3GPP TSG-RAN WG2 Meeting #115 R2-210xxxx

Online, 09 – 27 August 2021

**Agenda item: 8.14.2.1**

**Source: Huawei, HiSilicon**

**Title: Report of offline: [AT115-e][046][QoE] Mobility (Huawei)**

**WID/SID: NR\_QoE-Core - Release 17**

**Document for: Discussion and Decision**

# 1 Introduction

This document aims at capturing views related to the following e-mail discussion:

* [AT115-e][046][QoE] Mobility (Huawei)

Scope: Treat R2-2109036 and related proposals. For each point, attempt to agree, if agreement seems not possible, outline the options or specify a FFS to be addressed later.

Intended outcome: Agreements, Report

Deadline: Tuesday W2 (CB)

Companies are asked to reply to several questions, which are based on the summary of companies’ contributions [1]-[9], as provided in the summary document in [10] (which is a revision of R2-2109036).

Section 2 contains a summary of companies contributions, which is just a copy of section 2 from [10].

The companies are requested to answer the questions in section 3.

## Companies’ contact details

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| --- | --- |
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# 2 Summary of companies contributions from [10]

## 2.1 Management based and signalling based QoE

In [1], it is proposed to clarify that the QoE configuration propagates during the handover only for signalling-based QoE activation, while it does not propagate for management-based QoE. Similarly, [5] assumes that QOE continuity is only applicable to signalling-based QoE. In [2] on the other hand, there is a view that all mobility related procedures should be applicable to both signalling-0based and management-based QoE. The rapporteur would like to note that RAN3 is already discussing this topic and made the following agreement:

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| Include signaling based QoE measurement configuration in handover preparation messages i.e. in XnAP: HANDOVER REQUEST, NGAP: HANDOVER REQUEST. FFS on NGAP HANDOVER REQUIRED |

Furthermore, it is already noted in WID (RP-210913) that for mobility handling for management based QoE activation, SA5 input is required:

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| * Specify the support for QoE measurement collection and reporting continuity in intra-system intra-RAT mobility scenario for signaling based QoE. Mobility support for management based QoE measurements is pending input from SA5. [RAN3, RAN2] |

It seems that for now RAN2 can assume that a discussion and agreements related to mobility are applicable to signalling-based QoE and whether they are applicable to management-based QoE depends on further discussions in RAN3 based on input from SA5.

**Proposal 1: RAN2 assumes that all QoE mobility related agreements made by RAN2 are applicable at least to signalling based QoE. Whether the same applies to management-based QoE is pending further input from SA5 and RAN3.**

## 2.2 Area handling for QoE during handover

RAN2 received an LS from RAN3 in R3-212976 with the following conclusion with respect to area handling for QoE during mobility:

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| RAN3 discussed further the following three options captured in TR 38.890 regarding the area handling for QoE during mobility.  - Option 1, where the network is responsible for keeping track of whether the UE is inside or outside the area and configures / releases configuration accordingly.  - Option 2, where the network is responsible for keeping track of whether the UE is inside or outside the area, and the UE responsible to manage start/stop of QoE accordingly.  - Option 3, where the UE is responsible for area checking (UE has the area configuration) and to manage start/stop of QoE accordingly.  RAN3 agreed to support Option 1. |

Based on this agreement, several contribution discuss the details of option 1 selected by RAN3, e.g. [1], [2], [4], [5], [6], [9].

In [4], [5] and [6], network side behaviour is clarified for QoE configurations handling upon handover based on the relevant area scope. It is clarified that area scope of each QoE configuration will be known at the target gNB based on the Xn signalling, at least for signalling based QoE activation. Based on this information, the target gNB can decide which QoE configurations to keep and which QoE configurations to release by taking into consideration the relevant area scope of each of QoE configuration. Similarly, [1] discusses *areaScope* parameter, which was previously described by SA5 in an LS in R2-1900096 for LTE QoE and it is also clarified that gNB itself can determine whether the UE is in the measurement area or not and can either keep or release the QoE configuration based on this. Based on the views expressed in these papers, the following can be proposed:

**Proposal 2: Area scope parameter is not introduced in RRC procedures supporting QoE.**

**Proposal 3: The target gNB decides which QoE configurations to keep and which to release during a handover, e.g. based on QoE configuration information received from the source gNB in Xn signalling and/or UE’s current RRC configuration of QoE.**

With respect to QoE handling upon mobility, in [2] and [4], the following SA4 requirement is recalled:

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| 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. |

According to the contributions, this requirement means that the gNB should not release a QoE configuration for which the QoE session is ongoing, even when the UE moves outside of the QoE area. This in turn requires the gNB to be aware of when the session is ongoing. Furthermore, in [9] it is indicated that session start/end indications from the UE are required for the QoE related procedures in the network, especially for activation and deactivation procedures, e.g. for the network to know when the QoE configurations may be released from the UE once the deactivation command is received by the gNB. Based on [2], [4] and [9] the following proposals are then made:

**Proposal 4: The UE informs the gNB when the QoE measurement session starts or when the session ends, e.g. to enable QoE configuration handling upon mobility or for QoE activation/deactivation procedures.**

In [4], it is also indicated that CT1 may need to be involved to specify the relevant indication from application to AS layer:

**Proposal 5: RAN2 sends an LS to CT1 group to specify session start and session end indications from application to AS layer.**

In [2], the network side behaviour is also further clarified for the case where the UE moves out of the QoE measurement area, but the related QoE measurement session is ongoing when the handover occurs:

**Proposal 6: If SA4 confirms that the requirement for configuration changes of ongoing QMC sessions is applicable also for NR QMC: In case the UE moves out of the measurement area during a handover, the target gNB should release the QoE configuration of the UE if the related QoE measurement session is not ongoing and should keep the QoE configurations for which the QoE measurements are ongoing (regardless of whether the UE stays within the associated QoE area or not).**

