3GPP TSG-RAN WG2 #117-e R2-22xxxxx

Electronic meeting, Feb 21 – Mar 3, 2022

Agenda Item: 8.13.5

Source: CATT

Title: [AT117e][877][SON/MDT] SONMDT related UE Capabilities (CATT, Intel)

Document for: Discussion

# 1 Introduction

This document is to kick off the following offline discussion:

* **[AT117e][877][SON/MDT] SONMDT related UE Capabilities (CATT, Intel)**

Based on R2-2202804, R2-2202975, R2-2203028 and R2-2203427, build capability CR(s)

Intended outcome: Report and draft CR(s)

Deadline: 23:55 UTC, Feb, 25th

The offline will have 2 parts: Fisrtly companies should achieve convergence on all the UE capabilities, and then we will prepare a draft CRs about UE capability on TS38.306 and TS 38.331.

* First phase deadline for companies feedback on discussion: 23:55 UTC, Thursday Feb 24
* Second phase deadline for companies feedback on draft 38.306 and 38.331CR: 23:55 UTC, Friday Feb 25

In this offline discussion, the following contributions related to UE capabilities are discussed to decide if these contributions or proposals in the contributions can be agreed.

[1] R2-2202804 UE Capabilities about SON and MDT Enhanced Features CATT

[2] R2-2202975 Consideration on UE capability ZTE Corporation, Sanechips

[3] R2-2203028 Discussion on UE capabilities for R17 SON and MDT Huawei, HiSilicon

[4] R2-2203427 SON MDT UE Capabilities Qualcomm Incorporated

# 2 Discussion

Rapporteur encourages the participating delegates to provide their contact information in this table.

|  |  |
| --- | --- |
| Company | Contact: Name (E-mail) |
| ZTE | qiu.zhihong@zte.com.cn |
| Qualcomm | rkum@qti.qualcomm.com |
| Samsung | sb07.kim@samsung.com |
| CATT | shijie@catt.cn |
| Huawei, HiSilicon | Simone.Provvedi@huawei.com |
| Apple | ssirotkin@apple.com |
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## 2.0 Background of UE Capabilityin TS38.306

The UE capabilities can be classified into 3 types according to the sections 4,5,6 in TS38.306:

* Type1: UE radio access capability parameters (Section 4 in TS38.306);
* Type2: Optional features without UE radio access capability parameters (Section 5 in TS38.306);
* Type3: Conditionally mandatory features without UE radio access capability parameters (Section 6 in TS38.306).

Therefore for each SON/MDT related UE capability, one of the types above should be chosen firstly, and then the descriptions and limitation can be defined further.

If company has different view for any of the proposed UE capability types of the issues below, please mark clearly which Type you want for the specific issue in your comments.

## 2.1 Capability about SON features

The UE capabilities about following issues need to be discussed in this section.

* RLF-Report for CHO and DAPS HO
* Successful Handover Report
* 2-step RACH Information Report
* SgNB RACH Report
* SCell RACH Reporting
* PSCell MHI Report
* SCG Failure Report for MRO

### **Issue#1-1: RLF-Report for CHO and DAPS HO**

The UE capabilities about RLF-Report for CHO and DAPS HO have been discussed in [1][2][3][4].

To optimize DAPS HO, the RLF report is enhanced to include the DAPS HO-related parameters by collecting necessary parameters. Similarly, to optimize CHO, the RLF report is enhanced to include the CHO-related parameters by collecting necessary parameters. In Rel-16, RLF reporting is mandatory without capability signalling. Different ways for indicating whether UE supports DAPS HO and CHO failure reporting can be following based on the 3 UE capability introduction methods according to sections 4,5,6 of TS38.306:

1. Mandatory support: A Rel-17 UE supporting DAPS HO/CHO, supports DAPS HO/CHO failure reporting.
2. Explicit UE capability: Introduce UE capabilities for CHO and DAPS HO. UE indicates whether it supports DAPS and CHO failure reporting explicitly.
3. Optionally supported: UE can optionally support CHO and DAPS HO reporting, without explicit UE capability signaling for DAPS HO and CHO failure reporting

1 company [1] supports option(2) above for the sake of assisting the network to choose UEs for RLF information retrieval based on the UE capability. 2 companies [2][3] support option(3) since there is no pre-configuration is required, therefore no explicit signalling is needed. No company support option(1) since UE has to obtain additional parameters for DAPS HO and CHO reporting.

