3GPP TSG-RAN WG2#115-e R2-21xxxxx

Electronic meeting, 16th August – 27th August 2021

Agenda Item: 8.13.3.2

Source: Ericsson

Title: Report of [Offline-872][SONMDT] Logged MDT enhancements (Ericsson)

Document for: Discussion, Decision

# 1 Introduction

This document provides the outcome of the following offline discussion conducated during RAN2#115 meeting:

* [AT115e][872][SON/MDT] Logged MDT enhancements (Ericsson)

**Scope**: Focus on the set of proposals which are highlighted as such for discussions and potential agreements in this meeting in R2-2109016

**Intended outcome**: Report with Agreements

Please provide your comments by **Tuesday, August 24th 11:00 UTC** so that there is enough time to summarize and verify the summary which has the deadline of Wednesday, August 25th 11:00 UTC.

# 2 Contact Information

To make it easier to find the correct contact delegate in each company for potential follow-up questions, the rapporteur encourages the delegates who provide input to provide their contact information in this table:

|  |  |
| --- | --- |
| Company | Contact: Name (E-mail) |
| Ericsson (Rapporteur) | Pradeepa Ramachandra (pradeepa.ramachandra@ericsson.com) |
| Qualcomm | Rajeev Kumar (rkum@qti.qualcomm.com) |
| vivo | Ming Wen (ming.wen@vivo.com) |
| Apple | Sasha Sirotkin <ssirotkin@gmail.com> |
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# 3 Discussion

## 3.1 On demand SI related

### 3.1.1 Scenarios

It has already been agreed that the failed on-demand SI request related measurements shall be reported by the UE in RAN2#114 meeting.

UE records intended SIBs for failed on-Demand SI request. FFS the successful case.

It has also been agreed in RAN2#113bis meeting that the UE shall generate the report for both msg-1 based and msg-3 based on demand SI request.

Both Msg1-based and Msg3-based SI request related information are supported.

However, the following scenarios associated to on-demand SI request needs to be discussed. The supporting companies (direct proposals or via indirect proposals) are indicated in the round brackets.

1. Successful on-demand SI request ([4], [5], [6], [8], [13])
2. On-demand positioning SI/SIB request ([4], [13])
3. On-demand SI request in connected mode ([5])

**Question-1: Which of the following scenarios should be included as part of the logging of measurements associated to on-demand SI request?**

1. **Upon successful on-demand SI request**
2. **Upon on-demand positioning SI/SIB request**
3. **Upon on-demand SI request in connected mode**

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| **Company name** | **Agreeable scenarios?**  **None, 1, 2, 3, All** | **Comments** |
| Qualcomm | None | 1) SI and SIB mapping cannot be optimized based on each single UE.  2) can be studied when we consider SON/MDT enhancements for the sideline.  3) Network already knows the requested SIB in the connected state. Therefore, we don’t need this |
| vivo | 1/2 | 1) is needed, shares the same logic with failed case;  2) can be further discussed.  We are not convinced that 3) is needed.  According to **TS 38.300 Clause 7.3.2**, the intended SIB(s) that UE requested can be explicitly known by NW, therefore no need to send such information via any other report:  ‘For UEs in RRC\_CONNECTED, a request for Other SI may be sent to the network in a dedicated manner (i.e., via UL-DCCH) and the granularity of the request is one SIB. The gNB may respond with an RRCReconfiguration including the requested SIB(s). It is a network choice to decide which requested SIBs are delivered in a dedicated or broadcasted manner.’  DedicatedSIBRequest-r16-IEs ::= SEQUENCE {  onDemandSIB-RequestList-r16 SEQUENCE {  requestedSIB-List-r16 SEQUENCE (SIZE (1..maxOnDemandSIB-r16)) OF SIB-ReqInfo-r16 OPTIONAL,  requestedPosSIB-List-r16 SEQUENCE (SIZE (1..maxOnDemandPosSIB-r16)) OF PosSIB-ReqInfo-r16 OPTIONAL  } OPTIONAL,  SIB-ReqInfo-r16 ::= ENUMERATED { sib12, sib13, sib14, spare5, spare4, spare3, spare2, spare1 } |
| Ericsson | 1,2 | We believe 1) is a must as the network needs to collect information from both successful and failed on demand SI requests. The successful on demand SI request also provide information related to the allocation of RA resources were optimal or not. For example, if RA premable-x is allocated to both SIB-A and SIB-B, but UE wants only SIB-A, sending preamble-x in msg1 would result in transmission of both SIB-A and SIB-B. However, the UE might be interested only in SIB-A and thus the network is wasting the transmission of SIB-B and network never realizes the inefficient mapping of msg-1 and SI/SIB. Therefore, we support successful on demand SI related info to be logged by the UE.  As positioning SIBs are amongst the most likely SI to be sent on demand, it is fair to include positioning SI as part of the on-demand SI reports to give more info to the operators to understnad its efficiency.  We believe, connected mode on-demand SI request can be looked at in Rel-18. |
| Apple | None | We are not convinced this provides a useful information. |
| OPPO | None |  |
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**Rapporteur Summary:**

