3GPP TSG-RAN WG3 #114bis-e R3-221040

Online, 17th – 26th Jan 2022

Agenda Item: 15.4

Source: Qualcomm Incorporated (moderator)

Title: SoD on CB: # QoE6\_MDTAlignment

Document for: Approval

# Introduction

**CB: # QoE6\_MDTAlignment**

**- Alignment approach: Network based or UE based?**

**- Whether OAM need to include QoE Reference of QMC inside MDT configuration? Whether to include QoE Reference in MDT configuration sent to UE?**

**- Include QoE reference in MDT report for ID correlation in case of QoE Reference associated with multiple MDT reports?**

**- MDT/QMC alignment in split architecture. E1/F1 enhancement?**

**- Whether RAN needs to add time stamp information for MDT and QMC reports to assist with correlation? Other information included by RAN and sent to MCE? e.g., UE’s serving cell CGI, C-RNTI, etc.?**

**- Alignment scenarios: s-based QMC and m-based MDT?**

**- Whether and how to achieve alignment in case QoE reporting is paused? Any enhancement needed or not?**

**- DRB information related to the QoE measurement should be indicated to the gNB or QoE server for correlation?**

**- Focus on key issues, capture agreements and provide TPs if agreeable.**

(Qualcomm - moderator)

Summary of offline disc [R3-221040](Inbox\\R3-221040.zip)

# For the Chair’s Notes

TBD

# Round-2 Discussion

TBD

# Round-1 Discussion

## Alignment approach

The following options to align radio-related measurement with QoE measurement have been considered in the previous meetings:

* **Option 1 (OAM based alignment):** OAM can activate/deactivate QoE and MDT appropriately (already agreed)
* **Option 2 (UE assisted alignment):** UE indicates start/stop of QMC to the gNB (application session start and end). Upon receiving the start indication from the UE, the RAN configures the UE with an Immediate MDT configuration
* **Option 3 (UE based alignment)**: UE access stratum keeps MDT configuration pending until the application layer session starts

In this section, the moderator seeks inputs on whether to support option 2 or option 3 should be supported in addition to option 1 (which is already agreed). Companies’ views in the contributions are summarized below:

**[1], Ericsson: 🡪 option 2**

**Proposal 1:** Send an LS asking RAN2 to specify in RRC signalling the Measurement Session Start and Measurement Session End indications, based on the draft LS presented in Annex A of this paper.

**[6], Samsung 🡪 option 2**

**Proposal 4:** RAN3 agrees that session start indication should be transmitted from UE when the QoE measurement starts at UE Application for the time alignment.

**Proposal 8:** The session start indication and session end start indication of QoE measurement should be transmitted over Uu.

**[7], CATT: 🡪 option 2 or option 3**

**Proposal 1**: UE assisted solution (e.g., UE indicates start/stop time of QoE, UE keeps MDT configured pending at RRC till session starts) should be supported if the MDT is configured only for QoE analysis

**[2], Qualcomm:**

Observation 1: Start and stop time of QoE measurements are already included by UE APP in the QoE report sent to OAM/MCE as seen from the following clause in TS 26.114:

*The startTime and stopTime attributes identifies the client NTP time when the measurements included in the report were started and stopped. The time is based on the local real-time clock in the client and might not be consistent with the true NTP time. However, assuming that the reporting is done without any extra delay the server can use the stopTime attribute to correct the timestamps if necessary.*

**Proposal 1:** There is no need to include session start/stop indication from the UE access stratum over RRC for aligning legacy QoE and MDT; start/stop time included by UE APP in the QoE report to OAM is sufficient for alignment purposes. 🡪 No for option 2

**Proposal 2:** OAM based alignment approach i.e. OAM should activate/deactivate QoE/MDT appropriately (e.g., based on startTime/stopTime) is sufficient for aligning radio-related measurements and QoE measurements **🡪 option 1**