Furthermore, in [1] and [4], the aspects related to SRB4 release are discussed. In [1], it is indicated that, e.g. upon moving to RRC IDLE state, the UE will release SRB4 and that it should be clarified in the specifications that releasing SRB4 is equivalent to releasing all QoE configurations. Similarly, in [4], it is noted that a UE may move into the coverage of the gNB which does not support QoE and such gNB will not support SRB4. Without being configured with SRB4, the UE will not be able to send the QoE measurement reports to the network. Hence, it is proposed to clarify that the UE should discard the reports received from application layer in case it has no associated QoE configuration / SRB4 established. Based on the discussion in these papers, the following proposals are made:

**Proposal 7: When the UE moves to RRC IDLE state, it releases SRB4, releases all QoE configurations and discards any pending or not reported QoE data.**

**Proposal 8: The UE discards the reports received from application layer in case it has no associated QoE configuration configured.**

## 2.3 QoE handling upon receiving Full configuration

In [2], it is proposed that upon receiving full configuration during a handover, a UE shall check if otherConfig includes the QoE configuration or not. If the same QoE configuration exists, the UE shall continue the QoE measurements and otherwise, the UE should release QoE configuration. In order to reduce signalling overhead, it is further proposed in [2] that QoE configuration container is included optionally in QoE configuration, so that the network does not have to repeat QoE configuration in case it wants the UE to keep the QoE configuration upon full configuration procedure. Repeating the configuration will also make the UE to release an old QoE configuration and treat the repeated as the new one, since the UE is not able to really tell whether the configuration is the same or not. Therefore, it is proposed:

**Proposal 9: Upon FullConfig, the gNB can indicate to the UE the identifiers of QoE configurations which should be kept by the UE and the UE shall continue the QoE measurements for the indicated QoE configurations.**

## 2.4 QoE handling during mobility in RRC INACTIVE

In [7], it is proposed to discuss whether the UE should always store and recover all of its QoE configurations when transitioning between RRC INACTIVE and RRC CONNECTED states, or whether there should be a possibility for the network to decide which QoE configurations are stored/recovered, e.g. via RRCRelease or RRCResume message.

In [8], it is proposed to discuss how to restore QoE configurations stored in the UE context in three scenarios:

1. UE resumes the connection in the gNB supporting QoE with no overload/congestion.
2. UE resumes the connection in the gNB supporting QoE in an overload/congestion situation.
3. UE resumes the connection in the gNB not supporting QoE feature.

Furthermore, it is proposed in [8] that:

* When the UE resumes RRC connection in a gNB not supporting QoE, UE restores QoE context and performs QoE measurements but pauses QoE reporting. UE recognizes gNB not supporting QoE by the lack of indication to restore QoE in RRCResume message.
* When UE resumes RRC connection in a gNB supporting QoE, UE restores QoE reporting only after receiving explicit indication in RRCResume message.
* The gNB supporting QoE can release or pause all or part of QoE configurations during RRC resume.

Similar topic is discussed in [4]. It is indicated that the overall principle should be the same as for UE mobility in RRC CONNECTED state, i.e. it is the target gNB (new serving gNB), which should decide which QoE configurations to keep and which to release, e.g. based on area information received from the source node (anchor gNB). According to [4], this can be achieved by gNB sending an indication to the UE in RRCResume message about which QoE configurations should be kept at the UE and when there is no indication to restore the QoE configurations, the UE should release all of its QoE configurations. This way, it is possible to release all QoE configurations from the UE (e.g. when the connection is resumed in a gNB not supporting QoE) or some of the configurations (e.g. those which are not in relevant in the area where the UE resumes the connection).

Based on the above, it seems that an explicit indication in RRCResume to restore QoE configurations is required/beneficial to support at least the case where the UE resumes the connection in a gNB not supporting QoE as well as to release the QoE configurations which are not valid in the new gNB. Since an explicit indication is proposed in both [4] and [8] while [7] seems to be neutral on this topic, RAN2 is requested to discuss and agree the following proposal:

**Proposal 10: 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.**

There are different views on what should happen in case the UE resumes in the gNB not supporting QoE (e.g. in [4] and [8]), so it is further proposed to discuss the following proposal:

**Proposal 11: RAN2 is requested to discuss handling of QoE configurations when resuming the connection in a gNB not supporting QoE (recognized, e.g. by the lack of QoE indication in RRCResume):**

1. **The UE shall release all QoE measurement configurations.**
2. **The UE restores QoE context and performs QoE measurements but pausing QoE reporting.**

It is also proposed to discuss further whether it is required to allow a possibility for a target gNB to pause QoE measurement reporting during RRC Resume procedure, as proposed in [8]:

**Proposal 12: RAN2 is requested to discuss whether it should be possible for the gNB to restore and pause QoE measurement reporting for some/all QoE configurations during RRC Resume procedure.**

# 3 Offline [046] discussion

## 3.1 Potential easy agreements

The following proposals from [10] were identified by the rapporteur as potential easy agreements:

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| **Proposal 1: RAN2 assumes that all QoE mobility related agreements made by RAN2 are applicable at least to signalling based QoE. Whether the same applies to management-based QoE is pending further input from SA5 and RAN3.**  **Proposal 2: Area scope parameter is not introduced in RRC procedures supporting QoE.**  **Proposal 3: The target gNB decides which QoE configurations to keep and which to release during a handover, e.g. based on QoE configuration information received from the source gNB in Xn signalling and/or UE’s current RRC configuration of QoE.**  **Proposal 7: When the UE moves to RRC IDLE state, it releases SRB4, releases all QoE configurations and discards any pending or not reported QoE data.**  **Proposal 8: The UE discards the reports received from application layer in case it has no associated QoE configuration configured.**  **Proposal 10: 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.** |