Since 2 companies support option(2), we made the following question:

**[Q1] Do you agree to** **introduce optional UE capabilities without signalling for RLF-Report for CHO and DAPS HO, respectively?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | Prefer: optional UE capabilities with signalling  Acceptable: optional UE capabilities without signalling |  |
| Samsung | Yes |  |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

### **Issue#1-2: Successful Handover Report**

In RAN2#115e meeting, the SHR capability bit is agreed to be introduced:

3: Introduce a UE capability indication for SHR.

The UE capability about Successful Handover Report has been discussed in [1][2][4]. Since the NW needs to know UE capability to configure proper configuration to trigger SHR logging and reporting, therefore explicit capability signalling is needed.

**[Q2] Do you agree to introduce an optional UE capability with signalling for Successful Handover Report?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | Yes | We already agreed to introduce UE capability for SHR. |
| Samsung | Yes | It should be. |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

### **Issue#1-3: 2-step RACH Information Report**

The UE capability about 2-step RACH Information Report has been discussed in [1][2][3][4].

In Rel-16, an optional capability bit *rach-Report-r16* was defined, and it indicates whether the UE supports delivery of rachReport upon request from the network[3]. For Rel-17 2-step RACH information reporting, 3 companies [1][3][4] support to introduce new capability bit to let the network knows whether it expects 2-step related parameters in the RACH report[4], and 1 company thinks 2step RA report is optional supported and a common capability bit is used for 2step RA and 4step RA report[2].

Since 3 companies support to explicitly indicate whether the UE can support 2-step RACH Information Report, we made the following question:

**[Q3] Do you agree to introduce an optional UE capability with signalling for 2-step RACH Information Report?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | No | Since current RA report is extended to log 2stepRA information, there is no differentiation in NW’s request behavior and most of the time NW can know if the completion of RA is 2step or not, therefore there is no need for explicit signalling.  Then this feature can be either conditional mandatory or optional without capability signalling. Considering 2step RA is an important feature which brings great gain in access performance, therefore we prefer to have it as conditional mandatory, i.e., if UE supports RA-report and supports 2step RACH then it support 2stepRA report. |
| Qualcomm | Yes |  |
| Samsung | Yes | Similar with legacy RACH report.  We don’t think it should be conditional mandatory. |
| CATT | Yes | Since there is no additional information in the complete messages to indicate the RACH type, it seems helpful to inform the network whether the UE can support the 2-step RACH report to assist the network to choose UEs for RACH information retrieval. |
| Huawei, HiSilicon | Yes | Similar with legacy RACH report.  Agree with CATT. |
| Apple | Yes |  |
|  |  |  |

### **Issue#1-4: SgNB RACH Report**

The UE capability about SgNB RACH Report has been discussed in [1][2][3][4].

2 companies [1][2] think SgNB RACH report in NR can already be supported with existing NR RA report therefore no additional capability is required; 1 company[4] proposes to optionally support SN RACH report without UE capability signalling since it has additional UE complexity; 1 company[3] propose to introduce new capability bit with signalling since it has extra complexities to UE.

Since 2 companies think SgNB RACH report in NR can already be supported with existing NR RA report, we made the following question:

**[Q4] Do you agree that SgNB RACH report in NR can already be supported with existing NR RACH report and no additional capability is required?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | No | It imposes additional complexity at the UE; therefore, we prefer to optionally support SN RACH report w/wo UE capability signaling |
| Samsung | No | Share with Qaulcomm.  BTW, optional with sigalling is slightly more preferable, rather than without signalling. |
| CATT | Yes | The legacy capability parameter of “rach-Report-r16” is not used to limit the RACH record for random access to the MN or to the SN, but only to indicate whether the RACH Report delivery to the network is support. To introduce this enhancement, no new text procedure or ASN.1 is changed. So from this point of view, it could already cover the report of SN related RACH record. |
| Huawei, HiSilicon | No | we think it has extra complexities to UE, so it is proposed to introduce an UE capability bit and it is optional with capability signalling. |
| Apple | No | We prefer to define capability signaling |
|  |  |  |

For SgNB RACH Report enhancement in LTE, if the scenario can be agreed in R17, the UE capability can also be discussed. 1 companies [2] think there is no need for explicit capability signalling, it is proposed that SgNB RA-report in LTE is optional supported without capability signalling.