**Proposal 3:** UE based alignment approach i.e., the UE keeps MDT configuration pending at RRC till an application session starts should not be considered as such a “suspend” mechanism at RRC doesn’t exist in the current specifications. 🡪 No for option 3

**[3], Nokia**

Proposal 4: The gNB will use the first application layer report sent by the UE to trigger MDT configuration, so there is no need to make the Recording Session Indication explicitly visible to the gNB (hence no RRC impact for session start indication). 🡪 No for option 2

Proposal 5: The gNB adds time stamps to MDT and QMC reports using the same clock at the point in time when the reports transits via the gNB.

**[5], Huawei**

**Proposal 1:** RAN3 to discuss which option to adopt as the solution to the alignment between MDT measurement and QoE measurement. 🡪 Neutral

Considering there is not much support for option 3 and the concern raised by Proposal 3 in [2], the moderator proposes to only discuss Option 2 in Q1 below:

**Q1: Whether option 2 (UE indicating session start/end) needs to be supported in addition to already agreed option 1 (OAM can align MDT/QoE appropriately and is also assisted via session start/end timestamps in QoE report)?**

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| --- | --- | --- |
| Company | Whether Option 2 is needed | Comment |
| ZTE | No | The start/end time is included in the QoE report by UE APP. There is no need for UE to send any start/end indication to gNB. After all, it is the MCE to perform the correlation of MDT and QoE measurements. |
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## Whether OAM need to include QoE Reference of QMC inside MDT configuration?

**[1], Ericsson:**

**Observation 6**: Based on the TR received from the OAM in the QoE configuration, the RAN can configure the same UE with an m-based Immediate MDT configuration.

**Proposal 7:** There is no need to include the QoE reference in the MDT configuration for the purpose of enabling the RAN to select the same UEs for MDT and QMC.

**[3], Nokia:**

**Proposal 2**: OAM includes the QoE reference of the QMC configuration in m-based MDT configuration sent to NG-RAN in order to enable the gNB to select same UEs for MDT and QMC and to link the MDT configuration to the corresponding QMC configuration for which alignment is requested.

**Proposal 7**: OAM includes the QoE reference of the QMC configuration in s-based MDT configuration sent to NG-RAN in order to enable the gNB to link the MDT configuration to the corresponding QMC configuration for which alignment is requested.

**[4], CUC:**

**Proposal 1**: OAM should configure an m-based MDT along with m-based QoE with the same area scope.

**Proposal 2**: NG-RAN should ignore the new MDT configuration along with the m-based QoE if there is an ongoing MDT measurement for the selected UE.

**Proposal 3**: An explicit indication for NG-RAN to perform alignment of MDT and QoE should be needed.

**[5], Huawei:**

Proposal 4: Not need to introduce the QoE reference in the MDT configuration.

**[8], ZTE:**

Proposal 1: There is no need for OAM to additionally include the QoE Reference of QMC configuration in m-based configuration sent to NG-RAN.

**[2], Qualcomm:**

**Proposal 7**: Alignment of m-based MDT and m-based QoE can only be achieved for UEs which satisfy the area scope of both MDT and QMC. Alignment can’t be achieved for UEs which don’t satisfy the common area scope.

**Proposal 9:** UE selection process for m-based MDT and m-based QoE should not be impacted for the sake of MDT-QoE alignment, for example, OAM should not include the QoE reference of the QMC configuration in m-based MDT configuration sent to gNB in order to select same UEs for MDT and QMC

**Q2: Whether OAM need to include the QoE Reference of QMC inside MDT configuration sent to NG-RAN?**

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| Company | Yes or No | Comment |
| ZTE | No | We don’t think any impact on current MDT mechanism should be introduced. |
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## MDT/QMC alignment in split architecture

**[1], Ericsson:**

**Proposal 4**: There is no need to send the QoE measurement status information from the CU-CP to the CU-UP and DU for the purpose of QoE – MDT alignment.