To be added later

### 3.1.2 Report contents

The following report contents related to on demand SI request has been agreed in previous RAN2 meetings.

1. Agreements in RAN2#114:

Include information to differentiate between Msg1-based or Msg3-based on-demand SI request.

UE records intended SIBs for failed on-Demand SI request.

Agreements in RAN2#113bis:

UE reports the SIBs that UE actually intends to request.

Both Msg1-based and Msg3-based SI request related information are supported.

There are further proposals from companies on the following measurements to be included in the on-demand SI related report. The supporting companies (direct proposals or via indirect proposals) are indicated in the round brackets.

1. The number of times each SIB was intended to be requested by the UE ([5])
2. Failed or successful on-demand SI indicator ([5])
3. Failure type - failure at RA procedure or failure at acquiring SI messages ([6])
4. The information of the beams used to acquire the requested SI messages ([6])
5. The time between consecutive SI requests ([6])
6. The location information at the time of performing the SI request ([6])
7. an indicator to indicate if SI request was performed over either NUL or SUL ([13])

As the outcome of Qestion-1 impacts 2) in the above list, it is separated into a different question.

**Question-2: Which of the following report contents associated to on-demand SI request is agreeable?**

1. **The number of times each SIB was intended to be requested by the UE**
2. **Failure type (failure at RA procedure or failure at acquiring SI messages)**
3. **The beam identities used to acquire the requested SI messages**
4. **The time between consecutive SI requests**
5. **The location information at the time of performing the SI request**
6. **An indicator to indicate if the SI request was performed over NUL or SUL**

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| **Company name** | **Agreeable report contents?**  **None, 1, 2, 3, 4, 5, 6, All** | **Comments** |
| Qualcomm | 3 (can be determined using existing fields in RA-report) | 1, 2, 4 can be determined by the network, UE does not have to report these. 6 can be determined by existing BWP information in the RACH report. We don’t need option 5, cell information should be sufficient. |
| vivo | 3 may be useful | * 1 should be clarified, not clear why there would be ‘the number of times each SIB’ that UE intended to request. Since each entry only includes a one-shot request for SIB, how could the number be counted/ why should this be sent to NW (as it always equals to 1)? * Not sure for 2. What matters in the failed case is to make NW aware of the intended SIBs UE requested, regardless of whether the SIBs are successfully acquired. * 4 is not needed, don’t see how the consecutive SI requests are interrelated with each other. NW should adjust the broadcasting SIBs according to a large scale of UEs instead of a single UE pattern. * 5 seems not needed, cell ID is sufficient, should we include detailed location information in this case? * 6 can be derived by RACH report. |
| Ericsson | 2,3,4,5,6 | In the comments by Qualcomm they indicate that 2,,3, 4, 6 can be determined by the network. We are okay if they can be implicitly derived but we should agree that these information should be either explcitly or implicitly needed in the on-demand SI report.  On (2), it is important to know what needs to be optimized, is it the RA coverage (UL) or the SIB coverage (DL). Therefore, it is necessary to report the failure type.  On (4), this parameter provides information about whether two different Sis are required by the same UE together or not i.e., if an application in the UE wants to have SIB-A and SIB-B at the same time and the network had assigned SIB-A to one msg-1 and SIB-B to msg-2, then these two requests come back to back in time but the network cannot recognize that it is the same UE that requested these SIBs. Therefore, to make sure that SIB-A and SIB—B can be assigned to a single msg-1, it is necessary to know the time between their requests.  On (5), we believe location info is one of the most useful information in SON reports for the operators to identify where a particular service is needed.  We agree that (6) can be derived imp[licitly but it is important to agree that this information is needed. Whether to include ir implicitly or explicitly can be FFS. |
| Apple | 3 | 3 is sufficient |
| OPPO | 3 | 3 is unknown by the network. |
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**Rapporteur Summary:**

