3GPP TSG RAN WG2 Meeting #123-bis R2-23xxxxx

**Xiamen, China, 9 – 13 October, 2023**

**Agenda item:** XXX

**Source:** Huawei (Email rapporteur)

**Title:** [Post123][567][R18 SONMDT] Cap of SONMDT (Huawei)

**Document for:**  Discussion and decision

# Introduction

This is the email report of the following email discussion:

* **[Post123][567][R18 SON/MDT] Cap of SON/MDT (Huawei)**

Discussion on UE capabilities for introducing SON/MDT. The table in R2-2308630 should be used as start point.

Output: Report

Deadline: Friday September 22th

The section 2 is the same as R2-2308630, and section 3 is to collect companies’ views.

Participants are invited to leave their contact information in the table.

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# Discussion from R2-2308630

## Overview of R18 SONMDT features

According to the WID [1], the following features were discussed. In the following sections, we analyse the UE capabilities for these features.

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| --- |
| **Features** |
| 1. MRO for MR-DC SCG failure
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| 1. MRO enhancements for inter-system handover voice fallback (MRO for voice fallback for short)
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| 1. SON/MDT enhancements for MR-DC CPAC (CPAC for short)
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| 1. SON/MDT enhancements for Successful PSCell change report (SPR for short)
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| 1. SON/MDT enhancements for Successful Handover Report (e.g. inter-RAT) (inter-RAT SHR for short)
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| 1. SON/MDT enhancements for NPN (NPN for short)
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| 1. SON/MDT enhancements for RACH report (RACH report for short)
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| 1. SON/MDT enhancements for Fast MCG recovery (Fast MCG recovery for short)
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| 1. SON/MDT enhancements for NR-U (NR-U for short)
 |
| 1. Signalling based logged MDT override protection when UE reselects to NR where the signalling based MDT is configured in E-UTRAN (MDT override for short)
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## MRO for MR-DC SCG failure

RAN2 made few progress, so we have not observed new requirements on UE capability aspect.

## MRO for voice fallback

At RAN2#119b meeting, it was agreed:

Agreements:

1 An explicit indication is included in RLF-report when mobility from NR fails and the corresponding MobilityFromNRCommand includes voiceFallbackIndication

2 The below content is included in RLF-report when reestablishment procedure is initiated due to mobility From NR failure.

 a. reestablishmentCellID

At RAN2#121b-e meeting, it was agreed:

**Agreements:**

1 RAN2 to support the scenario of “after RLF occurs shortly after successful HO from NR to E-UTRAN for voice fallback, a suitable E-UTRA cell is selected, and the UE tries RRC connection setup procedure for the voice service in the E-UTRA cell, which is agreed in RAN3”.

2 FFS: Introduce an indication for the scenario of RLF after successful voice fallback HO in the LTE RLF report regarding voice fallback.

3 UE logs the agreed indication regarding voice fallback in the NR RLF report.

4 FFS: RAN2 agree to differentiate an acceptable E-UTRA cell from a suitable E-UTRA cell in the RLF report in case of voiceFallback HOF. FFS explicit or implicit indications.

At RAN2#122 meeting, it was agreed:

Agreements:

1 Introduce a new indication in the LTE RLF report for the case an RLF occurs shortly after successful HO from NR to E-UTRAN for voice fallback.

2 UE to log the time until reconnection during RRC connection establishment to the acceptable cell and reconnection cell ID in is absent, which will reuse the legacy field.

In order to support the above enhancements, a new UE capability bit is needed, and it can be optional without capability signalling.

**Observation 1: A new UE capability bit (optional without signalling) for RLF report for voice fallback is needed. This bit indicates whether the UE supports an explicit indication in RLF-report when mobility from NR fails and due to voice fallback.**

## CPAC

At RAN2#120, it was agreed:

Agreements:

1 RAN2 confirms the CPA/CPC scenarios agreed by RAN3 and discuss corresponding UE impacts.

2 SCGFailureInformation is enhanced to support CPAC MRO (i.e, no need to introduce new reports/message).

FFS: For CPAC MRO, information to differentiate CAPC from conventional SCG failure is needed (ffs by implicit or explicit indication).

So far, RAN2 has made few progress, so we observe no RAN2 impacts for this feature. The above FFS may have potential RAN2 impacts, but it depends.

## SPR

Since RAN2#119b meeting, lots of agreements were made by RAN2, e.g. the configuration, the reporting. In general, we think SPR feature is similar to Rel-17 SHR feature, so a new UE capability bit “Report for SPR” is needed.

**Observation 2: A new UE capability bit (optional with signalling) for SPR is needed. This bit indicates whether the UE supports the storage and delivery of Successful Handover Report for PSCell addition/change upon request from the network.**

## Inter-RAT SHR

At RAN2#119b meeting, it was agreed:

Agreements:

1 For Q5 in R2-2211160, RAN2 confirms the support for the parameters for inter-RAT SHR from NR to LTE when T310 and T312 are configured as triggering condition.

2 T304 trigger for inter-RAT SHR from NR to LTE is not supported.

=> RAN2 to prioritise inter-RAT HO from NR to LTE first. Inter-RAT HO from LTE to NR can be considered after that.

At RAN2#120 meeting, it was agreed:

Agreement:

1: For Q1 in the LS R2-2211160, RAN2 agrees to reduce/avoid the impact on LTE specification to support inter-RAT SHR.

7: For handover from NR to LTE, cross-RAT reporting is not supported, i.e., UE reports the SHR report to the network when it comes back to NR.

At RAN2#122 meeting,

**Inter-RAT SHR from LTE to NR will be deprioritized in RAN2 for R18**

So a new UE capability bit (for NR) is needed so that the NR network will know whether to configure the enhancements for the UE.

**Observation 3: A new UE capability bit (optional with signalling) for SHR for a handover from NR to E-UTRA is needed. This bit indicates whether the UE supports the storage and delivery of Successful Handover Report for Handover from NR to E-UTRA, upon request from the network.**

## NPN

At RAN2#119b meeting, it was agreed:

Agreements:

1 SNPN ID (e.g.,NID ID) checking is needed before sending the availability indication for corresponding SON and MDT report. The details can be discussed case by case. FFS PNI-NPN ID checking.

2 Include the NPN ID into SON/MDT report, whether SNPN ID or PNI-NPN ID related info should be included can be discussed per use case.

3 RAN2 prioritizes the use cases of RLF report and logged MDT enhancement for NPN.

At RAN2#122, it was agreed:

Agreements:

1 Include CAG ID(s) in the logged MDT area configuration.

For logged MDT, we think a new UE capability bit with signalling is needed as the network needs to make an appropriate decision.