**[Q5] Do you agree to introduce an optional UE capability without signalling for SgNB RACH Report in LTE, if any?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Samsung | Yes but | We are fine also with optional with signalling |
| CATT | Yes |  |
| Huawei, HiSilicon | No need to discuss | According ot he online agreements, we will focus on NR-DC only in Rel-17.  8 TS 36.331 modifications are not introduced to handle the scenario of LTE MN fetching the list of NR RA reports in Rel-17.  9 TS 38.331 modifications are not introduced to handle the scenario of NR MN fetching the LTE RA report in Rel-17.  Therefore, the discussion for SgNB RACH Report in LTE should be postponed. |
| Apple | Yes |  |

### **Issue#1-5: SCell RACH Reporting**

The UE capability about SCell RACH Reporting has been discussed in [4].

In rel-16, the UE RA report logs the SCell RACH-related paramters in the RA-report. Furthermore, In RAN2#116bis-e, we agreed:

Agreements

4 The UE includes the PCell ID in the RA-Report, if the RA procedure is performed in an SCell of the MCG.

5 The UE includes the PSCell ID in the RA-Report, if the RA procedure is performed in an SCell of the SCG.

Obtaining the SCell related RACH information imposes additional requirements at the UE, therefore, the SCell RACH reporting can be optionally supported without UE capability signaling.

**[Q6] Do you agree to introduce an optional UE capability without signalling for SCell RACH Reporting?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | No strong view |  |
| Qualcomm | Yes |  |
| Samsung | Yes |  |
| CATT | No | Report of the SCell related RA information has been agreed in RAN2#111e meeting, and we think no additional action is introduced for UE. And then including the PCell ID for SCell RA report is also not a technical enhancement, therefore no UE capability is needed for this issue. |
| Huawei, HiSilicon | Yes | We think it has extra complexities to UE, so it is proposed to introduce an optional UE capability without signalling. |
| Apple | Yes |  |
|  |  |  |

### **Issue#1-6: PSCell MHI Report**

The UE capability about PSCell MHI Report has been discussed in [1][2][3][4].

In RAN2#115-e meeting, we agreed PSCell MHI will be nested within PCell MHI, and it will be reported only to MN. For the storage of PSCell MHI, there is additional UE memory requirement. 3 companies [1][2][3] think there is no need to introduce explicit UE capability signalling, but an optional feature could be defined, without capability bit send to the network; 1 company[4] proposes to discuss and select whether a explicit bit is needed for PSCell MHI report enhancement.

Since 3 companies think an optional feature without capability bit is enough for PSCell MHI Report enhancement, we made the following question:

**[Q7] Do you agree to introduce an optional UE capability without signalling for PSCell MHI Report?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | Prefer: optional UE capabilities with signalling  Acceptable: optional UE capabilities without signalling |  |
| Samsung | Yes | Similar with legacy MHI report |
| CATT | Yes | Same as the PCell MHI capability. |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

If the question above is “Yes”, another question is introduced. Before R17, the MHI can only be recorded for PCell. But in TS38.306, the legacy MHI capability only mentions the support of storage of mobility history information, which cell type can be include for the storage is not clearly defined.

| Definitions for feature |
| --- |
| **Mobility history information storage**  It is optional for UE to support the storage of mobility history information and the reporting in *UEInformationResponse* message as specified in TS 38.331 [9]. |

Therefore rapporteur suggests adding the “PCell” to the legacy MHI UE capability for clarification.

**[Q7a] Do you agree to add “PCell” to the legacy MHI UE capability for clarification?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Samsung | Yes | Need to differentiate |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |
|  |  |  |

### **Issue#1-7: SCG Failure Report for MRO**

The UE capability about SCG Failure Report for MRO has been discussed in [1][2][3][4].