To be added later

If the option-1 in question-1 is agreed and if the same report (associated signaling design discussed in 3.1.3) is used to include both successful and failed on-demand SI procedure, then there are proposals from companies to include an indication in the report that indicates whether the on-demand SI request was successful or not.

**Question-3: Do you agree to include an indicator in the on-demand SI request related report indicating whether the on-demand SI request was successful or not?**

**Note: This questions assumes option-1 in question-1 is agreeable and a single report (associated signaling design discussed in 3.1.3) is used to include both successful and failed on-demand SI procedure related measurements.**

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| **Company name** | **Yes/No** | **Comments** |
| Qualcomm | Depends | It depends upon what signaling method we use. For example, if option 3 is adopted then we don’t need an indicator. IF option1 or 2 is adopted then we may need an indicator. |
| vivo | Depends | Similar view with QC. |
| Ericsson | Agree |  |
| Apple | Depends | Agree with QC and vivo |
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### 3.1.3 Signaling design

During RAN2#114 meeting, companies ([4], [5], [6], [8], [11] and [13]) disussed the what signaling design could be used to include the on-demand SI related report. However, no agreement was made as there were divergent views. Companies have submitted contributions to indicate their views on this topic again in this meeting. As this has been discussed in the past, the rapporteur requests companies to indicate their preferred option(s), their acceptable option(s) and any option(s) that are not acceptable at all. This would help to progress this topic during the meeting.

**Question-4: Which of the following option is to used to indicate the on-demand SI related report?**

**Option 1: Extend Logged MDT**

**Option 2: Extend RA report for both successful and failure on-demand SI request**

**Option 3: Extend RA report for successful on-demand SI request and extend other report (RA report, CEF report, new report) for failure on-demand SI request**

**Option 4: A separate and dedicated report**

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| **Company name** | **Which is the preferred option?** | **Which option(s) is (are) acceptable** | **Which option(s) is (are) NOT acceptable** | **Comments** |
| Qualcomm | Option 2 | Option 1 | Option3 and Option 4 | We do not want to introduce a new report for this. We are okay with option 3 if the failed scenario is logged in the CEF report. |
| vivo | Option 2 | Option 3 | Option 1/4 | Prefer to decouple logged MDT with RACH mechanism. |
| Ericsson | Option-4 | Option-3, Option-2 | Option-1 |  |
| Apple | 2 | 3 | 4 |  |
| OPPO | 3 | 1 | 2 | From LTE, the RACH report is for logging the information related to the successful RACH procedure. Such principle should be followed. |
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**Rapporteur Summary:**

To be added later

## 3.2 Signaling based logged MDT override protection

### 3.2.1 Scenarios

It has already been agreed in RAN2#114 meeting that the solution involving UE providing assistance has been agreed.

1 In order to avoid overwriting of signalling-based logged MDT, UE-assisted and network-based solution, which relying on network implementation through UE providing assistance, is introduced.

There are some associated scenarios based on the above agreement that has been brought up by companies in their respective contribution.

* Scenario-1: Signaling based Logged MDT is configured, but no results are available e.g. so far nothing stored, or all previously stored results retrieved ([2], [11])
* Scenario-2: Signaling based Logged MDT configuration is stopped (i.e. the expiry of T330), but UE still has un-retrieved results that would be discarded upon accepting a new configuration ([11] and [14])
* Scenario-3: Signaling based logged MDT is configured in LTE (NR), the UE comes to connected in NR (LTE). ([6], [14])
* Scenario-4: Signaling based logged MDT is configured, the UE comes to connected in a PLMN that is not in the *plmn-IdentityList*. ([6], [14])

**Question-5: Should the signaling based logged MDT override protection is applicable in the following scenarios?**

**Scenario 1: Signaling based Logged MDT is configured, but no results are available e.g. so far nothing stored, or all previously stored results retrieved**

