + The indication is provided per QoE configuration, and MeasConfigAppLayerId could be reused.
* P5, P6. [17]

Based on the proposals above, the following is summarized :

There are proposals related to resume, handover and re-establishment. An attempt is made to have similar handling at delta configuration and full configuration for the different use cases.

In RAN2#115 RAN2 agreed that the network explicitly indicates which QoE configurations to keep at Resume, but it was not clear whether it applies to the delta case or the fullConfig case.

In existing specification at fullConfig, the RRC layer configurations are released and the higher layer configurations are maintained. It would be simplest to keep the same principle for QoE configurations. That would mean that the UE can release the RRC part of the QoE configuration, but keep the QoE configuration in the application layer.

Some companies proposed a common indicator to keep all QoE configurations at Resume. If the same principle is used as in legacy, such an indicator seems not to be needed for delta configuration as only possible differences in the configuration are indicated. At fullConfig such an indication would require that the UE stores also part of the RRC configuration.

The understanding is that the measurements are released if QoE measurements are not supported in the target node. No support in the target node triggers RRCSetup at resume and re-establishment and fullConfig with no measurements indicated at handover.

Question 8: Do you agree that the network indicates only possible differences between the QoE configurations at resume, handover and re-establishment when delta configuration is used, i.e. similar as legacy?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes | It is OK to go this way, but it is not true that no support of QoE by the gNB always means fullConfig is triggered. The gNB not supporting QoE may still be able to identify QoE configuration and release it upon HO/resume/re-establishment to avoid fullConfig. |
| LGE | Yes | same as legacy. |
| Qualcomm | No | The agreement in the last meeting is: *When the UE resumes the connection in a gNB supporting QoE, the target gNB should explicitly indicate which QoE measurement configurations should be kept by the UE during RRC resume procedure, e.g. in RRCResume message. The UE shall release all QoE measurement configurations not indicated by the gNB for restoration. FFS how the indication looks like, e.g. granularity per QoE configuration or common for all QoE configurations.,* then this question is not meaningful and not aligned with the agreement.  Technically,  We understand fallback to RRCSetup at resume and reestablishment is only happened in the case the target gNB can not retrieve or verify UE context.  For the case of the target gNB not supporting QoE, the souce gNB should be aware whether the target gNB supporting QoE, and then determine whether forward QoE context to the target gNB.  In case the target gNB not supporting QoE receives QoE context, the target gNB cannot decode it and should ignore it. But this will not trigger the target gNB to fall back to RRCSetup message; and on the contrary, fallback to RRCSetup will overkill all other stored context.  If we look at the legacy handling during RRCResume, taking the following DCCA context resume as example, it is obvious that for delta configuration, DCCA context should be explicitly indicated to resume. If no any information in RRCResume message, UE should release the context. That means if a UE resumes in a legacy gNB, the legacy RRCResume should be received to resume other UE context, and UE release DCCA context. For QoE context resume, the same should be applied. That is why agreed the network explicitly indicates which QoE configurations to keep at Resume in the last RAN2 meeting.  1> if the *RRCResume* includes the *fullConfig*:  2> perform the full configuration procedure as specified in 5.3.5.11;  1> else:  2> if the *RRCResume* does not include the *restoreMCG-SCells*:  3> release the MCG SCell(s) from the UE Inactive AS context, if stored;  2> if the *RRCResume* does not include the *restoreSCG*:  3> release the MR-DC related configurations (i.e., as specified in 5.3.5.10) from the UE Inactive AS context, if stored;  2> restore the *masterCellGroup, mrdc-SecondaryCellGroup*, if stored, and *pdcp-Config* from the UE Inactive AS context;  2> configure lower layers to consider the restored MCG and SCG SCell(s) (if any) to be in deactivated state;  For RRC Re-establishment, we have to distinguish RRC resume and RRC re-establishment case. During RRC resume, all SRBs and DRBs will be resumed except for the explicit indication from the gNB; during RRC re-establishment, only SRB1 is resumed, SRB2 and DRBs should be re-established by RRCReconfiguration followed by RRC re-establishment. That is why we have different handling in today’s specification for RRCResume and RRC Re-establishment in section. Then, we can have two options for discussion:   * Option 1 : Same as today DCCA context handling during Re-eatablishment, when UE initiates RRC Re-establishment, UE should release DCCA context, then UE should release QoE context as the same   Option 2: Keep aligned handling with Resume and HO, that means using explicitly indication in RRCReconfiguraiton message following Re-establishement to resume QoE context. |
| ZTE | Yes |  |
| OPPO | Yes |  |
| Ericsson | Yes |  |
| Nokia | No | We think that joined consideration (and potential agreement) on resume, handover and re-establishment and full config isn’t fully correct here.  As Huawei and Qualcomm noted this isn’t fully accurate to assume:  “No support in the target node triggers RRCSetup at resume and re-establishment and fullConfig with no measurements indicated at handover. « |
| Intel | Yes with comment | First of all, we would like to clarify that QoE configuration can be interpreted in two different ways:  1) QoE configuration in RRC layer (QoE RRC configuration), this includes RRC ID (i.e. measConfigAppLayerId), service type, QoE configuration container, etc.  2) QoE configuration in application layer: it refers to QoE measurement configuration set by OAM, which is transparent to RAN (i.e. container in AS layer).  We first need to have a common understanding on the model – are the RRC parameters stored in the AS layer or are they passed on the application layer. The assumption seems to be that the measConfigAppLayerId is stored also in the AS though it doesn’t seem essential as the application layer also provides the measConfigAppLayerId with the measurements.  The principles of RRC delta configuration is that the target provides the delta to the existing AS configuration. We don’t see a reason to break that convention here.  If the target is of an earlier release, it will not be able to comprehend the ASN.1 and will have to use full configuration. If the target is of Rel-17, it should be able to comprehend the source AS configuration and also able to signal the release/reconfiguration if needed based on delta configuration – that is, the target provides only the difference to the source configuration. A Rel-17 target can also use full configuration if it wants to, though this will be more disruptive overall.  In summary, for the proposal above, for QoE RRC configuration, we agree that legacy procedure should be followed, i.e. during resume, handover, re-establishment, the target gNB sends a release message including *MeasConfigAppLayerId*(s) of the unsupported QoE measurements. Upon receiving the release message, AS layer will inform Application layer to release corresponding QoE measurement configuration and QoE measurement report in application layer. |
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Question 9: Do you agree that the network indicates the measConfigAppLayerId of the configurations that should continue and of the configuration that should be released at fullConfig at handover, resume and re-establishment, to enable the same UE behaviour as today at fullConfig? This means that the QoE configuration container may be omitted in the RRCReconfiguration message.