**Proposal 5:** The CU-CP sends the Immediate MDT configuration to the split RAN entities only after the QoE Measurement Session Start indication has been received from the UE.

**[6], Samsung:**

**Proposal 9**: In split architecture, the session start indication and session end start indication of QoE measurement should be transmitted over F1AP and E1AP.

**Proposal 10:** If option 1 “Pending Immediate MDT measurements until the session start is indicated” is agreed, an indicator is needed to notify the UE/DU/CU-UP not start MDT measurement once configured.

**[8], ZTE:**

**Proposal 3:** The corresponding procedure for split architecture should be specified in 38.401, considering s-based QoE and s-based MDT, m-based QoE and m-based MDT, no matter E1/F1 enhancement is needed or not.

**Observation 1:** In split architecture, gNB-CU-CP, gNB-DU and gNB-CU-UP can all perform MDT measurements, as specified in clause 8.13 of TS38.401. For gNB-CU-CP, the SA solution can be applied and no enhancement is needed. For gNB-DU and gNB-CU-UP, E1 and F1 enhancement is needed for alignment of MDT and QoE.

**Observation 2:** With the QoE Assistance information, the gNB-DU and the gNB-CU-UP can be notified about the information needed for the alignment of QoE and MDT, such as when to send the MDT and QoE reports to the MCE and when to stop, the IP address of the MCE, etc.

**Proposal 5**: To introduce QoE Assistant Information IE over F1AP and E1AP for alignment of QoE report and MDT report.

**[2], Qualcomm:**

**Proposal 6**: CU-CP should inform DU and CU-UP (the entities that are performing a portion of the MDT measurements e.g., M5/M7) about the MCE address where the aligned QoE/MDT reports are collected so that it can send the MDT reports to MCE as well (in addition to TCE)

**Q3: Whether any F1/E1 enhancement needed to support MDT-QoE alignment in split gNB architecture?**

* **Option 1:** There is no need to send the QoE measurement status (session start/stop) information from the CU-CP to the CU-UP and DU for the purpose of QoE – MDT alignment. The CU-CP sends the Immediate MDT configuration to the split RAN entities only after the QoE Measurement Session Start indication has been received from the UE.
* **Option 2**: gNB-DU and the gNB-CU-UP can be notified about the information needed for the alignment of QoE and MDT, such as when to send the MDT and QoE reports to the MCE and when to stop, the IP address of the MCE, etc.

It is moderator’s view that the support of session start/stop indication from CU-CP to DU and CU-UP in case of option 2 also depends on the discussion in section 3.1. However, whether CU-CP can indicate the IP address of the MCE to DU and CU-CP (so that the split RAN entities can forward the MDT results to MCE in addition to TCE) can be an independent discussion.