**Scenario 2: Signaling based Logged MDT configuration is stopped (i.e. the expiry of T330), but UE still has un-retrieved results that would be discarded upon accepting a new configuration.**

**Scenario 3: Signaling based logged MDT is configured in LTE (NR), the UE comes to connected in NR (LTE)**

**Scenario 4: Signaling based logged MDT is configured, the UE comes to connected in a PLMN that is not in the plmn-IdentityList.**

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| **Company name** | **Agreeable scenarios?**  **None, 1, 2, 3, 4, All** | **Comments** |
| Qualcomm | scenario 1 and 2 | Inter-RAT protection should not be needed. During inter-RAT mobility, a different RAT should be allowed to override the S-based configuration. Similarly in scenario 4. |
| vivo | 1/2 |  |
| Ericsson | All | Regarding the comment from Qualcomm, this is not our understanding. A signaling based MDT should have the highest priority independent of the RAT |
| Apple | All | OK to consider all the options |
| OPPO | 1 | Scenario 2 is not needed. If UE still has un-retrieved results, when the UE comes back to the RRC\_Connected state, the UE will send the flag of the available of the logged measurement results (***idleMeasAvailable***) towards the network in RRCSetupComplete/RRCResumeComplete msg. Upon reception of such information, the network, if demands, should send RRC msg towards UE for retrieving the logged measurement results. Otherwise, the network will do nothing. |
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**Rapporteur Summary:**

To be added later

### 3.2.2 Signaling

During RAN2#113bis meeting, it has already been agreed that the LoggedMeasurementConfiguration sent by the network includes a flag indicating whether the logged MDT configuration is a signaling based MDT configuration or not.

5 Introduce the logged MDT type (i.e. the management based MDT or the signalling based MDT) in the logged MDT configuration.

The contributions to this meeting include discussions related to the how the UE indicates to the network about the availability of the signaling based logged MDT configuration or signaling based logged MDT report content.

**Question-6: Which of the following UL RRC messages can carry the indicator (flag) indicating the availability of signaling based logged MDT configuration?**

1. **RRCSetupComplete/RRCConnectionSetupComplete**
2. **RRCResumeComplete/RRCConnectionResumeComplete**
3. **RRCReestablishmentComplete/RRCConnectionReestablishmentComplete**
4. **RRCReconfigurationComplete/RRCConnectionReconfigurationComplete**

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| **Company name** | **Agreeable RRCxxComplete messages?**  **1, 2, 3, 4, All** | **Comments** |
| Qualcomm | We don’t need this indicator. A single indicator for questions 6 and 7 is sufficient. | I believe both indicators in questions 6 and 7 are not needed. A conditional indication using a single indicator is sufficient. For example, if signaling-based MDT is configured, UE can indicate whether T330 is running or not.  In general, whether s-based is configured at the UE is known at the UE, as s-based PLMN identity list is shared during inter-PLMN, intra-PLMN, UE context retrieval, and others. |
| vivo | 1/2 | Upon RRC transition from IDLE/INACTIVE to CONNECTED state, UE can report the availability indicator to NW, and NW can be aware it is the signalling-based logged MDT report that exists at UE side. There is no need to notify NW every time after UE comes back to CONNECTED state. |
| Ericsson | 1 and 2 |  |
| Apple | 1 and 2 |  |
| OPPO | 1 and 2 |  |
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**Rapporteur Summary:**

To be added later

### 3.2.3 Further assistance

Several companies have provided proposals regarding including indication regarding the status of the T330 timer to the network node with respect to the signaling based logged MDT configuration. The proposals can be broadly summarized as the following options.

1. The UE indicates whether T330 timer is still running or not in the RRCxxComplete messages agreeable in Question-6.
2. The UE indicates the remaining T330 timer value in the RRCxxComplete messages agreeable in Question-6.
3. The UE indicates whether T330 timer is still running or not in the UEAssistanceInformation message.
4. The UE indicates the remaining T330 timer value in the UEAssistanceInformation message.

