**3GPP TSG RAN2 #116-e R2-21xxxxx**

**Electronic Meeting, 1st – 12th Nov 2021**

**Agenda Item:**  **9.3: TEI17**

**Source: Qualcomm Inc. (rapporteur)**

**Title:** **Report on [Post115-e][203][TEI] Discussion on details of event-triggered logged MDT for LTE**

**Document for: Discussion and decision**

### **1 Introduction**

In [2]-[3], event-based measurements for logged MDT are proposed for LTE by replicating the event-triggered measurements in NR. The two event-based measurements are

* (i) event L1: UE performs logging of the measurements when the camped cell radio quality falls below a threshold, and
* (ii) OutOfService: UE performs logging of measurements when the UE enters any cell selection state.

The purpose of these two event-triggered measurements is to determine coverage issues with LTE, as the memory allocated for logged MDT is limited.

In [4]-[8], UE capability for this feature was proposed.

In RAN2#115-e meeting, RAN2 made the following agreements [1] based on contributions in [2]-[8]:

* Clear support but need to discuss more details (including whether this is sufficient). If we agree to the proposal, UE capability is needed.
* Further details discussed in post-meeting email discussion (Qualcomm)

This is the email discussion report of the following:

* [Post115-e][203][TEI17] Event triggered logged MDT for LTE (Qualcomm)

Scope: Discuss the details of event-triggered logged MDT for LTE (i.e. how it would work) and draft CRs accordingly.

Intended outcome: Report + draft CRs

Deadline: Long

Given that draft CRs may need to be updated/created based on the responses below, rapporteur suggests the following intermediate deadline:

Deadline for input to the questions below: October 7, 2021, 09:00 UTC

Deadline for input to updated draft CRs (to be shared later): October 21, 2021, 09:00 UTC

#### **1.1 Contact Information:**

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| **Company** | **Contact Name** | **Email** |
| Intel |  |  |
| CATT |  |  |
| Huawei, HiSilicon | Chenjun (Jun) | Jun.chen@huawei.com |
| Ericsson | Pradeepa Ramachandra | pradeepa.ramachandra@ericsson.com |
| Qualcomm | Umesh Phuyal | uphuyal <at> qti.qualcomm.com |
| Nokia, Nokia Shanghai Bell | Malgorzata Tomala | malgorzata.tomala@nokia.com |
| Samsung | Sangbum Kim | Sb07.kim@samsung.com |
| KDDI | Taisei Watabe | ti-watabe@kddi.com |

### **2 Discussion**

The discussion is mainly divided into two sections: Section 2.1 is for general discussion on the new events and procedures for event-triggered logged MDT for LTE. Section 2.2 is specific to the actual CRs.

#### **2.1 General**

During the online discussion, there was “clear support” to introduce event-triggered logged MDT for LTE. It was also understood that the baseline would be the two events (event L1 and OutOfService) with procedures similar to NR. Therefore, companies especially not agreeing with this general understanding are encouraged to provide there view and explanation. (Consistent with the online conclusion, no answer here will be interpreted as support.)

**Question 1: Comment on introducing event-triggered logged MDT for LTE, taking two events (event L1 and OutOfService) from NR as baseline (with additional changes as identified below in other questions). Please explain, especially if you do not support (No answer here will be interpreted as support).**

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| **Company** | **Support/No Support** | **Comments** |
| Intel | support | This seems useful information for the network to understand the coverage issue. |
| CATT | Support | The main mechanism of NR event-triggered Logged MDT can be reused for LTE. |
| Huawei, HiSilicon | Support |  |
| Ericsson | Support |  |
| Nokia, Nokia Shanghai Bell | Support | Given NR roll-outs we believe there will be more focus on NSA deployments, thus taking NR baseline for filtering the measurements out seems resaonable |
| Samsung | Support |  |
| KDDI | Support |  |

**Observation 1: No objections to introducing event-triggered logged MDT for LTE taking event L1 and OutOfService from NR as baseline, with additional changes as identified further below.**

In event-triggered measurement logging for outOfService in NR, UE logs the measurement only once after coming out of any cell selection state (see agreed CR in CR#2802, R2-2108968, first change in 5.5a.3.2). Rapporteur thinks LTE logged measurement should follow the same procedure. The CRs submitted in previous meeting may need update to address this. The following question is included here to make sure everyone is on the same page.