Based on the RAN3 LS, RAN2 agreed to report RACH-related parameters to the network in the case failureType is set to randomAccessProblem, beamFailureRecoveryFailure, or synchReconfigFailureSCG. Although other requested parameters and which report carries RACH-related parameters are still FFS[4]. However, as the additional parameter reporting imposes additional complexity at the UE, 3 companies [1][2][3] think there is no need to introduce explicit UE capability signalling, but an optional feature could be defined, without capability bit send to the network; 1 company[4] proposes to discuss and select whether a explicit bit is needed for SCG Failure Report for MRO.

Since 3 companies think an optional feature without capability bit is enough for SCG Failure Report for MRO, we made the following question:

**[Q8] Do you agree to introduce an optional UE capability without signalling for SCG Failure Report for MRO?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | Prefer: optional UE capabilities with signalling  Acceptable: optional UE capabilities without signalling |  |
| Samsung | Yes |  |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

## 2.2 Capability about MDT features

The UE capabilities about following issues need to be discussed in this section.

* On-demand SI Report
* Early Measurement Logging in Logged MDT
* Signaling Based Logged MDT Override Protection
* Multiple CEF Report
* Logged MDT Measurement Suspension due to IDC Interference

### **Issue#2-1: On-demand SI Report**

For on-demand SI information reporting, the intention is to collect necessary information for successful and failed on-demand SI procedures, and then the network can optimize the parameters for on-demand SI and broadcast SI.

The UE capability about On-demand SI Report has been discussed in [1][2][3][4]. Since it is a new feature in R17, and to let the network knows whether it expects on-demand SI parameters in the RACH report, 3 companies [1][3][4] propose to introduce a explicit UE capability with signalling; 1 company[2] proposes to have this feature as optional without capability signalling.

Since 3 companies think an explicit UE capability with signalling is needed for On-demand SI Report, we made the following question:

**[Q9] Do you agree to introduce an optional UE capability with signalling for On-demand SI Report?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | No | If UE doesn’t support on-demand SI logging then it will simply not include intended SIB information, we don’t see the usage of such indication from NW’s perspective. And it is preferred not to introduce capability signalling unless it is necessary. It can be optional support without capability signalling. |
| Qualcomm | Yes |  |
| Samsung | Yes |  |
| CATT | Yes | And the legacy capability parameter of “rach-Report-r16” should be the prerequisite for the new introduced on-demand SI report UE capability. |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

### **Issue#2-2: Early Measurement Logging in Logged MDT**

The UE capability about Early Measurement Logging in Logged MDT has been discussed in [2][4]. Since there has already been capability bits defined for early measurement and logged MDT, 1 company[2] thinks the NW can based on the capability signalling to decide if to configure early measurement frequency in logged MDT configuration, and no need to define additional capability bit for support of early measurement result logging; and the other company[2] thinks either optionally supported without capability signalling or explicit capability signalling should be introduced because additional complexity is introduced at the UE.

So it is proposed companies to discuss whether to introduce UE option feature for Early Measurement Logging in Logged MDT, or whether an explicit bit is needed.

**[Q10] Please provide which Type (as listed in section2.0) of UE capability you think is appropriate for Early Measurement Logging in Logged MDT?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Type 1/2/3** | **Comments if any** |
| ZTE | See comments | We think it depends on how EMR is logged in logged MDT. If UE simply logs available EMR in logged MDT, then it can be conditional mandatory, i.e., if UE supports logged MDT and it supports EM then UE supports logging of EMR in logged MDT. If UE logs measurement on EMR frequencies based on MDT principles regardless if UE supports EM or not, which requires additional measurements at UE’s side, then capability signalling is needed to allow configuring of EM related frequencies. |
| Qualcomm | Optional UE capability with signalling | However, we should follow the MDT/SON principle for the feature, i.e., UE does not perform additional measurements for a SON/MDT feature. |
| Samsung | Optional with signalling | Share with Qualcomm |
| CATT | Type2 | We consider Type2 (Optional features without UE capability parameters) is appropriate since additional complexity is introduced in UE for storing the early measurement result in logged MDT. But since the network many have no use to know whether the UE has the capability, an explicit bit is not needed to send to the NW. |
| Huawei, HiSilicon | Optional with signalling | Share with Qualcomm |
| Apple | Optional with capability signaling |  |
|  |  |  |

### **Issue#2-3: Signaling Based Logged MDT Override Protection**

The UE capability about Signaling Based Logged MDT Override Protection has been discussed in [1].