For SON reports, it depends on which of SON features will be impacted, e.g. CEF report, RLF report, RA report, SHR. In our opinion, the main changes of SON/MDT enhancements for NPN are to add NPN related IDs into SON reports, so our views are:

* There can be new UE capabilities, which are optional without signalling
* The UE capabilities are defined per feature

**Observation 4: New UE capability bits for SON/MDT for NPN are needed. This bit indicates whether the UE supports the inclusion of NPN ID in SON/MDT procedures, upon request from the network. For MDT for NPN, the UE capability bit is optional with signalling. For SON for NPN, the UE capability bits are defined per feature, and they are optional without signalling.**

## RACH report

**RACH report for RACH partitioning info and features**

At RAN2#119b meeting, it was agreed:

Agreements:

For RACH report about RACH partitioning information

1 Agree to add the following parameters into RACH report for RACH partitioning:

- Feature or the combination of features that triggered the RACH

- Used feature combination

At RAN2#122 meeting, it was agreed:

RACH Partitioning

1 RAN2 confirms agreed “used feature combination” is all the features configured in the FeatureCombination applied for the RACH procedure.

2 Feature specific RACH information is included in RA-InformationCommon and is also included for RLF report and CEF report.

Agreements:

1 For RACH report for RACH partitioning, RAN2 to agree to include NSAG ID when the applicable feature is slicing.

4 UE includes RA and SDT information in RA report when an SDT operation fails.

The RACH report enhancements are expected to be done on top of existing RACH report framework, so new UE capability bit is needed.

**Observation 5: A new UE capability bit (optional with signalling) for RACH report about RACH partitioning information is needed. This bit indicates whether the UE supports the storage and delivery of RACH partitioning related information via RACH report procedure, upon request from the network.**

**RACH report for SN RA report**

At RAN2#120 meeting, it was agreed:

2 RACH report enhancements required for NE-DC are de-prioritized.

3 For EN-DC and NG-EN-DC, the UE collects SN RA report container (for NR) and reports to the LTE MN. FFS on whether and which PSCell identity UE should report outside the RACH report.

At RAN2#121 meeting, it was agreed:

Agreements:

1: To have “a list of SN RA report entries as a single NR container (i.e. NR RA-ReportList)”.

At RAN2#122 meeting, it was agreed:

SN RACH Report

4 When reporting SN NR RA-report to LTE BS, the unique PSCell identities (i.e. if a PSCell occurs more than once in NR RA-ReportList, it is recorded only once in the list of PSCell identities) are included outside the NR RA report container.

5 Revert the agreement that UE does not support reporting NR RA report to LTE when it is in standalone LTE mode i.e., eNB may fetch the NR RA report irrespective to whether the UE is in single connectivity or dual connectivity.

6 No need to introduce availability bit to notify LTE BS there are available NR RA report for fetching.

7 Enhance the LTE UE information Request procedure with NR RA-Report request flag to fetch the NR RA-Report in LTE.

8 For NR RACH report, UE performs RPLMN checking before sending the NR RACH report to LTE BS.

9 A new UE capability is introduced to indicate whether UE supports NR RACH Report in LTE.

According to the above bullet 9, RAN2 has already agreed on a new UE capability (for LTE).

**Observation 6: (for LTE) A new UE capability bit (optional with signalling) for RACH report about NR RACH Report in LTE is needed. This bit indicates whether the UE supports NR RACH report in LTE, upon request from the network.**

## Fast MCG recovery

At RAN2#120 meeting, it was agreed:

Agreements

1 For fast MCG recovery MRO, prioritize NR-DC scenario. if time allows, study whether the same solution can be extended for others DC scenarios.

2 Consider at least below scenarios for fast MCG recovery MRO:

a. T316 expiry

b. SCG failure/deactivation during fast MCG recovery (i.e., running of T316). The “upon fast MCG recovery case” is FFS.

3 RLF report is enhanced to support fast MCG recovery MRO.

4 Fast MCG recovery failure cause shall be included for fast MCG recovery optimization. FFS details

=> Deprioritize NE-DC / EN-DC scenarios for SCG failure information report.

At RAN2#122 meeting, it was agreed:

Agreements:

1 RAN2 confirms scenario of near failure fast MCG recovery.

2 RAN2 confirms scenario f1, i.e., SCG fails or is deactivated before the UE sends the MCGFailureInformation. FFS RAN2 impact.

For Fast MCG recovery, it can be seen that some new information will be added to RLF report, so a new UE capability bit “RLF for Fast MCG recovery” is needed.

**Observation 7: A new UE capability bit (optional without signalling) for RLF for Fast MCG recovery is needed. This bit indicates whether the UE supports RLF-Report for Fast MCG recovery.**

## NR-U

At RAN2#119b meeting, it was agreed:

Agreements:

1 The UE will log information of multiple RA procedures related to consistent LBT failures. FFS details.

Agreements:

1 Introduce a new raPurpose in the RA-Report to indicate that the RA was initiated following a “consistent LBT failures” in the SpCell.

2 RAN2 agree to log kind of “the number of LBT failures” in the RA report.

 LBT failure is the failure to access the channel before transmission.

The definition of “the number of LBT failures” should be clarified.

FFS how to log the number of LBT failures in the RA report.

At RAN2#122 meeting, lots of agreements were made and leftovers will be further discussed.

According to RAN2 progresses made so far, some new information will be added to SON reports, e.g. :

* On how to represent the preamble transmission attempts blocked by LBT, introduce a field (or reusing the existing field) that counts the number of preamble transmissions blocked by LBT per RA procedure, and a flag indicating transmission failures experienced right before beam switching. Details can FFS.
* If RA-InformationCommon is used for such enhancements, it seems few impacts to other SON reports
* The detailed “per RA attempt info” are only reported in the RLF-Report for the last RA procedure before RLF/HOF, FFS whereas limited information are reported for the other BWPs in which consistent LBT failure is detected.
* The UE logs RA-InformationCommon including LBT info in the RLF-Report, in case of HOF and when the RLF cause is randomAccessProblem or beamFailureRecoveryFailure (as in legacy).
* The UE logs the available RSSI measurement in the RLF-Report. FFS in which case.

We observe that at least RA report and RLF report will be enhanced for NR-U purpose (while it is FFS whether other features will be impacted or not). Similar to our analysis for NPN, we think new UE capabilities are needed and they should be defined per feature.

**Observation 8: New UE capability bits for SON for NR-U are needed. This bit indicates whether the UE supports to report NR-U related information in SON, upon request from the network. The UE capability bits are defined per feature, and they are optional without signalling.**

## MDT override

At RAN2#121 meeting, it was agreed:

Agreements For solution 2:

1 Extend the LTE LoggedMeasurementConfiguration to include Logged MDT type indication information

2 NR signaling is needed to inform the gNB that signaling based MDT is configured by E-UTRA.

3 Try to reuse R17 NR signaling by the UE to inform gNB whether signaling based MDT is configured even when it is configured by E-UTRA.

At RAN2#122 meeting, it was agreed:

Agreements:

1 In NR, considering UE capability, UE reports availability of signalling based logged MDT configuration without checking the RAT information.