**Question 2: Do you agree to keep the same behavior in the outOfService event-based measurement logging between LTE and NR, i.e. UE logs the camped cell information only once after coming out of any cell selection state?**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes |  |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Ericsson | Agree to keep the UE behaviour as in NR (do not agree with **‘i.e. UE logs the camped cell information only once after coming out of any cell selection state’** ) | The text (‘**i.e. UE logs the camped cell information only once after coming out of any cell selection state**’) in the question is a bit confusing.    In NR, when the UE is configured with outOfService as the event criterion, the UE logs the last serving cell before entering the any cell selection state and the first cell after coming back from the any cell selection state.  Also, when the UE is in any cell selection state, then the UE performs the logging periodically at every loggingInterval and the logged information includes the previous serving cell information as per the existing procedural text.  Corresponding changes in NR specification for reference:  2> else if the *reportType* is set to *eventTriggered*, and *eventType* is set to *outOfCoverage*:  3> perform the logging at regular time intervals as defined by the *loggingInterval* in *VarLogMeasConfig* only when the UE is in any cell selection state;  3> upon transition from any cell selection state to camped normally state in NR:  4> if the RPLMN is included in *plmn-IdentityList* stored in *VarLogMeasReport*; and  4> if *areaConfiguration* is not included in *VarLogMeasConfig* or if the current camping cell is part of the area indicated by *areaConfig* of *areaConfiguration* in *VarLogMeasConfig*:  5> perform the logging at regular time intervals, as defined by the *loggingInterval* in the *VarLogMeasConfig*;  This behavior should be retained while introducing event triggered MDT in LTE. |
| Qualcomm | Yes | Regarding Ericsson’s comments: This question relates to NR CR in R2-2108968 (which is specific to “after coming back from any cell selection state” and is not related to “before entering” or while “in any cell selection state”):  Change#4:  It is clarified that the UE logs only once after coming back from any cell selection state to camped normally state if the UE is configured with OutOfCoverage event triggered logged MDT.  Basically, the intent was to say similar to this change in the NR CR:    The LTE CR should be updated as following: |
| Nokia, Nokia Shanghai Bell | See comment | More clarification is needed on the intention:  Intention with legacy LTE procedure (without even-based configuration) was that the UE acts on logging interval during “anyCellSelection state” to collect (e.g.) location information for the state in perdiodical manner. I.e. the UE in out-of-Coverage was still able to record location information and time stamp for further analysis.  In the baseline CR, the NR behaviour splits the UE procedures into two phases:   * Monitoring if there is “anyCellSelectionDetected” which results in: * Logging only “during” anyCellSelection state (which results in perdiodical samples tagged with the status “anyCellSelectionDetected” – similar behaviour to legacy LTE, even though no event-triggered configuration applies), * Monitoring if the new “anyCellSelectionDetected” is being detected after” going back from “anyCellSelectionDetected”   In any case, it seems the UE does the check in periodical manner (at regular time intervals). Thus, we may need to clarify if the check or logging is supposed to happen periodically. |
| Samsung | Yes |  |
| KDDI | Yes | We should adopt the NR change agreed in CR#2802, R2-2108968. |

**Observation 2: LTE CRs should include the NR change (first change in 5.5a.3.2) agreed in CR#2802, R2-2108968.**

In [6], need for UE capability for this feature was discussed. RAN2 agreed that “If we agree to the proposal, UE capability is needed.” Further the corresponding 36.331 and 36.306 CRs propose one bit for UE capability.

**Question 3: For indicating support for the two new event triggered measurement logging, should RAN2 add a single capability bit or two separate UE capability bits (for each event)?**