For signaling based logged MDT override protection, it is supported in R17, the intention is to avoid signaling based logged MDT configuration is overridden by management based logged MDT configuration. As logged MDT measurement is an optional feature and the network should send the logged measurement configuration to the UE, 1 company suggests introducing an explicit UE capability bit for it.

**[Q11] Do you agree to introduce an optional UE capability with signalling for Signaling Based Logged MDT Override Protection?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | NO | We prefer to have it as conditional mandatory (i.e., if UE supports logged MDT then it supports signalling MDT protection) otherwise this feature in R17 seems less useful. |
| Qualcomm | Yes | The feature introduces additional UE complexity, therefore, optional UE capability with signaling is required. |
| Samsung | Yes |  |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes | Agree with Qualcomm |
| Apple | Yes |  |
|  |  |  |

### **Issue#2-4: Multiple CEF Report**

In RAN2#116bis-e meeting, the new multiple CEF capability bit is agreed to be introduced:

11 New capability bit is introduced to indicate if UE supports multiple CEF

**[Q12] Do you agree to introduce an optional UE capability with signalling for Multiple CEF Report?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE |  | This has been agreed. Though we don’t see the necessity to have this capability bit, but we compromised for the sake of progress. |
| Qualcomm | Yes | Have been agreed already. |
| Samsung | Yes | It should be. |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

### **Issue#2-5: Logged MDT Measurement Suspension due to IDC Interference**

The UE capability about Logged MDT Suspension with IDC Problem Indication has been discussed in [1][2][3][4]. All of the 4 companies think UE should mandatorily support logged MDT with IDC problem detection and indication if UE supports both logged MDT and IDC.

**[Q13] Do you agree to introduce a conditionally mandatory feature for Logged MDT Measurement Suspension due to IDC Interference?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Samsung | Yes |  |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

## 2.3 Capability about L2M

In RAN2#116bis meeting the definition for excess packet delay for NR was agreed: It represents the ratio of packets in UL per DRB exceeding the configured delay threshold among the UL PDCP SDUs received.

Excess packet delay for NR is measured per DRB and will have specific configuration parameter such as *delayThreshold* in TS38.331.

The UE capability about NR excess packet delay has been discussed in [2][3][4]. Since obtaining the D1 delay ratio measurement imposes additional requirement, and the NW needs to configure UE the report thresholds, all 3 companies propose to introduce an optional UE capability bit for NR excess packet delay.

**[Q14] Do you agree to introduce an optional UE capability with signalling for NR excess packet delay?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Samsung | Yes |  |
| CATT | Yes | The network can decide whether to configure the ratio measurement based on the capability. |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

## 2.4 Other

For the new UE capability bits, it is also required to discuss the following aspects [3]:

- Need of FDD/TDD differentiation

- Need of FR1/FR2 differentiation

In [2][3], 2 companies mentiond that in Rel-16, most of SON/MDT UE capabilities did not have such differentiations, and for SON/MDT features, there is no motivation to have per BC or per feature set capability which may cause different TDD/FDD or FR1/FR2 capability. Then the Rel-17 new UE capabilities may follow the designs.

**[Q15] Do you agree that R17 SON-MDT related capabilities are all defined per UE?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any** |
| ZTE | Yes |  |
| Qualcomm | Yes |  |
| Samsung | Probably yes | For now, it seems clear that most of SON/MDT UE capabilities don’t need FDD/TDD differentiation and FR1/FR2 differentiation.  Anyway, we need to carefully check it for future proof, i.e. to avoid unnecessary work in future. |
| CATT | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
|  |  |  |

# 3 Conclusion

TBD