**Question-7: Which of the following information is to be reported by the UE?**

1. **The remaining T330 timer value**
2. **An indication (1-bit flag) as to whether T330 is running or not.**

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| **Company name** | **Agreeable option?**  **None, 1, 2, Both** | **Comments** |
| Qualcomm | Option 2 | The use case can be satisfied by a single indicator. Therefore, we don’t need 1. |
| vivo | Option 2 | Simpler to go for Opt2 so that NW knows when is the right timing to send another configuration. |
| Ericsson | Option-1 | Option-1 gives the most information to the network |
| Apple | Option 2 |  |
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**Rapporteur Summary:**

To be added later

**Question-8: If the answer to previous question is not ‘None’ then which RRC message is used to carry the information in Question-7?**

1. **The RRCxxComplete message(s) that were agreeable in Question-6**
2. **The UEAssistanceInformation message.**

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| **Company name** | **Agreeable option?**  **None, 1, 2, Both** | **Comments** |
| Qualcomm | Option 1 | The indicator can be indicated in RRCComplete messages where we indicate the availability of the logged MDT. |
| vivo | Option 1 |  |
| Ericsson | Option-2 | We do not want to increase the RRCxxComplete message size as it seems like slowly we are adding more and more bits to the mandatory messages |
| Apple | Option 1 |  |
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**Rapporteur Summary:**

To be added later

## 3.3 RAN3 LS related (R3-212824)

RAN3 has sent an LS to RAN2 with some questions.

RAN3 discussed the configuration of Area Scope of Neighbour Cells for logged MDT and the NR Frequency Band in the Area Scope of Neighbour Cells. RAN3 would like to check if there is alignment between TS 38.413 and TS 38.331.

* Area Scope of Neighbour Cells for logged MDT

The Area Scope of Neighbour Cells was introduced for signalling based logged MDT in Rel-16 as an IE that does not depend on the presence of the Area Scope of MDT, e.g. see TS38.413. However, RAN3 observed that the Area Scope of Neighbour Cells cannot be configured to the UE if the Area Scope of MDT is configured as PLMN wide at NGAP level. The reason is that in TS 38.331, the areaConfiguration-r16 is optional, and the interFreqTargetList-r16 is encoded inside the areaConfiguration-r16.If the Area Scope of MDT is configured as PLMN wide, the IE AreaConfiguration-r16 would not be configured to the UE which leads to the fact that the interFreqTargetList-r16 cannot be configured in this case.

RAN3 would like RAN2 to check whether this is an erroneous implementation in TS 38.331.

* Frequency band info

In TS 38.413, the NR Frequency Info in Area Scope of Neighbour Cells supports NR Frequency Band List configuration. While in TS 38.331, there isn’t any NR Frequency Band configuration in the InterFreqTargetInfo configured to the UE.

RAN3 would like RAN2 to feedback whether NR Frequency Band needs to be supported for the Area Scope of Neighbour Cells.

In the contribution [12], Huawei has provided the following related proposals.

**Proposal 1: It is proposed RAN2 to discuss whether the area scope of neighbour cells is dependent on the area scope of serving cells or not:**

* **If there is a dependency, from Rel-17, one option (for RAN3) is to add a clarificaiton to TS 38.413 that “Area Scope of Neighbour Cells” should be simultaneously configued with “the Area Scope of MDT is configured as PLMN wide”**
* **If there is no dependency, from Rel-17, one option (for RAN2) is to introduce AreaConfiguration-r17 including areaConfig-r16 and interFreqTargetList-r16 inside, and both fields are optional**
* **Rel-16 specifications are unchanged (leave it to network implementation)**

**Proposal 2: It is proposed to reply to RAN3 that NR Frequency Band is not supported for the Area Scope of Neighbour Cells.**

Based on the above, the following question is used to collect companies’ views regarding the question of interFreqTargetList within AreaConfiguration:

**Question-9: Which of the following option(s) are preferred regarding the RAN3’s question on the presence of** ***interFreqTargetList* within *AreaConfiguration*?**

1. **Add a clarificaiton to TS 38.413 that “Area Scope of Neighbour Cells” should be simultaneously configued with “the Area Scope of MDT is configured as PLMN wide” i.e., no change to RAN2 specification.**
2. **Introduce AreaConfiguration-r17 including areaConfig-r16 and interFreqTargetList-r16 inside, and both fields are optional.**
3. **Rel-16 specifications are unchanged**