**Question 1: Companies are requested to indicate in the below table in case they object to any of the proposals above.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Objected proposal** | **Reason for objection / alternative proposal** | **Rapporteur reply** |
| CMCC | 8 | We may not be able to decide Proposal 8 for now, and recall that we haven’t got the reply on LS to SA4 asking where to store the report, and we haven’t got the reply on LS to SA5 asking whether the configuration release will impact the ongoing session. So it might be safer to wait for feedbacks. | As mentioned below - P8 is not related to pause/resume mechanism which we asked SA4 about. The proposal speaks of the case when there is no QoE configuration configured in RRC that corresponds to the report received from app layer. In this situation the UE will never get a possibility to report it and there is no use of storing it. The described situation may happen in case RRC releases the QoE configuration while the QoE measurement is still ongoing in application (and this is possible according to current agreement already) |
| Qualcomm |  | Not object but further clarification  For P3, it is unclear what configuration information in the “*e.g. based on QoE configuration information received from the source gNB in Xn signalling and/or UE’s current RRC configuration of QoE*” part. Actually, RAN3 is discussing this issue.  For P10, it should allow another option, i.e. 1-bit flag indicates to restore all the QoE measurement configurations, which is also proposed in R2-2107817. | As clarified below, for P3: The main purpose of the proposal is to agree that it is target gNB’s decision which QoE configurations to keep and which to release during a handover. RAN3 already agreed that signalling based QOE configuration is forwarded to target gNB and also UE AS context containing QoE RRC configuration will be forwarded, so this information can be used when making the decision (these are just examples anyway).  For P10: I think we can leave how the indication looks like exactly for FFS. |
| Huawei, HiSilicon | No objections, but some clarifications | @CMCC: P8 is not related to pause/resume mechanism which we asked SA4 about. The proposal speaks of the case when there is no QoE configuration configured in RRC that corresponds to the report received from app layer. In this situation the UE will never get a possibility to report it and there is no use of storing it. The described situation may happen in case RRC releases the QoE configuration while the QoE measurement is still ongoing in application (and this is possible according to current agreement already)  @Qualcomm:   * For P3: The main purpose of the proposal is to agree that it is target gNB’s decision which QoE configurations to keep and which to release during a handover. RAN3 already agreed that signalling based QOE configuration is forwarded to target gNB and also UE AS context containing QoE RRC configuration will be forwarded, so this information can be used when making the decision (these are just examples anyway). * For P10: As during a handover without fullConfig, the gNB needs to have a possibility to indicate which configurations to keep and which not to keep (see P3). This is the same for HO with fullConfig as also in this case only a subset of QoE configuration may be relevant (e.g. because the UE moves out of area scope). Therefore, 1-but flag is not sufficient. We could have it as an optimization to handle a special case where all or none QoE configurations are relevant, but is it really worth it? |  |
| LGE | 3 | The intention of P3 seems if the target cell doesn’t belong to the QoE area, then the target will release the QoE during handover. However, according to SA4 requirements UE should keep performing the QoE even after going outside the area if the session is on-going, so the configured QoE would be released when the session stops, not during handover.  Regarding P7/8: We agree with P7/8 but no further agreement is needed on these. It is obvious to release SRB4 upon entering IDLE, and others can be covered by previous agreements.   |  | | --- | | RAN2#114   * At reception of QoE release, the UE shall discard any unsent QoE reports corresponding to the released QoE configuration. * If the UE enters IDLE state, UE should release all of the QoE measurement configurations. | | For P3: This proposal seems to be true regardless of SA4 reply, i.e. in case the QoE configuration should not be released due to ongoing session then the gNB should not release it based on the information received from source gNB and the QoE configuration of the UE, i.e. as in P3. If this requirement does not hold for NR, then the only thing that gNB considers is area scope. In both cases P3 is correct, the difference is just in the information that needs to be forwarded between the gNBs (which is not specified in the proposal).  For P7, I tend to agree this is rather covered by previous agreements, so it might be OK not to have it.  For P8 however, I think this covers another case, i.e. there is no configuration at the UE, but the application layers provides a report. And it needs to be discarded in this case. |
| Ericsson |  | We are fine with all proposals. Regarding the comment from LGE on P3; if there is no ongoing session the target should release the measurement already at the handover if the new cell is outside the area. |  |
| vivo | No objections, but some clarifications | For P3, if the target gNB does not support QoE, then the source gNB may decide to release the QoE configuration. Besides, it is in RAN3 scope.  For P8, we already agreed that if a QoE measurement configuration is released, RRC layer informs the upper layer to release the QoE measurement configuration. Then the UE will not receive the QoE report. | For P3: This proposal is to cover the case where both gNBs support QoE. It can be clarified in the proposal. |
| ZTE |  | We agree all proposals. |  |
| CATT | P3, P8 | For P3, wait for RAN3. RAN3 is discussing the whether the configuration is stored if the target is not in area or not support. But no conclusion now. If then the target node will not release any configuration during HO.  For P8, I don’t think it is reasonable case as vivo mentioned. The RRC layer QoE configuration release should be informed to APP layer. Then the case never happened. | For P3 – as clarified above, this proposal covers the case where target gNB supports QoE. It also follows the agreement that RAN3 made to support option 1 as in R3-212976, so it seems we can move forwards on this already in RAN2. |
| Apple |  | We are fine with all the proposals |  |
| Lenovo | P8 | Looks like a UE misconfiguration when RRC releases the QoE configuration while the QoE measurement is still ongoing in application. Not sure whether we need to specify such abnormal case in the spec. | Whether this is a misconfiguration actually depends on SA4 reply to the question asked by RAN3 in :  “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?”  But even if it was a misconfiguration only, then it might be worth specifying the behavior as in case application layer is involved a misconfiguration might happen as well. |
| Nokia, Nokia Shanghai Bell | P8 | The associated would imply the UE has to be able to recognize the report that corresponds to a configured QoE or not, so an ID should be included in the QoE Report from application layer? | As discussed during the online session, the UE will have to anyway be able to recognize the report one way or another. This can either happen via service type (if only one QoE configuration per service is allowed) or with a QoE ID, if more than one are allowed. |
| Qualcomm-2 |  | For P10, in today’s specification, it already supports 1-bit flag to restore all configurations, copy as following. So using 1-bit flag to indicate QoE restoration is same as DC restoration. This can same MSG 4 size.  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; | With 1-biut approach, if there would be a single QoE configuration which is out of scope of the area in the gNB where the connection is resumed, then all QoE configuration would have to be released. Subsequently the gNB would have to reconfigure those that are relevant. This seems very inefficient. We can keep the details of the indication FFS for now anyway. |
| Intel | P8 | For P8, we also share the same understanding that, when UE is release to RRC\_IDLE, UE may need to send an AT command with discard request to application layer, indicating the application layer should stop recording the requested information. It is similar as deactivation of measurement collection job in LTE, as defined in TS28.405. Hence, the AS layer will not receive the report from application layer after RRC Release. | This assumption is still to be confirmed by SA4. Please see the reply to Lenovo above. |
| Samsung | P3/8 | P3: According to the proposal 3, when UE performs handover outside of measurement area, target gNB (i.e., gNB1) releases QoE configuration. Then, when the UE performs handover once again inside measurement area, we assume a new target gNB (i.e., gNB2) restores and configures the QoE configuration. We would like to discuss on this in addition to P3. However, we can wait for RAN3's discussion, as stated by CATT.  P8: In our understanding, RAN2 does not need to discuss this proposal. In fact, RAN2 already agreed: When QoE configuration is released, any unsent reports are discarded. And RRC layer informs the upper layer to release the QoE configuration. It means, after release, no more reports are expected from application layer. Therefore, this proposal is duplicate with previous RAN2's agreements:  *1) At reception of QoE release, the UE shall discard any unsent QoE reports corresponding to the released QoE configuration.*  *2) If a QoE measurement configuration is released, RRC layer informs the upper layer to release the QoE measurement configuration. This could be revisited based on other issues’ progress.* | For P3: What you describe is correct in my understanding and this is how option 1 is supposed to work. RAN3 has already made an agreement on this and they already communicated to RAN2 in R3-212976 to trigger RAN2 work. Then, it seems there is no use waiting.  For P8: Please see the reply to Lenovo. |