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| **Company** | **Single capability bit/ Two separate capability bits** | **Comments** |
| Intel | Two | As two features seem different in implementation. Two bits seem to be more reasonable. |
| CATT | Single capability bit | In NR, only a single bit is defined for normal logged MDT (except for WLAN and BT), and a UE that supports logged measurements shall support both periodical logging and event-triggered logging. Therefore the possible 2 events for the event triggered logging introduced in the same release (Rel-17) of LTE only needs a single capability bit. |
| Huawei, HiSilicon | Either | In NR, the UE capability indication loggedMeasurements-r16 is coupled with both periodical logging and event-triggered logging. In LTE, the UE capability indication loggedMeasurementsIdle is coupled with periodical logging.  We slightly prefer single capability bit because both event triggered measurements are useful, and we also see the flexibility of having two bits. |
| Ericsson | Single capability bit | We do not see big impacts on the UE implementation side on keeping a single capability bit for both these events. If there is a good motivation why there should be two capability bits, we are happy to discuss. |
| Qualcomm | Two | The features are different in implementation. Two separate bits would be easier for implementation and testing. |
| Nokia, Nokia Shanghai Bell | Either manner is acceptable |  |
| Samsung | Single | Single bit seems sufficient, as in NR (which has a single bit for both periodic and event-triggered, see *loggedMeasurements-r16*). |
| KDDI | Either |  |

**Summary:**

Out of 8 responding companies, 3 companies think singal capability bit is enough, 3 companies think either one or two bits are ok, and 2 companies think 2 separate bits are reasonable. Since the two features may have different implementations and availability of testing opportunities, rapporteur suggests to have 2 separate optional capabilities with signalling.

**Observation 3: Since the two features may have different implementations and availability of testing opportunities, it seems reasonable to have two separate optional capabilities with signalling to indicate support of event L1 and OutOfService.**

One of the discussion scope is “details of event-triggered logged MDT for LTE (i.e. how it would work)”.

The assumption/intent so far seems to be that the procedures for the **two new events in LTE would be same as in NR**.

Companies are encouraged to provide any comments or clarification on the operation of the new events, specially if it is expected to be different from NR.

**Question 4: Provide any comments or clarification on the operation of the new events, specially if it is expected to be different from NR.**

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| **Company** | **Comments (any difference from NR?)** |
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As NR is still discussing on similar topics, further enhancements in NR cannot be ruled out. (See for example the CR related to Question 1 above.)

Assuming the baseline procedures for the two new events in LTE is assumed to be same as in NR, if there are further enhancements related to event-triggered logged MDT in NR in upcoming meetings, it may be beneficial to avoid longer discussions in the future and adopt the principle that those would be ported-back to LTE as well. Of course this would be just a “principle” and exact changes would need to be discussed and agreed case by case.

**Question 5: Should RAN2 agree to the principle that** **if there are further enhancements related to event-triggered logged MDT in NR in upcoming meetings, those would be ported-back/adopted to LTE?**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes | Agreement add a little flexibility > “that if there are further enhancements related to event-triggered logged MDT in NR in upcoming meetings, those would be ported-back/adopted to LTE if possible” |
| CATT | Maybe | We think this can be discussed on a case by case basis. So perhaps no need to have such general conclusion at the moment. |
| Huawei, HiSilicon | Maybe | We think the further enhancements should be discussed case by case. |
| Ericsson | Case by case | We would like to highlight one discussion from RAN2#115 meeting.  During the online session in NR SON-MDT WI Rel-16 corrections, an operator expressed interest in introducing logging of measurements when the UE is in ‘camped on any cell’ state. It was said that such an enhancement is too late for Rel-16 corrections but may be such enhancements could be discussed in this TEI related work directly as it is related to out of coverage related enhancements? |
| Qualcomm | Yes | As noted above, this should be just a “principle” and the exact changes would need to be discussed and agreed case by case.  Regarding comment/suggestion from Ericsson: at least we have not found any benefit of logging measurements of acceptable cells in ‘camped on any cell’ state. Logged MDT is used for coverage optimizations for the normal operation. Coverage optimization considering camped normally state and any cell selection state should be sufficient as it will optimize the coverage for both emergency services as well as normal services. But we are open to understand further what other benefits may be achieved by logging acceptable cell info and measurements. |
| Nokia, Nokia Shanghai Bell | Case by case |  |
| Samsung | Yes |  |
| KDDI | Case by case |  |

**Observation 4: If there are further enhancements related to event-triggered logged MDT in NR in upcoming meetings, those could be ported-back/adopted to LTE based on further case-by-case discussion.**

#### **2.2 CRs**

This section is for comments on the previously submitted CRs, which may be useful for updating/drafting the CRs as required.