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| Company | Option 1 or Option 2 | Comment |
| ZTE | Option2 with some revision | It seems our proposal has caused some ambiguity. We would like to make some clarification here.  Firstly we want to clarify on some wording in our proposal ‘when to send the MDT and QoE reports to the MCE and when to stop’, which is highlighted in green by Moderator. The words does not equal to the session start/stop indication discussed in section 4.1. btw we are not supporting start/stop indication in that part.  Actually ‘when to start/stop’ is related to the activation and deactivation of QMC, which we call called ‘QoE measurement status change’ in our paper (but seems the words ‘QoE measurement’ should be removed to avoid ambiguity). To be specific, if at least one QMC with the alignment indication(Trace ID) is received by CU-CP, the CU-UP/DU should starts sending MDT reports to MCE for alignment. Likewise, when all the QMC with alignment requirement are deactivated in CU-CP, the CU-UP/DU should be notified to stop sending MDT reports to MCE.  That’s why we propose to add the new IE ‘**QoE Assistance Information IE**’ over E1/F1. In order to prevent ambiguity, we try to make some revision on our proposal and further clarify our intention here.  The new introduced **QoE Assistance Information IE** over E1/F1, which includes the following two IEs:  **- ~~QoE measurement~~ status change information (e.g., start, stop, etc.)**  **- MCE IP address**  The status change information is used for CU-UP/DU to take corresponding actions like starting or stopping sending MDT reports to MCE, which at least includes the following two cases:   * when CU-CP receives at least one QMC configuration which includes a Trace Id (the implicit indicator as we agreed for MDT alignment) , the gNB-CU-CP should immediately send a QoE Assistance Information to CU-UP/DU, by setting status change information IE into ‘Start’, to notify the gNB-CU-UP or gNB-DU to start sending MDT reports to MCE. * when CU-CP receives the deactivation message resulting in the deactivation of all existing QMC with alignment requirement, it should send a QoE assistance Information IE to notify the CU-UP/DU to stop sending MDT reports to MCE, by setting the status change information into ‘Stop’.   We think the status change information is needed, so that the MDT reports in gNB-CU-UP and gNB-DU can be well handled for the alignment with QMC. And of course MCE IP address is also needed for CU-UP/DU to transmit the MDT reports to MCE.  Hope the discussion above clarifies.  And we try to make a revision on Option 2 as below to make it more clear:   * gNB-DU and the gNB-CU-UP can be notified about the information needed for the alignment of QoE and MDT, such as ~~when to send the MDT and QoE reports to the MCE and when to stop~~ status change information to indicate DU/CU-UP to start/stop sending MDT reports to MCE, the MCE IP Address, etc. |
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## Alignment between s-based QoE and m-based MDT

**[1], Ericsson:**

**Observation 5:** The OAM may use the following solutions for the alignment of s-based QoE and m-based MDT measurement at a UE:

• Configuring an m-based MDT measurement in the same area where an s-based QoE measurement is configured for the UE and asking the RAN node to align the s-based QoE measurement and m-based MDT measurement.

• Requesting the RAN node (as part of s-based QoE configuration) to opportunistically align the s-based QoE measurement with any available MDT measurement for the UE.

**Proposal 2:** The Rel-17 NR QMC supports the alignment scenario between s-based QoE and m-based MDT measurements for the same UE.

**Proposal 3:** The OAM can request a RAN node to align any available MDT measurement with an s-based QoE measurement running at the same time at the UE.

**[3], Nokia:**

**Proposal 1:** Rel-17 NR QMC will NOT support the scenario: s-based QoE and m-based MDT

>> If this scenario were to be supported, a new UE selection mechanism for m-based MDT would be needed. This mechanism would have to ensure that UEs receiving s-based QMC activation are selected for m-based MDT, and we think that such mechanism doesn't fit well with legacy m-based MDT selection mechanisms and therefore should be avoided. Also, nothing prevents an operator to also provide s-based MDT configuration together with s-based QMC.

**[8], ZTE:**

**Proposal 4:** There is no need to support the alignment of s-based QoE and m-based MDT. It can be left to R18.

**[2], Qualcomm:**

**Proposal 8:** Alignment of s-based QoE and m-based MDT is not always guaranteed (as there is no guarantee that a UE configured with s-based QoE also meet the requirements of m-based MDT). Alignment can however be achieved for those UEs which are configured with s-based QoE and also meets the requirements of m-based MDT.

**Q4: Whether the alignment of s-based QoE and m-based MDT should be supported? If yes, which alignment options can be considered?**

**Option 1:** Configuring an m-based MDT measurement in the same area where an s-based QoE measurement is configured for the UE and asking the RAN node to align the s-based QoE measurement and m-based MDT measurement.

**Option 2:** Requesting the RAN node (as part of s-based QoE configuration) to opportunistically align the s-based QoE measurement with **any available** MDT measurement for the UE.