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | No | We understand the motivation of this proposal is to reduce unnecessary signalling of QoE configuration. Given that we support delta configuration, it is not clear to us that further optimization for full configuration is needed. |
| vivo | No | Agree with Apple, delta configuration is enough to reduce the signalling. For full configuration, the AS layer shall release the current configuration and apply the new one. |
| Ericsson |  | A comment to the comments above. The proposal means no change to the current UE behaviour at fullConfig. The UE can still release RRC and keep higher layer configuration, which is the existing behaviour. Releasing the QoE configuration would mean change to the current UE behaviour and cause network issues due to very large Handover Command. |
| Huawei, HiSilicon | Yes | As indicated in our Tdoc in R2-2110606, it would be simplest to keep the QoE configuration, similarly as logged MDT configuration is now kept upon fullConfig. But we are also OK to go the way suggested by the rapporteur as a compromise, i.e. release RRC configuration of QoE, but keep QoE ongoing in app layer. We definitely should not affect app layer measurements by fullConfig unnecessarily not to lose the already gathered data which is the same as rationale for keeping logged MDT configuration upon fullConfig in our understanding. |
| LGE | No | The signalling optimization is not needed for full configuration. |
| Qualcomm | No strong view | This is beneficial and optimization to fullconfig. But it can achieve the same motivation by delta configuration. It there any scenario we have to use fullconfig instead of delta configuration for QoE? |
| ZTE | ``` | I’m not sure whether i understand the question clearly.  From our point of view, after UE receives the fullConfig, UE should release all stored QoE configurations and use the new received QoE configuration. |
| OPPO | No | We prefer keeping the reception of the fullConfig as current implementation: keeping the higher layer configuration, while releasing previous RRC configuration. |
| Ericsson | Yes | We don’t propose any changes to fullConfig. Our proposal is to change the presence of the QoE configuration container to OPTIONAL in RRCReconfiguration, If we don’t do that, handover with fullConfig will in practice not work due to too large Handover Command.  As mentioned already, the existing UE behaviour is that the UE releases the RRC part of the configuration, but not the higher layer configurations at fullConfig, the proposal is inline with that behaviour. |
| Nokia | No | Full configuration is the remedy to keep the UE in case of configuration/signalling misalignment that is more critical than QoE continuity. |
| Intel | See comment | As commented in Q8, we first need to have a common understanding on the RRC model on whether QoE AS configuration (e.g., measConfigAppLayerId) is retained in UE AS layer or is it only transparently passed to application layer. The following discussion is based on the assumption that QoE AS configuration is maintained in the UE AS before full configuration.  Full configuration is designed to be forward and backward compatible. It can be used if the target cannot comprehend some of the source AS configuration (for example when the target is of an earlier release to the source). As it cannot infer the source configuration, it is unable to explicitly release that configuration and full configuration flag will ensure that all of the AS configuration is released. If in a future release, we add another AS parameter, a Rel-17 target can still use full configuration to release all of the source configuration. These principles should be maintained even for QoE. That is, setting the full configuration flag should result in the release of all of the AS configuration, including all (Rel-17 and fields defined in future releases) QoE AS configuration.  Regarding the application layer configuration, since it not part of the AS configuration itself, full configuration does not necessarily have to release these. There are several options:   1. **Release only the AS configuration**. If the application layer provides the measurements and no AS configuration exists (like measConfigAppLayerId), the UE will not provide the results to the gNB (i.e. AS layer will release the received QoE report from application layer). The only consequence of this is that UE may have unnecessarily performed measurements. This is not a real issue either – full configuration should not be frequent and also implementations can still indicate release of application layer configuration if the corresponding measConfigAppLayerId is not available in AS to avoid unnecessary UE measurements. 2. **Releasing the application layer configuration together with AS configuration would be simplest.