2 RAN2 confirms that sigLogMeasConfigAvailable can be re-used for to indicate the availability of the LTE signalling based logged MDT in NR.

For LTE, a new UE capability bit is needed, as LTE network needs to configure the logged MDT type based on such information. Whether there are impacts to NR side due to UE capability aspect can be further discussed.

**Observation 9: (for LTE) A new UE capability bit (optional with signalling) for signalling based logged MDT override protection is needed. This bit indicates whether the UE supports the override protection of the signalling based logged measurements configured in E-UTRA when going to NR.**

## Summary

Based on the analysis above and observations, the UE capability bits are summarized in the table below.

Note 1: the column “Diff” means Need of FDD/TDD differentiation and Need of FR1/FR2 differentiation.

Note 2: the column “Mandatory/Optional” may have the following possibilities:

* Mandatory without capability signalling
* Conditional mandatory without capability signalling
* Optional with capability signalling
* Optional without capability signalling

**Table 1: Summary on UE capabilities for R18 SONMDT features**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Features** | **UE capability** | **Definition** | **Mandatory/ Optional** | **Diff** | **Note** |
| MRO for MR-DC SCG failure |  |  |  |  | RAN2 has not identified impacts due to this feature |
| MRO for voice fallback | 1 bit | Whether the UE supports an explicit indication in RLF-report when mobility from NR fails and due to voice fallback. | Optional without signalling | No |  |
| CPAC |  |  |  |  | RAN2 has not identified impacts due to this feature |
| SPR | 1 bit | Whether the UE supports the storage and delivery of Successful Handover Report for PSCell addition/change upon request from the network. | Optional with signalling | No |  |
| Inter-RAT SHR | 1 bit | Whether the UE supports the storage and delivery of Successful Handover Report for Handover from NR to E-UTRA, upon request from the network. | Optional with signalling | No |  |
| NPN | Defined per feature | Whether the UE supports the inclusion of NPN ID in SON/MDT procedures, upon request from the network. | For SON:Per feature, optional without signallingLogged MDT:Optional with signalling | No |  |
| RACH report | 1 bit | Whether the UE supports the storage and delivery of RACH partitioning related information via RACH report procedure, upon request from the network. | Optional with signalling | No |  |
| 1 bit | (for LTE) Whether the UE supports NR RACH report in LTE, upon request from the network. | Optional with signalling |  |  |
| Fast MCG recovery | 1 bit | Whether the UE supports RLF-Report for Fast MCG recovery. | Optional without signalling | No |  |
| NR-U | Defined per feature | Whether the UE supports to report NR-U related information in SON, upon request from the network. | Per feature, optional with/without signalling | No |  |
| MDT override | 1 bit | (for LTE) Whether the UE supports the override protection of the signalling based logged measurements configured in E-UTRA when going to NR. | Optional with signalling | No |  |

Based on the discussions above, we have the following observations regarding the need/definitions of UE capabilities:

**Observation 1: A new UE capability bit (optional without signalling) for RLF report for voice fallback is needed. This bit indicates whether the UE supports an explicit indication in RLF-report when mobility from NR fails and due to voice fallback.**

**Observation 2: A new UE capability bit (optional with signalling) for SPR is needed. This bit indicates whether the UE supports the storage and delivery of Successful Handover Report for PSCell addition/change upon request from the network.**

**Observation 3: A new UE capability bit (optional with signalling) for SHR for a handover from NR to E-UTRA is needed. This bit indicates whether the UE supports the storage and delivery of Successful Handover Report for Handover from NR to E-UTRA, upon request from the network.**

**Observation 4: New UE capability bits for SON/MDT for NPN are needed. This bit indicates whether the UE supports the inclusion of NPN ID in SON/MDT procedures, upon request from the network. For MDT for NPN, the UE capability bit is optional with signalling. For SON for NPN, the UE capability bits are defined per feature, and they are optional without signalling.**

**Observation 5: A new UE capability bit (optional with signalling) for RACH report about RACH partitioning information is needed. This bit indicates whether the UE supports the storage and delivery of RACH partitioning related information via RACH report procedure, upon request from the network.**

**Observation 6: (for LTE) A new UE capability bit (optional with signalling) for RACH report about NR RACH Report in LTE is needed. This bit indicates whether the UE supports NR RACH report in LTE, upon request from the network.**

**Observation 7: A new UE capability bit (optional without signalling) for RLF for Fast MCG recovery is needed. This bit indicates whether the UE supports RLF-Report for Fast MCG recovery.**

**Observation 8: New UE capability bits for SON for NR-U are needed. This bit indicates whether the UE supports to report NR-U related information in SON, upon request from the network. The UE capability bits are defined per feature, and they are optional without signalling.**

**Observation 9: (for LTE) A new UE capability bit (optional with signalling) for signalling based logged MDT override protection is needed. This bit indicates whether the UE supports the override protection of the signalling based logged measurements configured in E-UTRA when going to NR.**

In summary, we have the following proposal:

**Proposal 1: It is proposed to use table 1 as a starting point to discuss UE capabilities for R18 SONMDT features.**

# Collecting companies’ views

It is suggested to discuss UE capabilities feature by feature instead of directly discussing the above Table 1. In the following, some tables are put to collect companies’ views.

**Observation 1: A new UE capability bit (optional without signalling) for RLF report for voice fallback is needed. This bit indicates whether the UE supports an explicit indication in RLF-report when mobility from NR fails and due to voice fallback.**

**Question 1: For the feature RLF report for voice fallback, do you agree with Observation 1?**

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| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes for NR | We think for the agreement of “Introduce a new indication in the LTE RLF report for the case an RLF occurs shortly after successful HO from NR to E-UTRAN for voice fallback”, the UE capability without signalling in LTE spec is also needed. |
| vivo | Yes for optional capability with signalling | Observation 1 is ambiguous, new bit implies optional with capability signalling.In R17, the capabilities of RLF for CHO and DAPS HO were introduced. A similar capability of RLF for inter-RAT mobility can be used for NW reference when requesting for RLF report. |
| Huawei, HiSilicon | Yes | In our opinion, a new UE capaiblity bit (optional without signaling) is similar to section 5.7 in TS 38.306. For example, **SpCell ID indication**It is optional for UE to support the delivery of the *spCellID-r17* in the RA-Report, if the RA procedure is performed in a SCell of the MCG/SCG.In our opinion, if the UE supports it, the UE just includes the explicit indication in the RLF report.If majority of companies would like UE to signal it to NW, we can be also fine. |
| Nokia | Yes | We see no reason to signal it to the network |
| ZTE | Yes | There is no need for explicit siganlling.And it is for both NR and LTE RLF report |
| Samsung | Yes |  |
| Ericsosn | Yes | And agree with CATT |
| Sharp  | Yes  | Explicit signalling is not needed. |
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**Observation 2: A new UE capability bit (optional with signalling) for SPR is needed. This bit indicates whether the UE supports the storage and delivery of Successful Handover Report for PSCell addition/change upon request from the network.**