Summary:  
There were no objections received for proposal 1, 2 and 10. Hence they are deemed agreeable and proposed for agreement without online discussion with only a simple clarification for P10 marked in yellow, based on the received comments:

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| --- |
| **Proposal 1: RAN2 assumes that all QoE mobility related agreements made by RAN2 are applicable at least to signalling based QoE. Whether the same applies to management-based QoE is pending further input from SA5 and RAN3.**  **Proposal 2: Area scope parameter is not introduced in RRC procedures supporting QoE.**  **Proposal 10: 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.** |

Also, it was indicated that most of the parts of proposal 7 were already agreed while the fact that SRB4 is released upon going to RRC IDLE seems obvious. It is then proposed not to discuss this proposal.

Companies raised some concerns towards Proposal 3 and Proposal 8. Proposal 8 seems non-controversial, but some companies believe it is not needed. As clarified by the rapporteur, it might be beneficial/safer to have it agreed anyway, so it is kept as it was and proposed for agreement. For P3, the rapporteur provided further clarifications in the table above. In particular, it was indicated that RAN3 has already made an agreement choosing option 1 and informed RAN2 about this in R3-212976. This proposal is just a further clarification of this option, so the rapporteur would like to keep it for agreement with a clarification that it applies to the case where target gNB supports QoE which was raised by one of the comments.

**Proposal P3\_rev: During the handover to target gNB which supports QoE, the target gNB decides which QoE configurations to keep and which to release during a handover, e.g. based on QoE configuration information received from the source gNB in Xn signalling and/or UE’s current RRC configuration of QoE.**

**Proposal 8: The UE discards the reports received from application layer in case it has no associated QoE configuration configured.**

## 3.2 Discussion on mobility in RRC CONNECTED

Based on the companies contributions, the following proposals were made in [10] with respect to QoE configuration handling during UE mobility (with no full configuration):

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| **Proposal 4: The UE informs the gNB when the QoE measurement session starts or when the session ends, e.g. to enable QoE configuration handling upon mobility or for QoE activation/deactivation procedures.**  **Proposal 5: RAN2 sends an LS to CT1 group to specify session start and session end indications from application to AS layer.**  **Proposal 6: If SA4 confirms that the requirement for configuration changes of ongoing QMC sessions is applicable also for NR QMC: In case the UE moves out of the measurement area during a handover, the target gNB should release the QoE configuration of the UE if the related QoE measurement session is not ongoing and should keep the QoE configurations for which the QoE measurements are ongoing (regardless of whether the UE stays within the associated QoE area or not).** |

The rationale for introduction of session start/stop indications from the UE to the gNB is that:

1. Session start/stop indications are used by the network during session activation and deactivation procedures.
2. Under normal circumstances (e.g. when there is no overload in the network), the gNB should not release the QoE configuration for which the session is ongoing, even when the UE moves out of the QoE measurement area during handover.