** However, some companies are concerned about the size of subsequent reconfiguration of the QoE configuration and also the interruption during HO. We don’t think this is a big issue as the configuration can provided after HO and full configuration shouldn’t happen often (full configuration is disruptive in many ways – user plane interruption/data loss, size of phy channel configuration, etc. – so full configuration is not designed to be used often).   As we agreed in previous RAN2 meeting:   * The UE discards the reports received from application layer in case it has no associated QoE configuration configured.   The UE will anyway discard the QoE report when full configuration is flagged, as currently there’s no associated QoE AS configuration stored in AS layer. It is not essential to maintain QoE service continuity during full configuration.   1. Add specific handling in the full configuration section similar to the DRB handling in LTE that will release only the QoE configuration that is not configured following the full Config:    1. Something like:   For each measConfigAppLayerId that is not included in the measConfigAppLayerToAddList in the RRCReconfiguration message, indicate to the application layer the release of the QoE configuration  Providing the continue/release lists explicitly is not clear to us how this solution will work when the target is a Rel-16 gNB that cannot provide this list of continue/release measConfigAppLayerIds, as anyway Rel-16 gNB cannot support QoE measurement. UE should release all AS QoE configuration when it resumes connection to a non-supporting QoE gNB – either because if it is a Rel-16 gNB or a Rel-17 gNB not supporting QoE  In summary, we provided some possible solutions but we are open to other solutions that:   1. Follow the principles of full configuration by releasing the entire AS configuration by default, that ensures forward and backward compatibility 2. Any solution that proposes to maintain application layer QoE should clarify details of:    1. The RRC model that is being used (is measConfigAppLayerId maintained in AS layer?)    2. How backard compatibility is supported towards Rel-16 gNB (that does not comprehend ASN.1 or support QoE)    3. How forward compatibility is supported when a new QoE field is introduced in a later release |
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Question 10: Do you agree that the UE releases the QoE measurements if no measConfigAppLayerId is indicated in the Handover Command, i.e. when the target node does not support QoE measurements?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | Yes |  |
| vivo | Yes | When the target node does not support QoE, the mapping relation info of RRC ID and QoE reference will get lost and the potential report will be useless. |
| Huawei, HiSilicon | Depends | This contradicts the proposal in question 8. There can be two cases:   1. Target node does not support QoE but does comprehend QoE configuration 🡪 in this case the gNB should indicate the release of QoE conifgurations, as per proposal in Q8 2. Target node does not QoE and is not bale to comprehend Qoe configuration 🡪 in this case full configuration is used with no additional QoE indications and all QoE configurations are released. |
| LGE | Yes |  |
| Qualcomm | Yes | The source gNB should be aware whether the target gNB supports QoE, and does not forward QoE context to the target gNB not supporting QoE. In this case, no any QoE information included in HO command, UE should release QoE context. I think this handling is aligned with RRC Resume procedure. |
| ZTE | Yes |  |
| OPPO | Yes |  |
| Ericsson | Yes |  |
| Nokia | To be clarified | In general the configuration should be released, but how this is handled may be stage 3 detail, as source gNB should be aware too. |
| Intel | No (with comments) | It is not clear to us whether this question is about the end functionality or the signalling. From UE perspective, it is not aware of whether the target supports QoE or not – it simply goes by the signalling provided.  First regarding the signalling, as discussed in Q8, delta RRC configuration is used during normal handover. We think target gNB should send release message to the UE with *measConfigAppLayerID*  Then, in terms of functionality on whether corresponding to the released QoE measurement configuration, we don’t have a strong view either way. As indicated in our response to Q9, one possible option (at least for full configuration option, that will be applicable for a Rel-16 gNB that does not support QoE) would be to not release the application layer configuration. The only consequence of not releasing the application layer configuration is potential unnecessary measurements (which can also be avoided by implementations). |
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Question 11: Do you agree that the UE releases the QoE measurements if RRCSetup is received in response to RRCResumeRequest or RRCReestablishmentRequest, i.e. when the target node does not support QoE measurements?