Given that this is a TEI17 item, rapporteur thinks there should be no more than one CR per impacted spec. This means following CRs should be merged, along with making further changes identified, if any, in conclusion of other questions (above or below):

* For TS 36.331: merge the CRs in [2] and [6]
* For TS 37.320: merge the CRs in [3] and [7]

**Question 6: Any comment on merging [2]+[6] and [3]+[7] and** **making further changes identified, if any, in conclusion of other questions (above or below)? [Please avoid CR-specifc comments here, as there are questions for each CR below]**

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| **Company** | **Comments** |
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**Observation 5: Preferable to have no more than one CR per impacted spec. So, some CR merging is needed.**

For the actual changes in the CRs, please provide your comments in the respective tables below, **including whether the corresponding CR is needed/not needed**. These comments will be helpful to update the CRs as needed.

**Question 7: Comments on CR for TS 36.304: [8] R2-2108560**

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| **Company** | **Comments** |
| Samsung | It is unclear if the change from [8] is suitable, i.e. T330 always starts whenever *LoggedMeasurementConfiguration* is received, regardless of periodical or event-triggered.  Instead, if the corresponding CR is needed for TS36.304, we would like to suggest to add the following texts:  8          Logged measurements  The UE may be configured to perform logging of measurement results in RRC\_IDLE mode with the *LoggedMeasurementConfiguration* message as specified in TS 36.331 [3]*.* This configuration is valid while the logging duration timer is running.  *(skipped)*  If the configuration of logged MBSFN measurements is valid, the UE shall perform logging of measurement results in RRC\_CONNECTED in addition to RRC\_IDLE, as described in TS 36.331 [3].  If the configuration of event-triggered logged measurements is valid, The UE shall perform logging of measurement results whenever the configured event has met as specified in TS 36.331 [3].  Otherwise, the logging of measurement results shall be suspended.  NOTE:      Even if logging of measurement results is suspended, the logging duration timer and time stamp will continue, and the logged measurement configuration and corresponding log are kept. |
| Qualcomm2 | The change in 36.304 seems not needed as the existing text equally applies for event triggered as well and nothing seems to be missing. |
| Huawei, HiSilicon | The intention of updating TS 36.304 is that the text in section 8 does not mention anything about event triggered MDT, so it may be understood that event triggered MDT is not supported. We are fine with the proposed change provided by Samsung. |
| Qualcomm3 | Ok to have 36.304 CR if there are no other objections. |
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**Summary**: As discussed in email thread, there were no objections to having a 36.304 CR.

**Question 8: Comments on CR for TS 36.306: [5] R2-2108557**

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| **Company** | **Comments** |
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**Question 9: Comments on CR for TS 36.331: [2] R2-2109027 + [6] R2-2108558**

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| **Company** | **Comments** |
| Qualcomm | Change in 5.6.8.2 should be updated as follows: |
| Qualcomm2 | In addition to above, several minor changes and clarifications are proposed in updated draft CR. |
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**Summary:**

Ericsson explained in email thread that there is an issue with current ASN.1. In LTE ASN.1, reporting of the serving cell identity and the serving cell measurement is mandatory whereas in NR ASN.1 this is optional. Upon coming in to any cell selection state from camped normally state but the last cell in which the UE was camping was not in the areaConfig or if the RPLMN was not in the stored plmn-IdentityList, UE should not include the cell identifier of the cell and the corresponding measurements. However, the ASN.1 signalling does not allow these values to be absent (as the fields are mandatory).

Ericsson proposed to have an explicit flag to be included by the UE to indicate that the serving cell information included in such case should be ignored by the network. Rapporteur thinks that setting all values of these fields to zero and implicitly indicating the values are unavailable could be sufficient. There was not enough time to conclude on this aspect (due to the issue being identified towards the end of the discussion). Editor’s note with FFS is marked in the 36.331 draft CR. This needs to be discussed by RAN2 before agreeing the 36.331 CR.

**Observation 6: One FFS needs to be resolved in 36.331 CR. Other draft CRs (for 36.304, 36.306, 37.320) are stable.**

**Question 10: Comments on CR for TS 37.320: [3] R2-2109028 + [7] R2-2108559**

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| **Company** | **Comments** |
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#### **2.3 Other**

**Question 11: Anything else that is not covered by above questions? Please explain.**

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| **Company** | **Comments** |
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### **3 Conclusion**

This email discussion on event-triggered logged MDT for LTE concluded with following observations and proposals.