It was raised during an e-mail discussion that whether the requirement of QoE measurement continuity outside the measurement area is applicable to NR is still pending SA4 confirmation. RAN3 sent an LS to SA4 to ask this question in [11]. On the other hand, reason mentioned in bullet in 1 seems to still hold for NR. Companies are then requested to answer the following questions:

**Question 2: Do companies agree that the UE should inform the gNB when the QoE measurement session starts or when the session ends?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Reason / comments** |
| CMCC | Yes | Since QoE measurement is an end-to-end behaviour, and gNB is agnostic to whether the ongoing session is over or not otherwise. UE could have such flexibility to inform RAN to perform more flexible configuration release over uu. |
| Qualcomm | No | We have several comments on this proposal, and there are some drawbacks identified.  - For the activation or deactivation purpose, we don’t see the motivation to do that. From RAN point of view, when RAN receives the QMC configuration and then configures to the UE, then the QMC is activated. No need further start or end indication.  - From mobility perspective, RAN3 asked some questions to SA4 about the QoE measurement continuity requirement and whether “release” command will affect the ongoing sessions. SA4 answer will directly impact our discussion. So anyway, we need to wait. And in SA4, Location filter is already introduced TS26.114 and TS26.247 as following, that means UE application layer will check the location to determine whether to start a new session or not. If introducing RAN level mechanism, how to co-exist with application layer mechanism? what is the motivation to introduce RAN level mechanism on top of application layer mechanism?  *“****<LocationFilter>***  *When present, this element indicates the geographic area(s) or location(s) where quality metric collection is requested. When not present, quality metric collection is requested regardless of the device’s location. The LocationFilter element comprises one or more instances of any combination of targeted cell-IDs, polygons and circular areas.Each cell-ID entry in LocationFilter is announced in cellList, and each polygon and circular area entry is announced in the polygonList or and circularAreaList elements, respectively.”*  - We introduce pause and resume mechanism for SRB4, and SRB will be treated as lower priority. The start and end indication cannot be reported to the gNB in time, which will mislead the gNB behaviour.  - There could be multiple APPs running in the UE and multiple QoE sessions for each APP. If we consider per-slice QoE, that could be much more. If UE reports every start and end indication for all the QoE session, a large of signalling overhead will be cost.  - If finally we really need introduce something, we prefer to consider “low cost” and in-time mechanism instead of costing large of Uu signalling overhead. |
| Huawei, HiSilicon | Yes | This is useful not only in case of QoE measurement continuation outside of measurement area, which is pending SA4 reply. Based on SA5 specifications, this indication is also passed to OAM so that OAM knows whether there is sufficient number of QoE measurements ongoing already or not.  Also, we do not really agree with the disadvantages mentioned by Qualcomm. The overhead for sending a single bit indication for session start/stop is very limited and even though SRB4 has lower priority than other SRBs it does not mean that its delay will be significant.  Also, in case SA4 agrees the requirement for mobility holds, then we do not understand how location filter can be used by the gNB for this purpose. gNB has no knowledge about the location filter, so it cannot know whether it should or should not release the QoE configuration when the UE moves out of the are scope. |
| LGE |  | We don’t think UE needs to inform network of ‘session start’. The purpose is not clear.  Since the configured QoE can be released only after the session stop, gNB needs to know the ‘session stop’, but wonder if this information should be provided by UE. |
| Ericsson | Yes | Both session start and stop indications are needed. It is not enough with session stop because if a session has not started the UE will not send any stop indication. If then the UE moves out of the area, the gNB should release the measurements at the area border, but it will not as it hasn’t received any stop indication and may never receive it either if the UE never starts a session. |
| vivo | Depends on the LS reply | For the first purpose about the activation and deactivation, the proponent shall further clarify why RAN should be aware of the QoE measurement status to perform the activation and deactivation.  For the mobility purpose, we think it is essential if SA4 confirm that the QoE measurement cannot be released once start even when UE moves out of the area scope.  In general, we prefer to wait for the LS reply. |
| ZTE | Yes | Below content can be found in section 4.2.1, TS28.405:    (zoom up if needed)   1. *When the application in the serviceType starts, the QMC is initiated.* 2. *The application layer sends the AT command +CAPPLEVMR including a recording session indication that indicates that a session is started to the access stratum.* 3. *The UE sends the message MeasReportAppLayer including the recording session indication to the eNB.*   It is clear that in step 6, 7, and 8, app layer should generate a session start indication when the QMC is initiated. Similar mechanism can be applied to the session end indication. We prefer to follow the SA5’s requirement and introduce the start/stop indications.  The detail of the indications(e.g. whether this indication is inside the QoE container, whether to use this indication during HO, etc) should be FFS. |
| CATT | Yes | For session start indication, SA5 captured in 28.404/405 as ZTE show here.  28.404 5.4.4  Provide the OAM system with an indication that a recording session has started and subsequently allow the OAM system to modify the QoE measurement configuration e.g. the QoE configured area if the number of sessions are too small or too large.  The indication may also be used to determine whether or not to terminate the QoE information collection if sufficient number of recording sessions have been started.  For session end indication, I think the QMC report can be used to indicate the session end |
| Apple | No | Prefer to wait for clarification from SA4 |
| Lenovo | Wait for SA4 reply | We are not convinced on the need of an explicit session start/stop indication from UE to NW. So, let’s wait for the reply LS from SA4.  @ZTE, CATT: there seems a misalignment between SA5 and CT1. Having checked the latest TS 27.007 V17.2.0 (2021-06), clause 8.79 the AT command +CAPPLEVMR is specified there as follows:  +CAPPLEVMR=<app-meas\_service\_type>,<app-meas\_report\_length>,<app-meas\_report>  That means no explicit session start indication has been defined in the AT command +CAPPLEVMR. We suppose a session start is implicitly indicated by the QoE reports sent from UE. |
| Nokia, Nokia Shanghai Bell | No | More understanding is needed on what is meant by "session ends". Is it is end of an application session ? End of reporting session?  If the report is provided periodically, each report (as suggested by companies) would imply “end of session”? |
| Qualcomm-2 |  | About the comments some companies raised that SA5 already introduced Session start or end indication procedure, we understand we only introduce what RAN2 thinks necessary instead of everything defined in SA5. For this special issue, we don’t see the motivation to introduce it. |
| Intel |  | QoE may be report periodically according to *reportinginterval* set in QoE configuration container (for example DASH service as defined in TS26.247). We are wondering whether the QoE report “*MeasReportAppLayer*” is used as end of reporting session, as commented by Nokia. If so, the session end indication is needed to indicate session end to the network.  For session start, we are ok to wait for SA4/5 feedback and then discuss what can be used for session start/ends. |
| Samsung | Yes, but | According to SA5 spec, we support Session start or end indication. However, it seems we need confirmation from SA5 that it applies to NR as well. |