**Question 2: For the feature SPR, do you agree with Observation 2?**

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| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
| ZTE | Yes |  |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| Sharp  | Yes  |  |
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**Observation 3: A new UE capability bit (optional with signalling) for SHR for a handover from NR to E-UTRA is needed. This bit indicates whether the UE supports the storage and delivery of Successful Handover Report for Handover from NR to E-UTRA, upon request from the network.**

**Question 3: For the feature SHR for a handover from NR to E-UTRA, do you agree with Observation 3?**

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| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
| ZTE | Yes |  |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| Sharp  | Yes  |  |
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**Observation 4: New UE capability bits for SON/MDT for NPN are needed. This bit indicates whether the UE supports the inclusion of NPN ID in SON/MDT procedures, upon request from the network. For MDT for NPN, the UE capability bit is optional with signalling. For SON for NPN, the UE capability bits are defined per feature, and they are optional without signalling.**

**Question 4: For the feature NPN, do you agree with Observation 4?**

|  |  |  |
| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes, but | For MDT, we agree the UE capability bit is optional with signalling.For SON, we also agree that the UE capability bits are defined per feature. Since we only discuss RLF/HOF report for NPNs, for this feature the UE capability bit can be optional without signalling.Since other features (e.g. CEF report, RA report) are still under discussion (in post email whether we handle them in Rel-18), we think the discussion about UE capability issue for other features can wait for related progress. |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
| ZTE | Yes for MDT, comments for SON | Similar view as CATT. Since RAN2 has not discussed SON reports except for RLF report, we can first confirm for RLF report it is optional without signaling and the put ffs on other features. |
| Samsung | Yes | Agree with CATT |
| Ericsson | Yes | For RLF no signalling of capability is needed, but for MDT signalling is needed.For other features we can discuss based on the progress, later. |
| Sharp  | Yes  |  |
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**Observation 5: A new UE capability bit (optional with signalling) for RACH report about RACH partitioning information is needed. This bit indicates whether the UE supports the storage and delivery of RACH partitioning related information via RACH report procedure, upon request from the network.**

**Question 5: For the feature RACH report about RACH partitioning information, do you agree with Observation 5?**

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| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | No | We do not see a reason why the network should know the UE reporting capability about RACH partitioning before the NW receives the RACH report. From the actual report the NW can learn if the UE supports it or not. |
| ZTE | Yes | We see benefits to have such capability information, for example NW can request UE with capability to support RACH partitioning report if it would like to perform enhancements specific to RACH partitioning configuration.  |
| Samsung | Yes |  |
| Ericsson | No | No signalling is needed. No action at the network is foreseen to be done based on this capability |
| Sharp  | No | Share the same view with Nokia, we are not clear about the reason why the network should know this capability. |
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**Observation 6: (for LTE) A new UE capability bit (optional with signalling) for RACH report about NR RACH Report in LTE is needed. This bit indicates whether the UE supports NR RACH report in LTE, upon request from the network.**

**Question 6: For the feature RACH report about NR RACH Report in LTE, do you agree with Observation 6?**

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| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
| ZTE | Yes |  |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| Sharp  | Yes  |  |
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**Observation 7: A new UE capability bit (optional without signalling) for RLF for Fast MCG recovery is needed. This bit indicates whether the UE supports RLF-Report for Fast MCG recovery.**

**Question 7: For the feature RLF for Fast MCG recovery, do you agree with Observation 7?**

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| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes |  |
| vivo | Yes for optional capability with signalling | See comments in Q1. |
| Huawei, HiSilicon | Yes | If majority of companies would like UE to signal it to NW, we can be also fine. |
| Nokia | Yes | We see no reason to signal this to the network |
| ZTE | Yes |  |
| Samsung | See comments | There is a need for the network to know whether UE has not reported fast MCG recovery related information in RLF report due to not supporting this feature or because there was no Fast MCG recovery was initiated. A new capability with signalling may be a simpler option, alternative is to include all the causes in the RLF report. |
| Ericsson | Yes | No need to signal it to the network. |
| Sharp  | Yes  | The explicit capability bit is not needed. |
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**Observation 8: New UE capability bits for SON for NR-U are needed. This bit indicates whether the UE supports to report NR-U related information in SON, upon request from the network. The UE capability bits are defined per feature, and they are optional without signalling.**

**Question 8: For the feature NR-U, do you agree with Observation 8?**

|  |  |  |
| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes but | NR-U information is also included in RA-report, usually, the UE capability related to RA-report is optional and with signalling. So here, may be it is necessary to differentiate the NR-U related capability for **RA report with signalling and RLF report without signalling**. For SHR reporting, it is better to be optional with signalling to help network find the UE logging NR-U related SHR information, then the network could request the UE to report the NR-U related SHR information and perform the optimization. |
| vivo | Yes for optional capability with signalling | See comments in Q1.In R17, the capability of RA report for 2-step RACH was introduced. A similar capability of RA report for NR-U is needed. |
| Huawei, HiSilicon | Yes | If majority of companies would like UE to signal it to NW, we can be also fine. |
| Nokia | Comment | It would be a very strange UE implementation that supports NR-U, and a SON feature (e.g., SHR), but does not support that SON feature for NR-U. |
| ZTE | Comments | For all SON features except for SHR, no pre-configuration is required. And NR-U information in SHR, since there is no specific configuration introduced for NR-U, there is also no need for explicit signalling to NW. But explicit capability signalling is also fine to allow NW to request reports more specifically.Based on above analysis, we are fine with either optional with or without signalling for support SON features for NR-U. As per feature capability, we don’t see the actually need since the NR-U information introduced in all the reports are basically the same. It is preferred to have one UE capability for NR-U information report for all cases. |
| Samsung | Single capability is sufficient for all NR-U features. | We think that based on the current agreements there is a strong correlation between the contents for RA report, RLF report and SHR. So a single capability is enough |
| Ericsson | Yes | For NRU information logging in the RLF report and RACH report no signalling of the capability is neededFor SHR, no signalling is needed as long as there is no impact on the SHR configuration |
| Sharp  | Yes  | No strong view, slightly prefer no new signalling bit. |
|  |  |  |
|  |  |  |
|  |  |  |

**Observation 9: (for LTE) A new UE capability bit (optional with signalling) for signalling based logged MDT override protection is needed. This bit indicates whether the UE supports the override protection of the signalling based logged measurements configured in E-UTRA when going to NR.**

**Question 9: For the feature signalling based logged MDT override protection, do you agree with Observation 9?**

|  |  |  |
| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes | We think that some minor modification in the description of the Rel-17 NR capability bit is needed to cover the MDT override enhancement for E-UTRA, as the current definition of the flag limits this capability to NR:***sigBasedLogMDT-OverrideProtect-r17***Indicates whether the UE supports the override protection of the signalling based logged measurements configured in NR.We think that this limitation could be removed with the following simple change:***sigBasedLogMDT-OverrideProtect-r17***Indicates whether the UE supports the override protection of the signalling based logged measurements. |
| ZTE | Yes |  |
| Samsung | Yes |  |
| Ericsson | Yes |  |
| Sharp  | Yes  |  |
|  |  |  |
|  |  |  |
|  |  |  |

For new UE capabilities for Rel-18 SON and MDT enhancements, the need of FDD/TDD and FR1/FR2 differentiation can be discussed.