* Extend the ***MDT Alignment Information*** CHOICE structure in the QoE BL CRs for TS 38.413 and TS 38.423 with an indication requesting the recipient NG-RAN node to align the s-based QoE measurement with any available MDT measurement

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| --- | --- | --- | --- | --- |
| CHOICE *MDT Alignment Information* | O |  |  | Indicates the MDT measurements with which alignment is required. |
| >S-based MDT |  |  |  |  |
| >>NG-RAN Trace ID | M |  | OCTET STRING (SIZE(8)) | This IE is composed of the following: Trace Reference defined in TS 32.422 [11] (leftmost 6 octets, with PLMN information encoded as in 9.3.3.1), and Trace Recording Session Reference defined in TS 32.422 [11] (last 2 octets). |
| >M-based MDT |  |  |  |  |
| >>Trace Reference | M |  | OCTET STRING (SIZE(6)) | *Trace Reference* defined in TS 32.422 [11]. |
| >Any MDT Measurement |  |  |  | This option is present only in the case of s-based QoE measurement. |

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| Company | Option 1 and/or Option 2 | Comment |
| ZTE |  | We don’t see any strong necessity to support the alignment of s-based QoE and m-based MDT. Additional , how to ensure the UEs receiving s-based QMC activation are selected for m-based MDT is not clear. It can be left to R18 if needed.  And Option 1 cannot be accepted. As has been mentioned, MDT configuration should not be impacted by QoE, not even in the selection of area. |
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## Timestamp information in QoE report sent to MCE

**[3], Nokia:**

**Proposal 5:** The gNB adds time stamps to MDT and QMC reports using the same clock at the point in time when the reports transits via the gNB.

**[8], ZTE:**

**Proposal 2:** MCE can use the session start and end information inside the QoE report to help with the correlation between MDT and QoE. There is no need for RAN to add the start and end time to the QoE measurement report. No enhancement is needed for the case that QoE reporting is paused.

**[2], Qualcomm:**

**Observation 1:** Start and stop time of QoE measurements are already included by UE APP in the QoE report sent to OAM/MCE as seen from the following clause in TS 26.114**:**

*The startTime and stopTime attributes identifies the client NTP time when the measurements included in the report were started and stopped. The time is based on the local real-time clock in the client and might not be consistent with the true NTP time. However, assuming that the reporting is done without any extra delay the server can use the stopTime attribute to correct the timestamps if necessary.*

**Proposal 4**: As UE already includes the session start and end time stamp in the QoE report sent to OAM, NG-RAN need not include the session start/end timestamp in the QoE report sent to MCE to avoid duplicity.

**Proposal 5**: Make following changes to the previous agreement:

*To enable time alignment between an already ongoing Immediate MDT and a QoE measurement started later, the start time and end time of the QoE measurement* ***included in the QoE report can be used****, in addition to the Trace Reference and Trace Recording Session ID~~, needs to be added to the QoE measurement report at the NG-RAN node~~.*

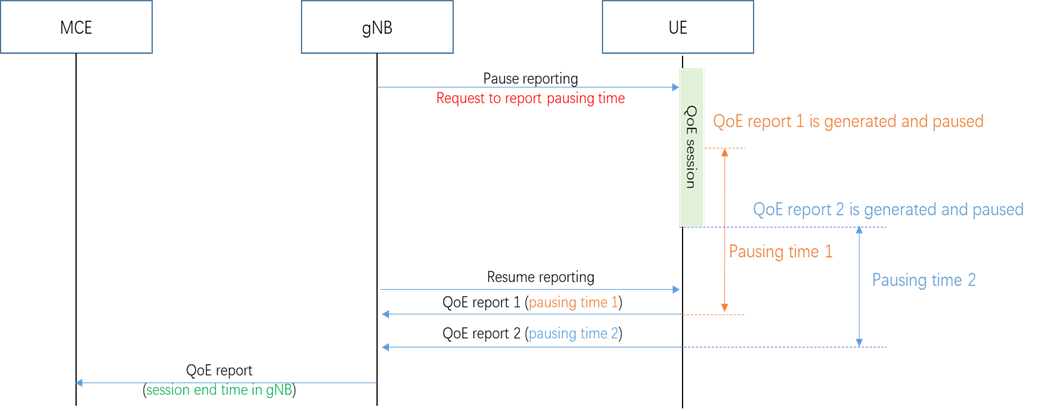
**Q5:** Companies are requested to provide their preference on the following 2 options for time alignment:

**Option 1:** startTime / stopTime already included by UE in QoE report is sufficient for time alignment at MCE

**Option 2:** NG-RAN needs to explicitly add session start/end timestamp information in the QoE report sent to MCE

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| Company | Option 1 or Option 2 | Comment |
| ZTE | Option 1 | Start time and stop time are already included in the QoE report. It seems unnecessary for the NG-RAN to add start/end time information with the QoE report sent to MCE. |
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## QoE–MDT alignment when QoE reporting is paused



**[3], Nokia:**

Observation: MDT/QMC alignment in case of paused QoE reporting will require the UE to report the time elapsed between generating the QoE report and the time of reporting the QoE report via RRC.

**[5], Huawei:**

Observation 3: As long as QoE measurement start and end time corresponding to each QoE measurement report are available at RAN side, i.e., option 1 above is adopted, there will be no issue for the alignment between MDT and a paused QoE measurement report.

**[6], Samsung:**

Proposal 5: If the QoE report is paused, a pausing time should be included in the QoE report to help gNB calculate the actual session start and end time in gNB clock.

Proposal 6: A request to report pausing time should be notified to UE in advance to distinguish the normal QoE report without alignment requirements.

**[7], CATT:**

Proposal 4: In case of alignment between MDT and a paused QoE, UE does not report the time elapsed between generating the QoE report and the time of reporting the QoE report

**[8], ZTE:**

Proposal 2: MCE can use the session start and end information inside the QoE report to help with the correlation between MDT and QoE. There is no need for RAN to add the start and end time to the QoE measurement report. No enhancement is needed for the case that QoE reporting is paused.

**[2], Qualcomm:**

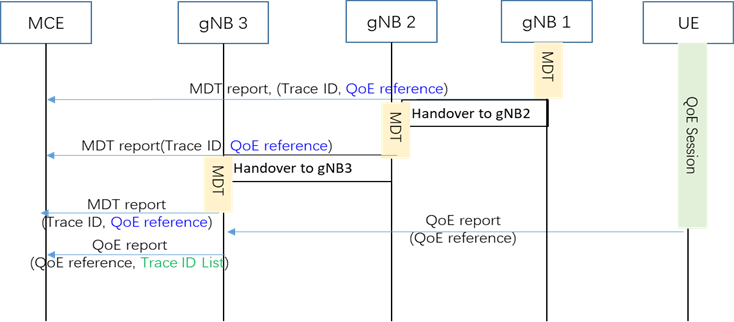
Proposal 10: There are no enhancements needed to support alignment between MDT and a paused QoE, for example, UE need NOT report the time elapsed between generating the QoE report and the time of reporting the QoE report i.e., when reporting is resumed

**Q6: Whether UE should report the Pausing time i.e., the time elapsed between generating the QoE report and the time of reporting the QoE report via RRC, to achieve alignment when QoE reporting is paused?**

It is moderator’s view that this “pausing time” is not only restricted to the pause/resume scenario in case of overload e.g., a UE would report the QoE report via RRC only when it has SRB4 and when there are sufficient grants available; so this delay is inherent and can’t be avoided in most cases.