Summary:

Yes: 6 companies, main arguments:

* + - Needed already as per SA5 specifications
    - Needed to handle ongoing QoE session continuity when the UE leaves the QoE area

No: 3 companies, main arguments:

* + - Should investigate whether “implicit” indication is possible
    - Unclear whether SA5/SA4 requirements apply to NR

FFS: 4 companies, main arguments:

* + - Unclear whether SA5/SA4 requirements apply to NR (wait for SA4 reply)

Based on the replies above, the best way forward seems to be to wait for feedback from SA4 on whether the ongoing QoE session should be continued when the UE moves out of QoE measurement area. Therefore it is proposed:

**Proposal [046]-1: FFS whether the UE needs to inform the gNB when the QoE measurement session starts or when the session ends, e.g. to enable QoE configuration handling upon mobility or for QoE activation/deactivation procedures (pending SA4 reply on the ongoing QoE measurement session continuity requirement).**

**Question 3: Do companies agree that, in case SA4 confirms that the requirement for configuration changes of ongoing QMC sessions is applicable also for NR QMC, then if the UE moves out of the measurement area during a handover, the target gNB should release the QoE configuration of the UE if the related QoE measurement session is not ongoing and should keep the QoE configurations for which the QoE measurements are ongoing (regardless of whether the UE stays within the associated QoE area or not).**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Reason / comments** |
| CMCC | Yes | We generally agree to this proposal, but whether it can be turned as an agreement depends on SA4’s feedback. |
| Qualcomm | No | As commented for question 2 |
| Huawei, HiSilicon | Yes | The proposal already assumes that SA4 feedback is considered and is conditional on this feedback. |
| LGE | Yes | We should comply with RAN4 decision on this. |
| Ericsson | Yes |  |
| OPPO | Yes | The report of the QoE measurement ongoing needs to transmitted towards the CN entity with the correct address. |
| vivo | Yes |  |
| ZTE | \_ | This part can be further discussed after RAN2 receives SA4 input. We do not prefer to assume anything at current stage. |
| CATT |  | See the answer to Q1 P8, we may remove “the target gNB should release ….. “ And just keep “and should keep the QoE configurations for which ……” |
| Apple | Yes | Of course we need to wait for SA4 input before agreeing. |
| Lenovo |  | We prefer to wait for the reply from SA4. But it would be acceptable to us to agree on this proposal as assumption. |
| Nokia, Nokia Shangai Bell | No | More clarification is needed before RAN2 can agree and specify this feature. E.g.not clear what exactly "on-going session" means in RAN2 spec language? Is it when a Report for the corresponding QoE Configuration has already been produced or ongoing QoE configuration ? |
| Qualcomm-2 |  | We want to point out, RAN3 asked the exactly same question to SA4 in R2-2106945, we don’t need to discuss it again. And there is no meaning to have any assumption considering we knows SA4/RAN3 will discuss the issue.  *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?* |
| Intel | Yes |  |
| Samsung |  | Wait for SA4's reply. |

Summary:

Yes: 8 companies

No: 2 companies

FFS: 4 companies

Most of the companies are OK with the proposal, but there are also some concerns that is not useful to agree such conditional proposal. Based on this, no proposal is made for now and this can be decided when the reply from SA4 is received.

In [10], also the following proposal was made with respect to UE mobility where full configuration is applied during handover.

|  |
| --- |
| **Proposal 9: Upon FullConfig, the gNB can indicate to the UE the identifiers of QoE configurations which should be kept by the UE and the UE shall continue the QoE measurements for the indicated QoE configurations.** |

The scenario which is targeted by this proposal is when the target gNB supports QoE, but does not support another configuration of the UE and has to apply full configuration due to that reason. It was indicated that in case QoE configurations would be provided by the gNB explicitly, then the UE would have to resend them to the application layer, which would be treated as an overwrite of the previous QoE configuration with the same identifier. Based on this, companies are requested to reply to the following question:

**Question 4: Do companies agree that, upon FullConfig, the gNB can indicate to the UE the identifiers of QoE configurations which should be kept by the UE and the UE shall continue the QoE measurements for the indicated QoE configurations?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Reason / comments** |
| CMCC | Yes |  |
| Qualcomm | Yes but | Generally ok, but need the source gNB forwards the RRC ID together with the Reference and configuration to the target gNB. |
| Huawei, HiSilicon | Yes | As for QCM’s comments, we understand that this will be done as for each handover (source gNB does not know whether target gNB performs fullConfig or not, it just passes information as usual). |
| LGE | Yes |  |
| Ericsson | Yes | Agree that the RRC ID and QoE reference for each configuration needs to be forwarded at handover. This mapping is never sent to the UE, so it will not be part of the UE configuration that is forwarded at handover in container. Therefore, this information needs to be added outside the containers in RAN3 message. |
| OPPO | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| CATT | Yes |  |
| Apple | Yes |  |
| Lenovo | Yes |  |
| Nokia, Nokia Shanghai Bell | No | *Full configuration* is in principle to release and clear most of any configurations except MCG C-RNTI and security. By default the UE should delete all QoE configuration, as regular HO could not be performed for reason.  Companies seem to support the proposal for HO, but not clear if for Full COnfiguration |
| Intel | No | We share the same view with Nokia. We don’t see a clear benefit why we need to consider a special handling for QoE in FullConfiguration. |
| Samsung | Yes |  |