**Question 10: For new UE capabilities for Rel-18 SON and MDT enhancements, what is your view on the need of FDD/TDD differentiation and FR1/FR2 differentiation? If yes, please indicate which capability information needs to be differentiated in the comments column.**

|  |  |  |
| --- | --- | --- |
|  **Company** | **Yes or No** | **Comments if any** |
| CATT | No | We believe that there is no need to differentiate FDD/TDD or FR1/FR2 for all Rel-18 SON and MDT enhancement issues. |
| vivo | No |  |
| Huawei, HiSilicon | No |  |
| Nokia | No |  |
| ZTE | No |  |
| Samsung | No |  |
| Ericsson | No, but  | For NRU SON capabilities it should be clarified that the capabilities are applicable only to FR1.  |
| Sharp  | No  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Question 11: If you have other comments, please fill them in the table below.**

|  |  |
| --- | --- |
|  **Company** | **Comments** |
| CATT | Some more agreements are made in RAN2#123 for CPAC MRO, so wo think an AS UE capability without signalling is needed, since there are additional information in the SCGFailureInformation message for CPAC MRO. |
| Huawei, HiSilicon | Open for discussing UE capabilities for CPAC MRO.RAN2#123 made the following agreements for CPAC:3 For CPAC MRO, UE logs the below information in SCGFailureInformation: the type of the first triggered CPAC event if multiple events are configured the time duration between the two triggered CPAC events if multiple events are configured4 For CPAC MRO, RAN2 discuss which of below measurement information is included in SCGFailureInformation (should further check whether something is already existed): Latest radio measurements of neighbour cell(s) if available, reusing existing fields. Source PSCell info (cell ID, measurement result) if available, reusing existing fields. Target PScell info (cell ID, measurement result) if available, reusing existing fields.We check the status of running CR disc. For bullet 3, there is a small change in the field description but no changes in ASN.1. For bullet 4, the CR rapporteur think this is already possible using the existing fields.**[Post123][571][R18 SONMDT] Running CR for Rel-18 SON MRO (Ericsson)**In summary, bullet 3 and 4 can be used for UE capablity discussion for CPAC MRO. |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

# Conclusion

[To be added later]

# References

[1] RP-231157\_Revised WID on Further enhancement of data collection for SON Self-Organising Networks MDT Minimization of Drive Tests in NR standalone and MR-DC Multi-Radio Dual Connectivity, CMCC

[2] RP-223047, Status Report for WI: Core part: Further enhancement of data collection for SONMDT in NR standalone and MR-DC; rapporteur: CMCC (SR for RAN#98)

[3] RP-230293, Status Report for WI: Core part: Further enhancement of data collection for SONMDT in NR standalone and MR-DC; rapporteur: CMCC (SR for RAN#99)

[4] RP-231156, Status Report for WI: Core part: Further enhancement of data collection for SONMDT in NR standalone and MR-DC; rapporteur: CMCC (SR for RAN#100)

[5] R2-2308630, Discussion on UE capability, Huawei, HiSilicon, discussion

# Annex (from TS 38.822 v17.1.0)

## UE capabilities for Rel-16 SONMDT features

### 5.2.20 NR\_SON\_MDT-Core

**Table 5.2.20-1: Layer-2 and Layer-3 feature list for NR\_SON\_MDT-Core**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Field name in TS 38.331 [2] | Parent IE in TS 38.331 [2] | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Note | Mandatory/Optional |
| 20. NR\_SON\_MDT-Core | 20-1 | RACH reporting | Indicates whether the UE supports delivery of *rachReport* upon request from the network. |  | *rach-Report-r16* | *SON-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-2 | Measurement reporting – barometer measurement upon network request | Indicates whether UE supports uncompensated barometeric pressure measurement reporting upon request from the network. |  | *barometerMeasReport-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-3 | Immediate Measurement reporting – Bluetooth measurement | Indicates whether the UE supports Bluetooth measurements in RRC\_CONNECTED state. |  | *immMeasBT-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-4 | Immediate Measurement – WLAN measurement | Indicates whether the UE supports WLAN measurements in RRC\_CONNECTED state. |  | *immMeasWLAN-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-5 | Logged Measurement – Bluetooth measurement | Indicates whether the UE supports Bluetooth measurements in RRC\_IDLE and RRC\_INACTIVE state. |  | *loggedMeasBT-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-6 | Logged Measurement – UE support | Indicates whether the UE supports logged measurements in RRC\_IDLE and RRC\_INACTIVE. A UE that supports logged measurements shall support both periodical logging and event-triggered logging. The memory size of MDT logged measurements is 64KB. |  | *loggedMeasurements-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-7 | Logged Measurement – WLAN measurement | Indicates whether the UE supports WLAN measurements in RRC\_IDLE and RRC\_INACTIVE state. |  | *loggedMeasWLAN-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-8 | Measurement reporting – Orientation measurement upon network request | Indicates whether the UE supports orientation information reporting upon request from the network. |  | *orientationMeasReport-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-9 | Measurement reporting – Speed information upon network request | Indicates whether the UE supports speed information reporting upon request from the network. |  | *speedMeasReport-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-10 | Support of GNSS or A-GNSS to provide location information with SON and MDT related measurement | Indicates whether the UE is equipped with a GNSS or A-GNSS receiver that may be used to provide detailed location information along with SON or MDT related measurements in RRC\_CONNECTED, RRC\_IDLE and RRC\_INACTIVE. |  | *gnss-Location-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-11 | Support of UL PDCP Packet Average Delay measurement | Indicates whether the UE supports UL PDCP Packet Average Delay measurement (as specified in TS 38.314) and reporting in RRC\_CONNECTED state. |  | *ulPDCP-Delay-r16* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 20-12 | 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 [2]. |  | *N/A* | *N/A* | N/A | N/A |  | Optional without capability signalling |
| 20-13 | Cross RAT RLF Report | It is optional for UE to support the delivery of EUTRA RLF report to an NR node upon request from the network. |  | *N/A* | *N/A* | N/A | N/A |  | Optional without capability signalling |
| 20-14 | Radio Link Failure Report for inter-RAT MRO EUTRA | It is optional for UE to support:- Include EUTRA CGI and associated TAC, if available, and otherwise to include the physical cell identity and carrier frequency of the target PCell of the failed handover as *failedPCellId* in *RLF-Report* upon request from the network as specified in TS 38.331 [2].- Include EUTRA CGI and associated TAC as *previousPCellId* in *RLF-Report* as specified in TS 38.331 [2].- Include *eutraReconnectCellId* in *reconnectCellId* in the *RLF-Report* as specified in TS 38.331 [2] upon UE has radio link failure or handover failure and successfully re-connected to an E-UTRA cell. |  | *N/A* | *N/A* | N/A | N/A |  | Optional without capability signalling |
| 20-15 | Connection Establishment Failure Reporting | It is mandatory for UE to support Connection Establishment Failure Reporting. |  | N/A | N/A | N/A | N/A |  | Mandatory without capability signalling |
| 20-16 | Radio Link Failure Reporting | It is mandatory for UE to support Radio Link Failure Reporting. |  | N/A | N/A | N/A | N/A |  | Mandatory without capability signalling |
| 20-17 | Location reporting | If location information is available, it is mandatory for UE to include location information for SON and MDT related reporting. |  | N/A | N/A | N/A | N/A |  | Mandatory without capability signalling |