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| --- | --- | --- |
| Company | Yes or No | Comment |
| ZTE | No | No matter how long the QoE reporting is paused, the start/end time in the QoE report can be enough for MCE to perform correlation. There is no need to report the time elapsed. |
|  |  |  |

## Case when QoE measurement session span across multiple gNBs with different Trace IDs



**[6], Samsung**

**Observation 1:** In case of m-based/s-based QoE and s-based MDT, one QoE report may be associated with multiple gNBs, if adding using trace ID for correlation, multiple NG-RAN Trace IDs and corresponding time duration should be transmitted over Xn and included in the QoE report at the gNB that receives the QoE report.

**Proposal 3:** To support the ID correlation in case of one QoE report associated with multiple MDT reports from different gNBs, RAN3 agrees to include QoE reference in MDT report for ID correlation.

**Q7:** Do companies acknowledge the scenario as shown in the above figure as described in [6]? If so, companies’ views are requested on their preference in the following 2 options.

* **Option 1:** Include QoE Reference in MDT report
* **Option 2:** Include “Trace ID **List**” in QoE report

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| Company | Option 1 or Option 2 | Comment |
| ZTE |  | We think the scenario considered by [6] is a corner case. There is no need to take any further actions for that case. |

## Additional information in QoE report sent to MCE

**[CUC]:**

**Proposal 4:** In case of aligned MDT/QMC, NG-RAN includes Trace Reference and Trace Recording Session Reference and the **UE’s serving cell CGI** in the QoE report sent to MCE.

**[Huawei]:**

**Observation 4:** RAN3 needs to consider how the collection entity knows to which UE these reported information from NG-RAN belong.

**Observation 5**: Trace Reference/ trace recording session reference can globally identify a UE in case of signalling based measurement but cannot globally identify a UE in case of management based measurement.

**Proposal 2**: For m-based QoE and m-based MDT, the NG-RAN sends the MDT results and QoE results together with the **C-RNTI of the UE** to the collection entity.

**Proposal 3:** For m-based QoE and m-based MDT, when the QoE measurements is ended, the NG-RAN sends the **UE mobility history including the C-RNTI in each cell** to the collection entity.

**Q8:** Whether NG-RAN should include the following in the QoE report sent to MCE in addition to the already agreed Trace Reference and Trace Recording Session Reference?

1. UE’ serving cell CGI
2. C-RNTI of the UE
3. UE mobility history

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| --- | --- | --- |
| Company | Yes/No for a), b), c) | Comment |
|  | a: yes  b,c :no | The trace recording session reference in management based MDT is not globally unique among gNBs, so we think gNB can include UE's serving cell CGI in addition to the already agreed Trace Reference and Trace Recording Session Reference, to identify one trace recording session for the alignment of MDT and QoE measurements. |
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# References

|  |  |  |
| --- | --- | --- |
| [1] | [R3-220173](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114bis-e/Docs/R3-220173.zip) | (TP for QoE BL CR for TS 38.300) The Alignment of Radio-related Measurements and QoE Measurements (**Ericsson**) |
| [2] | [R3-220275](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114bis-e/Docs/R3-220275.zip) | Alignment of Radio related measurements and QoE measurements (**Qualcomm** Incorporated) |
| [3] | [R3-220332](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114bis-e/Docs/R3-220332.zip) | Alignment of MDT and QMC in Rel-17 (**Nokia**, Nokia Shanghai Bell) |
| [4] | [R3-220742](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114bis-e/Docs/R3-220742.zip) | Further discussion on alignment of MDT and QoE Measurements (**China Unicom**) |
| [5] | [R3-220913](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114bis-e/Docs/R3-220913.zip) | Further discussions on alignment between QoE measurement and MDT measurement (**Huawei**) |
| [6] | [R3-220924](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114bis-e/Docs/R3-220924.zip) | Alignment of MDT and QoE (**Samsung**) |
| [7] | [R3-220938](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114bis-e/Docs/R3-220938.zip) | Discussion on Alignment of MDT and QoE Measurements (**CATT**) |
| [8] | [R3-220966](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_114bis-e/Docs/R3-220966.zip) | Further discussion on alignment of MDT and QoE Measurements (**ZTE**) |