Summary:

Yes: 12 companies

No: 2 companies

Vast majority of companies supports the proposal that, upon FullConfig, the gNB can indicate to the UE the identifiers of QoE configurations which should be kept by the UE and the UE shall continue the QoE measurements for the indicated QoE configurations. Two companies prefer to clear the QoE configuration upon HO with full configuration. Based on clear majority preference, the following is proposed:

**Proposal [046]-2: Upon FullConfig, the gNB can indicate to the UE the identifiers of QoE configurations which should be kept by the UE and the UE shall continue the QoE measurements for the indicated QoE configurations.**

## 3.3 Mobility in RRC INACTIVE

Except for Proposal 10 from [10] which addresses QoE handling during connection resume in the gNB supporting QoE, the following proposal was made in [10] for the case where the connection is resumed in the gNB not supporting QoE.

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| --- |
| **Proposal 11: RAN2 is requested to discuss handling of QoE configurations when resuming the connection in a gNB not supporting QoE (recognized, e.g. by the lack of QoE indication in RRCResume):**   1. **The UE shall release all QoE measurement configurations.** 2. **The UE restores QoE context and performs QoE measurements but pausing QoE reporting.** |

Option 1 assumes that the QoE configurations are simply released by the UE as they cannot be reported in the gNB not supporting QoE and such gNB cannot anyway belong the QoE measurement area scope.

Option 2 on the other hand proposes that even though the measurements cannot be reported to the gNB where the connection was resumed, they can be stored in the UE and reported later. However, during e-mail discussion, there were some doubts raised about the feasibility of this approach on the network side. Specifically, it was pointed out that the QoE configurations need to be forwarded between gNBs at handover, but a gNB which does not support QoE can never forward any QoE information.

Base on the above, companies are requested to answer to the following question.

**Question 5: In your opinion, in case the UE resumes the connection in a gNB not supporting QoE, the UE should:**

**Option 1: The UE should release all QoE measurement configurations.**

**Option 2: The UE should restore QoE context and perform QoE measurements but pause QoE reporting.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred approach** | **Reason / comments** |
| CMCC | Option 1 | Option 1 seems to be a simple way that will not cause mismatch between gNB and UE. |
| Qualcomm | Option 2 | Can satisfy QoE measurement continuity and to keep application measurement behaviour agnostic to RAN situation. |
| Huawei, HiSilicon | Option 1 | As indicated above, option 2 seems not to work and proponents should first clarify how to address the issues that were raised.  We also do not understand why QoE measurement continuity is mentioned here if it is challenged even for RRC Connected mode QoE? Especially considering that in RRC Inactive the UE will have no ongoing QoE measurements so what is to be continued? |
| LGE |  | RAN2 agreed to deprioritize the QoE in INACTIVE.   * Confirm that RAN2 deprioritizes QoE measurement in RRC\_IDLE/RRC\_INACTIVE in Rel-17.   So it seems reasonable to release the QoE configuration upon entering RRC\_INACTIVE. |
| Ericsson | Option 1 | Option 2 doesn’t work for the reason mentioned by the rapporteur. A gNB that doesn’t support QoE measurements cannot forward the necessary information to the next gNB, so the information will be lost in the network side. |
| OPPO | Option 1 | Transmission of QoE configuration via AMF is needed for the Option 2, which is too complicated |
| vivo | Option 1 | Proponent should clarify how does the Option 2 work.  Even if the UE continue measurements in the current gNB does not support QoE and buffer data in application layer for further transmission, the UE is not expected to move to the gNB that support QoE in a certain time. Further, SA4 has not agreed to buffer the report in APP layer yet. |
| ZTE | Option1 | Share the same view with Ericsson. |
| CATT | Option 1 | For resume, the continuings is not needed |
| Apple | Option 1 |  |
| Lenovo | Option 1 |  |
| Nokia, Nokia Shanghai Bell | Option 1 | If the gNB does not support QoE, UE needs to delete all QoE config. If not the UE will still be configured for QoE but enable to forward the Report. In a next move to a gNB that supports QoE, the UE configuration would be lost at NW side and there could be configuration conflicts, so that it is better that UE deletes all QoE config if no QoE info is received at RRC Resume. |
| Intel | Option 1 | Agree with Ericsson, there will be no configuration handover to the next gNB of non-QoE supporting gNB. Hence, the UE will be anyway reconfigured by the next gNB of this non-QoE supporting gNB. The stored context and measurements will be discarded at that time as well. There’s no clear benefit to store it when handover to a non-QoE supporting gNB. |
| Samsung | Option 1 | Agree with rapporteur |

Summary:

Option 1: 12

Option 2: 1There is a very clear majority of companies in favour of option 1, i.e. in case the UE resumes the connection in a gNB not supporting QoE, the UE should release all QoE measurement configurations. Based on this, the following is proposed:

**Proposal [046]-3: In case the UE resumes the connection in a gNB not supporting QoE, the UE should release all QoE measurement configurations.**

There was also a proposal in one of the contributions which is echoed in [10] in the following way:

|  |
| --- |
| **Proposal 12: RAN2 is requested to discuss whether it should be possible for the gNB to restore and pause QoE measurement reporting for some/all QoE configurations during RRC Resume procedure.** |