## UE capabilities for Rel-17 SONMDT features

### 6.2.13 NR\_ENDC\_SON\_MDT\_enh

**Table 6.2.13-1: Layer-2 and Layer-3 feature list for NR\_ENDC\_SON\_MDT\_enh**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Field name in TS 38.331 [2]** | **Parent IE in TS 38.331 [2]** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Note** | **Mandatory/Optional** |
| 37. NR\_ENDC\_SON\_MDT\_enh-Core | 37-1 | RLF for CHO | Indicates whether the UE supports RLF-Report for conditional handover. |  | *rlfReportCHO-r17* | *SON-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-2 | RLF for DAPS HO | Indicates whether the UE supports RLF-Report for DAPS handover. |  | *rlfReportDAPS-r17* | *SON-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-3 | Report for SHR | Indicates whether the UE supports the storage and delivery of Successful Handover Report upon request from the network as specified in TS 38.331 [2]. |  | *success-HO-Report-r17* | *SON-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-4 | RA report for 2-step RA | Indicates whether the UE supports the storage and delivery of 2-step RACH related information upon request from the network as specified in TS 38.331 [2]. | 20-1 | *twoStepRACH-Report-r17* | *SON-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-5 | SpCell ID indication | It is optional for UE to support the delivery of the *SpCellID-r17* in the RA-Report, if the RA procedure is performed in a SCell of the MCG/SCG. | 20-1 | *N/A* | *N/A* | No | No |  | Optional without capability signalling |
| 37-6 | PSCell MHI storage | t is optional for UE to support the storage of PSCell mobility history information and the reporting in UEInformationResponse message as specified in TS 38.331 [2]. | 20-12 | *pscell-MHI-Report-r17* | *SON-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-7 | SCG Failure Report for MRO | It is optional for UE to support the delivery of the SCG failure related parameters for MRO in SCGFailureInformation message to the network. |  | *N/A* | *N/A* | No | No |  | Optional without capability signalling |
| 37-8 | On demand SI report | Indicates whether the UE supports delivery of on-Demand SI information upon request from the network as specified in TS 38.331 [2]. | 20-1 | *onDemandSI-Report-r17* | *SON-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-9 | Signaling Based Logged MDT Override Protection | Indicates whether the UE supports the override protection of the signalling based logged measurements configured in NR. | 20-6 | *sigBasedLogMDT-OverrideProtect-r17* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-10 | Multiple CEF report | Indicates whether the UE supports the storage and delivery of multiple CEF reports upon request from the network as specified in TS 38.331 [2]. |  | *multipleCEF-Report-r17* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-11 | Excess packet delay | Indicates whether the UE supports the UL PDCP excess packet delay measurement per DRB as specified in TS 38.314. A UE that supports the UL PDCP excess packet delay measurement shall also support the measurement configuration and reporting as specified in TS 38.331 [2]. |  | *excessPacketDelay-r17* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |
| 37-12 | Logged Measurements Suspension due to IDC Interference | It is mandatory to support Logged Measurements Suspension due to IDC Interference if both logged MDT and IDC are supported. | 20-6 and 24-7 | *n/a* | *n/a* | n/a | n/a |  | Conditional mandatory without capability signalling |
|  | 37-13 | Early measurement log | Indicates whether the UE supports the storage of Early Measurement Logging in logged measurements and the reporting upon request from the network as specified in TS 38.331 [2]. |  | *earlyMeasLog-r17* | *UE-BasedPerfMeas-Parameters-r16* | No | No |  | Optional with capability signalling |

# SON reports

#### – *UEInformationResponse*

The *UEInformationResponse* message is used by the UE to transfer information requested by the network.

Signalling radio bearer: SRB1 or SRB2 (when logged measurement information is included)

RLC-SAP: AM

Logical channel: DCCH

Direction: UE to network

*UEInformationResponse message*

-- ASN1START

-- TAG-UEINFORMATIONRESPONSE-START

UEInformationResponse-r16 ::= SEQUENCE {

 rrc-TransactionIdentifier RRC-TransactionIdentifier,

 criticalExtensions CHOICE {

 ueInformationResponse-r16 UEInformationResponse-r16-IEs,

 criticalExtensionsFuture SEQUENCE {}

 }

}

UEInformationResponse-r16-IEs ::= SEQUENCE {

 measResultIdleEUTRA-r16 MeasResultIdleEUTRA-r16 OPTIONAL,

 measResultIdleNR-r16 MeasResultIdleNR-r16 OPTIONAL,

 logMeasReport-r16 LogMeasReport-r16 OPTIONAL,

 connEstFailReport-r16 ConnEstFailReport-r16 OPTIONAL,

 ra-ReportList-r16 RA-ReportList-r16 OPTIONAL,

 rlf-Report-r16 RLF-Report-r16 OPTIONAL,

 mobilityHistoryReport-r16 MobilityHistoryReport-r16 OPTIONAL,

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 nonCriticalExtension UEInformationResponse-v1700-IEs OPTIONAL

}

UEInformationResponse-v1700-IEs ::= SEQUENCE {

 successHO-Report-r17 SuccessHO-Report-r17 OPTIONAL,

 connEstFailReportList-r17 ConnEstFailReportList-r17 OPTIONAL,

 coarseLocationInfo-r17 OCTET STRING OPTIONAL,

 nonCriticalExtension SEQUENCE {} OPTIONAL

}

LogMeasReport-r16 ::= SEQUENCE {

 absoluteTimeStamp-r16 AbsoluteTimeInfo-r16,

 traceReference-r16 TraceReference-r16,

 traceRecordingSessionRef-r16 OCTET STRING (SIZE (2)),

 tce-Id-r16 OCTET STRING (SIZE (1)),

 logMeasInfoList-r16 LogMeasInfoList-r16,

 logMeasAvailable-r16 ENUMERATED {true} OPTIONAL,

 logMeasAvailableBT-r16 ENUMERATED {true} OPTIONAL,

 logMeasAvailableWLAN-r16 ENUMERATED {true} OPTIONAL,

 ...