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| **Company name** | **Agreeable option(s)?**  **1, 2, 3, All** | **Comments** |
| Qualcomm | For rel-16, we should adopt option 3 and RAN3 can add clarification as in option 1.  We can consider option-2 in rel-17. |  |
| vivo | 2) | This issue can be fixed in Rel-17. |
| Ericsson | 2 and 3 |  |
| Apple | 3 |  |
| OPPO | 2） |  |
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**Rapporteur Summary:**

To be added later

Based on the past discussions in RAN2 quoted in [REF], it is clear that the frequency band list configuration is not supported in *interFreqTargetList* configuration*.*

**Question-10: RAN2 confirms that frequency band list configuration is not supported in interFreqTargetList configuration?**

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| **Company name** | **Yes/No** | **Comments** |
| Qualcomm | Agree. |  |
| vivo | Agree |  |
| Ericsson | Yes |  |
| Apple | Agree |  |
| OPPO | Agree |  |
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**Rapporteur Summary:**

To be added later

## 3.3 Other logged MDT topics

There are several proposals on the following topics but the topic is brought up by few companies only.

1. Clarifications related to early measurements logging in logged MDT report
2. Frequency-specific and RAT-specific coverage hole indication in logged MDT report and its associated configuration
3. Enhancements associated to CEF report and RLF report for UL/DL coverage imbalance issues
4. MDT for logging slice availability

If any of the above proposals need to be brought up for discussion in this meeting itself then the rapporteur requests companies to bring it up in the answer for the following question.

**Question-10: Are any of the following topics need to be discussed in this meeting (if not, they are postponed to the next meeting)?**

1. **Clarifications related to early measurements logging in logged MDT report**
2. **Frequency-specific and RAT-specific coverage hole indication in logged MDT report and its associated configuration**
3. **Enhancements associated to CEF report and RLF report for UL/DL coverage imbalance issues**
4. **MDT for logging slice availability**

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| **Company name** | **Comments** |
| Qualcomm | For 1), We had earlier agreements on logging early measurement frequency in the logged MDT, therefore, clarification related to early measurements logging in logged MDT may be needed.  2) may be required considering heterogeneous network deployment and it may be required to know the RAT-specific and frequency-specific coverage holes. As the logged MDT size is limited, an event triggered measurement logging upon detection of RAT or frequency-specific coverage is required.  3) we had earlier discussions on this, however, we need to consider UE memory for addressing this issue. A simpler solution that does not require high UE memory consumption at UE can be discussed.  4) invloves NAS at the UE. In the current SON reports, we don’t involve NAS, therefore, we can deprioritize this in rel-17. |
| Ericsson | We can discuss all four of them in the next meeting i.e., they are relevant to Rel-17 but can be postponed in this meeting. We are also open for discussing them over an email discussion between the RAN2#115 and RAN2#116 meeting. |
| OPPO | We agree with Qualcomm that 2) is required. At least, a post RAN2#115e email discussion is needed. |
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**Rapporteur Summary:**

To be added later

# 3 Conclusion

To be added later.

# 4 References

1. R2-2107394 logged MDT enhancement regarding RAT-specific coverage hole OPPO
2. R2-2107395 Futher consideration of MDT configuration priority OPPO
3. R2-2107508 Logged MDT in EN-DC and other enhancements Nokia, Nokia Shanghai Bell
4. R2-2107720 On-demand SI request enhancements vivo
5. R2-2107827 Considerations on MDT Enhancements for On-demand SI CATT
6. R2-2108306 On logged MDT related enhancements Ericsson
7. R2-2108331 Logged measurement Enhancements QUALCOMM INCORPORATED
8. R2-2108357 Consideration on on-demand SI request information report ZTE Corporation, Sanechips
9. R2-2108505 MDT for Slice unavailability CMCC, Ericsson, Huawei discussion
10. R2-2108543 Further consideration on UL-DL coverage mismatch CMCC
11. R2-2108566 Discussion on logged MDT enhancements Huawei, HiSilicon
12. R2-2108568 Discussion on Area scope configuration and Frequency band info in MDT configuration based on RAN3 LS R3-212824 Huawei, HiSilicon
13. R2-2108650 SON Enhancements for SI Request Optimization Samsung
14. R2-2108739 Discussion on Logged MDT issues Samsung Electronics Co., Ltd