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| **Company** | **Yes/No** | **Additional comments** |
| Apple | Yes |  |
| vivo | Yes | Same as above. |
| Huawei, HiSilicon | Yes | Whether there is extra specification impacts could be further discussed. |
| LGE | Yes |  |
| Qualcomm |  | When UE receives *RRCSetup* in response to RRCResumeRequest or RRCReestablishmentRequest, UE should discard any store AS context, that is existing UE behavior, then no anything needs to be specified.  But as we comment to question 8, legacy gNB can still send RRCResume message to the UE without any QoE indication, then UE release all the QoE context. This is aligned handling with handover to a gNB not supporting QoE in question 10.  1> if the *RRCSetup* is received in response to an *RRCReestablishmentRequest*; or  1> if the *RRCSetup* is received in response to an *RRCResumeRequest* or *RRCResumeRequest1*:  2> discard any stored UE Inactive AS context and *suspendConfig*;  2> discard any current AS security context including the KRRCenc key, the KRRCint key, the KUPint key and the KUPenc key;  2> release radio resources for all established RBs except SRB0, including release of the RLC entities, of the associated PDCP entities and of SDAP;  2> release the RRC configuration except for the default L1 parameter values, default MAC Cell Group configuration and CCCH configuration;  2> indicate to upper layers fallback of the RRC connection;  2> stop timer T380, if running; |
| ZTE | Yes |  |
| OPPO | Yes |  |
| Ericsson | Yes |  |
| Nokia | Different wording | We agree with Qualcomm, that the UE should discard any stored AS context, no specific treatment for QoE is needed |
| Intel | Yes (with comments) | UE will release QoE measurements on reception of RRCSetup (irrespective of whether it is due to target node support of QoE or not). Hence it is possible for the target to use this if it doesn’t support QoE – though the impact on other UE behaviour will be much higher in terms of user plane interruption, signalling required on the Uu and network interfaces. Hence we think an explicit release of the QoE configuration is the more optimal implementation if the target does not support QoE configuration than using RRCSetup. |
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## 2.5 Other proposals