}

LogMeasInfoList-r16 ::= SEQUENCE (SIZE (1..maxLogMeasReport-r16)) OF LogMeasInfo-r16

LogMeasInfo-r16 ::= SEQUENCE {

 locationInfo-r16 LocationInfo-r16 OPTIONAL,

 relativeTimeStamp-r16 INTEGER (0..7200),

 servCellIdentity-r16 CGI-Info-Logging-r16 OPTIONAL,

 measResultServingCell-r16 MeasResultServingCell-r16 OPTIONAL,

 measResultNeighCells-r16 SEQUENCE {

 measResultNeighCellListNR MeasResultListLogging2NR-r16 OPTIONAL,

 measResultNeighCellListEUTRA MeasResultList2EUTRA-r16 OPTIONAL

 },

 anyCellSelectionDetected-r16 ENUMERATED {true} OPTIONAL,

 ...,

 [[

 inDeviceCoexDetected-r17 ENUMERATED {true} OPTIONAL

 ]]

}

ConnEstFailReport-r16 ::= SEQUENCE {

 measResultFailedCell-r16 MeasResultFailedCell-r16,

 locationInfo-r16 LocationInfo-r16 OPTIONAL,

 measResultNeighCells-r16 SEQUENCE {

 measResultNeighCellListNR MeasResultList2NR-r16 OPTIONAL,

 measResultNeighCellListEUTRA MeasResultList2EUTRA-r16 OPTIONAL

 },

 numberOfConnFail-r16 INTEGER (1..8),

 perRAInfoList-r16 PerRAInfoList-r16,

 timeSinceFailure-r16 TimeSinceFailure-r16,

 ...

}

ConnEstFailReportList-r17 ::= SEQUENCE (SIZE (1..maxCEFReport-r17)) OF ConnEstFailReport-r16

MeasResultServingCell-r16 ::= SEQUENCE {

 resultsSSB-Cell MeasQuantityResults,

 resultsSSB SEQUENCE{

 best-ssb-Index SSB-Index,

 best-ssb-Results MeasQuantityResults,

 numberOfGoodSSB INTEGER (1..maxNrofSSBs-r16)

 } OPTIONAL

}

MeasResultFailedCell-r16 ::= SEQUENCE {

 cgi-Info CGI-Info-Logging-r16,

 measResult-r16 SEQUENCE {

 cellResults-r16 SEQUENCE{

 resultsSSB-Cell-r16 MeasQuantityResults

 },

 rsIndexResults-r16 SEQUENCE{

 resultsSSB-Indexes-r16 ResultsPerSSB-IndexList

 }

 }

}

RA-ReportList-r16 ::= SEQUENCE (SIZE (1..maxRAReport-r16)) OF RA-Report-r16

RA-Report-r16 ::= SEQUENCE {

 cellId-r16 CHOICE {

 cellGlobalId-r16 CGI-Info-Logging-r16,

 pci-arfcn-r16 PCI-ARFCN-NR-r16

 },

 ra-InformationCommon-r16 RA-InformationCommon-r16 OPTIONAL,

 raPurpose-r16 ENUMERATED {accessRelated, beamFailureRecovery, reconfigurationWithSync, ulUnSynchronized,

 schedulingRequestFailure, noPUCCHResourceAvailable, requestForOtherSI,

 msg3RequestForOtherSI-r17, spare8, spare7, spare6, spare5, spare4, spare3,

 spare2, spare1},

 ...,

 [[

 spCellID-r17 CGI-Info-Logging-r16 OPTIONAL

 ]]

}

RA-InformationCommon-r16 ::= SEQUENCE {

 absoluteFrequencyPointA-r16 ARFCN-ValueNR,

 locationAndBandwidth-r16 INTEGER (0..37949),

 subcarrierSpacing-r16 SubcarrierSpacing,

 msg1-FrequencyStart-r16 INTEGER (0..maxNrofPhysicalResourceBlocks-1) OPTIONAL,

 msg1-FrequencyStartCFRA-r16 INTEGER (0..maxNrofPhysicalResourceBlocks-1) OPTIONAL,

 msg1-SubcarrierSpacing-r16 SubcarrierSpacing OPTIONAL,

 msg1-SubcarrierSpacingCFRA-r16 SubcarrierSpacing OPTIONAL,

 msg1-FDM-r16 ENUMERATED {one, two, four, eight} OPTIONAL,

 msg1-FDMCFRA-r16 ENUMERATED {one, two, four, eight} OPTIONAL,

 perRAInfoList-r16 PerRAInfoList-r16,

 ...,

 [[

 perRAInfoList-v1660 PerRAInfoList-v1660 OPTIONAL

 ]],

 [[

 msg1-SCS-From-prach-ConfigurationIndex-r16 ENUMERATED {kHz1dot25, kHz5, spare2, spare1} OPTIONAL

 ]],

 [[

 msg1-SCS-From-prach-ConfigurationIndexCFRA-r16 ENUMERATED {kHz1dot25, kHz5, spare2, spare1} OPTIONAL

 ]],

 [[

 msgA-RO-FrequencyStart-r17 INTEGER (0..maxNrofPhysicalResourceBlocks-1) OPTIONAL,

 msgA-RO-FrequencyStartCFRA-r17 INTEGER (0..maxNrofPhysicalResourceBlocks-1) OPTIONAL,

 msgA-SubcarrierSpacing-r17 SubcarrierSpacing OPTIONAL,

 msgA-RO-FDM-r17 ENUMERATED {one, two, four, eight} OPTIONAL,

 msgA-RO-FDMCFRA-r17 ENUMERATED {one, two, four, eight} OPTIONAL,

 msgA-SCS-From-prach-ConfigurationIndex-r17 ENUMERATED {kHz1dot25, kHz5, spare2, spare1} OPTIONAL,

 msgA-TransMax-r17 ENUMERATED {n1, n2, n4, n6, n8, n10, n20, n50, n100, n200} OPTIONAL,

 msgA-MCS-r17 INTEGER (0..15) OPTIONAL,

 nrofPRBs-PerMsgA-PO-r17 INTEGER (1..32) OPTIONAL,

 msgA-PUSCH-TimeDomainAllocation-r17 INTEGER (1..maxNrofUL-Allocations) OPTIONAL,

 frequencyStartMsgA-PUSCH-r17 INTEGER (0..maxNrofPhysicalResourceBlocks-1) OPTIONAL,

 nrofMsgA-PO-FDM-r17 ENUMERATED {one, two, four, eight} OPTIONAL,

 dlPathlossRSRP-r17 RSRP-Range OPTIONAL,

 intendedSIBs-r17 SEQUENCE (SIZE (1..maxSIB)) OF SIB-Type-r17 OPTIONAL,

 ssbsForSI-Acquisition-r17 SEQUENCE (SIZE (1..maxNrofSSBs-r16)) OF SSB-Index OPTIONAL,

 msgA-PUSCH-PayloadSize-r17 BIT STRING (SIZE (5)) OPTIONAL,

 onDemandSISuccess-r17 ENUMERATED {true} OPTIONAL

 ]]