**Observation 1: No objections to introducing event-triggered logged MDT for LTE taking event L1 and OutOfService from NR as baseline, with additional changes as identified further below.**

**Observation 2: LTE CRs should include the NR change (first change in 5.5a.3.2) agreed in CR#2802, R2-2108968.**

**Observation 3: Since the two features may have different implementations and availability of testing opportunities, it seems reasonable to have two separate optional capabilities with signalling to indicate support of event L1 and OutOfService.**

**Observation 4: If there are further enhancements related to event-triggered logged MDT in NR in upcoming meetings, those could be ported-back/adopted to LTE based on further case-by-case discussion.**

**Observation 5: Preferable to have no more than one CR per impacted spec. So, some CR merging is needed.**

**Observation 6: One FFS needs to be resolved in 36.331 CR. Other draft CRs (for 36.304, 36.306, 37.320) are stable.**

Following CRs were discussed and updated as part of the email discussion:

* R2-2110643, Introduction of event-based trigger for LTE MDT logging, Huawei, HiSilicon, Qulacomm Inc., KDDI Corporation, 36.304
* R2-2110644, Introduction of event-based trigger for LTE MDT logging, Huawei, HiSilicon, Qualcomm Inc., KDDI Corporation, 36.306
* R2-2109715, Introduction of event-based trigger for LTE MDT logging, KDDI Corporation, CMCC, Telecom Italia, Samsung, Ericsson, China Unicom, Huawei, HiSilicon, Qualcomm Inc., 36.331
* R2-2109717, Introduction of event-based trigger for LTE MDT logging, KDDI Corporation, CMCC, Telecom Italia, Samsung, Ericsson, China Unicom, Huawei, HiSilicon, Qualcomm Inc., 37.320

Proposals:

**Proposal 1: Introduce event-triggered logged MDT for LTE taking event L1 and OutOfService from NR as baseline.**

**Proposal 2: Introduce two separate optional capabilities with signalling to indicate support of event L1 and OutOfService.**

**Proposal 3: Further enhancements related to event-triggered logged MDT in NR in upcoming meetings may be ported-back/adopted to LTE based on further case-by-case discussion.**

**Proposal 4: RAN2 to discuss and decide whether all zeros in servCellIdentity and measResultServCell can implicitly indicate unavailability of the servCellIdentity and measResultServCell or to introduce an explicit flag.**

**Proposal 5: Agree CRs in R2-2110643 (36.304), R2-2110644 (36.306), R2-2109717 (37.320) and revise CR in R2-2109715 (36.331) based on conclusion of proposal 4.**

### **4 References**

[1] R2-2108831 Report on LTE legacy, 71 GHz, DCCA, Multi-SIM and RAN slicing

[2] R2-2109027 Introduction of event-based trigger for LTE MDT logging, KDDI Corporation, CMCC, Telecom Italia, Samsung, Ericsson [36.331]

[3] R2-2109028 Introduction of event-based trigger for LTE MDT logging, KDDI Corporation, CMCC, Telecom Italia, Samsung, Ericsson [37.320]

[4] R2-2108556 Discussion on event triggered logged MDT for LTE, Huawei, HiSilicon

[5] R2-2108557 CR to 36.306 on event triggered logged MDT for LTE, Huawei, HiSilicon

[6] R2-2108558 CR to 36.331 on event triggered logged MDT for LTE, Huawei, HiSilicon

[7] R2-2108559 CR to 37.320 on event triggered logged MDT for LTE, Huawei, HiSilicon

[8] R2-2108560 CR to 36.304 on event triggered logged MDT for LTE, Huawei, HiSilicon

[9] R2-2110643, Introduction of event-based trigger for LTE MDT logging, Huawei, HiSilicon, Qulacomm Inc., KDDI Corporation, 36.304

[10] R2-2110644, Introduction of event-based trigger for LTE MDT logging, Huawei, HiSilicon, Qualcomm Inc., KDDI Corporation, 36.306

[11] R2-2109715, Introduction of event-based trigger for LTE MDT logging, KDDI Corporation, CMCC, Telecom Italia, Samsung, Ericsson, China Unicom, Huawei, HiSilicon, Qualcomm Inc., 36.331

[12] R2-2109717, Introduction of event-based trigger for LTE MDT logging, KDDI Corporation, CMCC, Telecom Italia, Samsung, Ericsson, China Unicom, Huawei, HiSilicon, Qualcomm Inc., 37.320