In the rapporteur’s understanding this proposal applies to connection resume under gNB supporting QoE and is an optimization on top of baseline behaviour proposed by Proposal 10 from [10]. The rationale is that the connection can be resumed under the gNB which is in overload condition. In this case, instead of releasing the QoE configuration (which would already be possible in case Proposal 10 is agreed), the gNB would have a possibility to pause reporting for some of the configurations. The companies are then requested to answer the following question:

**Question 6: Do companies think that it should be possible for the QoE supporting gNB to restore and pause QoE measurement reporting for some/all QoE configurations during RRC Resume procedure.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Reason / comments** |
| CMCC | Yes | gNB could have such flexibility for overload control. |
| Qualcomm | Yes | Useful for the case of resume in RAN overload, no need another reconfiguration procedure to pause QoE configuration. This is the same handling for today’s SCG bearers restoration. |
| Huawei, HiSilicon | Rather not | When the UE moves from RRC INACTIVE, it has no ongoing QoE measurements. In that situation, the gNB can just release the configurations if there is overload. This seems rather as a minor optimization. |
| LGE |  | RAN2 agreed to deprioritize the QoE in INACTIVE.   * Confirm that RAN2 deprioritizes QoE measurement in RRC\_IDLE/RRC\_INACTIVE in Rel-17.   So it seems reasonable to release the QoE configuration upon entering RRC\_INACTIVE. |
| Ericsson |  | No strong need. |
| OPPO | No | Not needed. Agree with Huawei that gNB could just release configurations if air interface resource is overloaded. |
| vivo | No for now | The intention make sense as the target Node can inform the RAN overload and pause the QoE reporting via both RRCResume and RRCReconfiguration.  However, the detailed mechanism of QoE measurement reporting pause in RRC\_CONNECTED has not decided yet pending on LS reply from SA4.  Therefore, we prefer to revisit this proposal after the pause mechanism become stable. |
| ZTE | No | Share the similar view with HW. |
| CATT | No |  |
| Apple | No | Seems like an optimization |
| Lenovo | No | We don’t see the stringent need for such optimization. |
| Nokia, Nokia Shanghai Bell | Yes | We agree with Qualcomm that restoration procedure can be used as a baseline and (possibility for) resuming one by one would help if we end up with multiple configurations |
| Intel | Yes | QoE measurement report is suspended and QoE configuration is stored when UE goes to RRC\_INACTIVE state. QoE measurement in application layer is also suspended. When UE goes back to RRC\_CONNECTED state, QoE configuration will be restored and application layer will continue its QoE measurement. The UE may also send the stored QoE measurement report which has not been sent before it goes to RRC\_INACTIVE. |
| Samsung |  | Same view with vivo. If we agree to selective pause later, RAN2 may discuss this issue. |

Summary:

Yes: 4

No: 6

FFS/no strong view: 3

There slight majority of companies prefers not to allow a possibility for the QoE supporting gNB to restore and pause QoE measurement reporting for some/all QoE configurations during RRC Resume procedure, as the gNB may release the configurations in case of overload in such situation. On the other hand, companies indicate that restoration procedure might be reused for this purpose and some companies propose to wait until more details for pause/resume mechanism are known. Based on this, the rapporteur proposes to wait for further details about pause/resume mechanism and no proposal is made at this moment.

# 4 Summary

Due to no objections raised during the discussion, the following proposals are deemed agreeable and proposed for agreement without online discussion:

|  |
| --- |
| **Proposal 1: RAN2 assumes that all QoE mobility related agreements made by RAN2 are applicable at least to signalling based QoE. Whether the same applies to management-based QoE is pending further input from SA5 and RAN3.**  **Proposal 2: Area scope parameter is not introduced in RRC procedures supporting QoE.**  **Proposal 10: 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.** |

The following proposals received some comments, but the rapporteur believes that with additional clarifications, they can be agreeable:

|  |
| --- |
| **Proposal P3\_rev: During the handover to target gNB which supports QoE, the target gNB decides which QoE configurations to keep and which to release during a handover, e.g. based on QoE configuration information received from the source gNB in Xn signalling and/or UE’s current RRC configuration of QoE.**  **Proposal 8: The UE discards the reports received from application layer in case it has no associated QoE configuration configured.** |

The following proposals are based on the discussion in section 3.2. and 3.3 and they also seem agreeable due to either expressing an FFS or a view of a very clear majority of companies:

|  |
| --- |
| **Proposal [046]-1: FFS whether the UE needs to inform the gNB when the QoE measurement session starts or when the session ends, e.g. to enable QoE configuration handling upon mobility or for QoE activation/deactivation procedures (pending SA4 reply on the ongoing QoE measurement session continuity requirement).**  **Proposal [046]-2: Upon FullConfig, the gNB can indicate to the UE the identifiers of QoE configurations which should be kept by the UE and the UE shall continue the QoE measurements for the indicated QoE configurations.**  **Proposal [046]-3: In case the UE resumes the connection in a gNB not supporting QoE, the UE should release all QoE measurement configurations.** |

# References

1. R2-2107513 QoE handling in RAN Nokia, Nokia Shanghai Bell
2. R2-2108110 Mobility Support for NR QoE Management Ericsson
3. R2-2108111 [Draft] Support for Session Start and Session End Indication Ericsson
4. R2-2108207 QoE handling during UE mobility Huawei, HiSilicon
5. R2-2108228 Discussion on NR QoEcontinuity in handover ZTE Corporation, Sanechips
6. R2-2108595 Discussion on QoE continuity during mobility vivo
7. R2-2108514 More considerations on configuration and reporting CMCC
8. R2-2107817 Left issues for QoE pause and resume procedure Qualcomm Incorporated
9. R2-2107381 Activation and deactivation for QoE collection CATT
10. R2-2109040 [Pre115-e][008][QoE] Summary Support for Mobility Huawei, HiSilicon
11. R2-2106945 LS on requirement for configuration changes of ongoing QMC sessions (R3-212953; contact: Qualcomm)