The following proposals submitted to AI 8.14.2.1 are not treated in this discussion due to out of scope of the discussion.

* The gNB sends the slice info as an explicit IE in RRC QoE configuration. The QoE configuration container should not include the slice info.[9]
* For the legacy QoE measurement reporting, there is no need to include slice information in the RRC signalling. The slice ID should be included in the QoE report container.[9]
* SRB4 release implies QoE configuration release, notifying upper layer about the release, discarding any pending or not reported QoE data.[10]
* QoE correlation with MDT / Trace PM data collection is handled in networks side.[10]
* RAN2 send a reply LS to SA4, including following contents:[2]
* Reply SA4 that “The duration of a RAN overload may last long. However, RAN should guarantee the temporary stop does not last long by controlling the buffer size limitation for stored QoE measurement report. ”[2]
* Reply SA4 that “Configuring UE with a limited duration or a limited buffer size for storing QoE report during QoE pause could help to avoid RAN overload recurrence during QoE resume”.[2]
* Reply SA4 that “From RAN2 point of view, QoE pause may not reduce overload situation at NG-RAN if the required average QoE load per application is smaller than 100bits/sec. RAN2 suggests SA4 to check with SA5 on the purpose and effectiveness of introducing QoE pause during RAN overload”.[2]
* During QoE pause, QoE reports are stored at AS layer with a limited buffer size.[2]
* RAN2 to agree that source gNB should send the information of the air-interface resource consumption for transmission of the measurement report for each QoE configuration towards the target gNB to assist the target gNB to choose which QoE measurement configuration should be released.[8]
* For the RRC resume scenario, RAN2 to agree that the granularity of the indication of the release is of per QoE configuration, and the source gNB should send the historical information of the air-interface resource consumption for transmission of the measurement report for each QoE configuration towards the target gNB when UE context is retrieved.[8]
* gNB can resume some of the QoE measurement configurations selectively from the list of complete QoE measurement configurations (previously sent to the UE) based on RRC identifier and own priorities.[10]
* Support measConfigAppLayer to be set to pause the QMC upon temporary stop procedure.[13]
* Support measConfigAppLayer to be set to restart the QMC upon QMC restart procedure.[13]
* Use SRB1 for transmission of RAN Visible parameters.[4]
* Add the RAN Visible QoE parameters in MeasurementReportAppLayer.[4]
* Send a reply LS to RAN3 with the agreements on RAN Visible parameters.[4]
* RAN-visible QoE is limited to the indication of separate parameters in QoE configuration (e.g. service type).[10]
* RAN2 does not specify extracting of the entire XML-report.[10]
* RV QoE data shall be transported via SRB4.[11]
* RAN2 shall define UE capability for RAN visible QoE measurement in Rel-17.[11]
* Add the information of RVQOE supporting and QoE Measurement Collection service type supporting in UE-NR-Capability in UECapabilityInformation.[12]
* Use the short RRC ID to identify a RAN-visible QoE measurement in RRC message[12]
* RAN2 design the format of RAN-visible QoE configuration according RAN3 agreements.[12]
* RAN2 design the format of the RAN-visible report with RRC IEs format.[12]

# 3 Conclusion

# 4 References

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