}

PerRAInfoList-r16 ::= SEQUENCE (SIZE (1..200)) OF PerRAInfo-r16

PerRAInfoList-v1660 ::= SEQUENCE (SIZE (1..200)) OF PerRACSI-RSInfo-v1660

PerRAInfo-r16 ::= CHOICE {

 perRASSBInfoList-r16 PerRASSBInfo-r16,

 perRACSI-RSInfoList-r16 PerRACSI-RSInfo-r16

}

PerRASSBInfo-r16 ::= SEQUENCE {

 ssb-Index-r16 SSB-Index,

 numberOfPreamblesSentOnSSB-r16 INTEGER (1..200),

 perRAAttemptInfoList-r16 PerRAAttemptInfoList-r16

}

PerRACSI-RSInfo-r16 ::= SEQUENCE {

 csi-RS-Index-r16 CSI-RS-Index,

 numberOfPreamblesSentOnCSI-RS-r16 INTEGER (1..200)

}

PerRACSI-RSInfo-v1660 ::= SEQUENCE {

 csi-RS-Index-v1660 INTEGER (1..96) OPTIONAL

}

PerRAAttemptInfoList-r16 ::= SEQUENCE (SIZE (1..200)) OF PerRAAttemptInfo-r16

PerRAAttemptInfo-r16 ::= SEQUENCE {

 contentionDetected-r16 BOOLEAN OPTIONAL,

 dlRSRPAboveThreshold-r16 BOOLEAN OPTIONAL,

 ...,

 [[

 fallbackToFourStepRA-r17 ENUMERATED {true} OPTIONAL

 ]]

}

SIB-Type-r17 ::= ENUMERATED {sibType2, sibType3, sibType4, sibType5, sibType9, sibType10-v1610, sibType11-v1610, sibType12-v1610,

 sibType13-v1610, sibType14-v1610, spare6, spare5, spare4, spare3, spare2, spare1}

RLF-Report-r16 ::= CHOICE {

 nr-RLF-Report-r16 SEQUENCE {

 measResultLastServCell-r16 MeasResultRLFNR-r16,

 measResultNeighCells-r16 SEQUENCE {

 measResultListNR-r16 MeasResultList2NR-r16 OPTIONAL,

 measResultListEUTRA-r16 MeasResultList2EUTRA-r16 OPTIONAL

 } OPTIONAL,

 c-RNTI-r16 RNTI-Value,

 previousPCellId-r16 CHOICE {

 nrPreviousCell-r16 CGI-Info-Logging-r16,

 eutraPreviousCell-r16 CGI-InfoEUTRALogging

 } OPTIONAL,

 failedPCellId-r16 CHOICE {

 nrFailedPCellId-r16 CHOICE {

 cellGlobalId-r16 CGI-Info-Logging-r16,

 pci-arfcn-r16 PCI-ARFCN-NR-r16

 },

 eutraFailedPCellId-r16 CHOICE {

 cellGlobalId-r16 CGI-InfoEUTRALogging,

 pci-arfcn-r16 PCI-ARFCN-EUTRA-r16

 }

 },

 reconnectCellId-r16 CHOICE {

 nrReconnectCellId-r16 CGI-Info-Logging-r16,

 eutraReconnectCellId-r16 CGI-InfoEUTRALogging

 } OPTIONAL,

 timeUntilReconnection-r16 TimeUntilReconnection-r16 OPTIONAL,

 reestablishmentCellId-r16 CGI-Info-Logging-r16 OPTIONAL,

 timeConnFailure-r16 INTEGER (0..1023) OPTIONAL,

 timeSinceFailure-r16 TimeSinceFailure-r16,

 connectionFailureType-r16 ENUMERATED {rlf, hof},

 rlf-Cause-r16 ENUMERATED {t310-Expiry, randomAccessProblem, rlc-MaxNumRetx,

 beamFailureRecoveryFailure, lbtFailure-r16,

 bh-rlfRecoveryFailure, t312-expiry-r17, spare1},

 locationInfo-r16 LocationInfo-r16 OPTIONAL,

 noSuitableCellFound-r16 ENUMERATED {true} OPTIONAL,

 ra-InformationCommon-r16 RA-InformationCommon-r16 OPTIONAL,

 ...,

 [[

 csi-rsRLMConfigBitmap-v1650 BIT STRING (SIZE (96)) OPTIONAL

 ]],

 [[

 lastHO-Type-r17 ENUMERATED {cho, daps, spare2, spare1} OPTIONAL,

 timeConnSourceDAPS-Failure-r17 TimeConnSourceDAPS-Failure-r17 OPTIONAL,

 timeSinceCHO-Reconfig-r17 TimeSinceCHO-Reconfig-r17 OPTIONAL,

 choCellId-r17 CHOICE {

 cellGlobalId-r17 CGI-Info-Logging-r16,

 pci-arfcn-r17 PCI-ARFCN-NR-r16

 } OPTIONAL,

 choCandidateCellList-r17 ChoCandidateCellList-r17 OPTIONAL

 ]]

 },

 eutra-RLF-Report-r16 SEQUENCE {

 failedPCellId-EUTRA CGI-InfoEUTRALogging,

 measResult-RLF-Report-EUTRA-r16 OCTET STRING,

 ...,

 [[

 measResult-RLF-Report-EUTRA-v1690 OCTET STRING OPTIONAL

 ]]

 }

}

SuccessHO-Report-r17 ::= SEQUENCE {

 sourceCellInfo-r17 SEQUENCE {

 sourcePCellId-r17 CGI-Info-Logging-r16,

 sourceCellMeas-r17 MeasResultSuccessHONR-r17 OPTIONAL,

 rlf-InSourceDAPS-r17 ENUMERATED {true} OPTIONAL

 },

 targetCellInfo-r17 SEQUENCE {

 targetPCellId-r17 CGI-Info-Logging-r16,

 targetCellMeas-r17 MeasResultSuccessHONR-r17 OPTIONAL

 },

 measResultNeighCells-r17 SEQUENCE {

 measResultListNR-r17 MeasResultList2NR-r16 OPTIONAL,

 measResultListEUTRA-r17 MeasResultList2EUTRA-r16 OPTIONAL

 } OPTIONAL,

 locationInfo-r17 LocationInfo-r16 OPTIONAL,

 timeSinceCHO-Reconfig-r17 TimeSinceCHO-Reconfig-r17 OPTIONAL,

 shr-Cause-r17 SHR-Cause-r17 OPTIONAL,

 ra-InformationCommon-r17 RA-InformationCommon-r16 OPTIONAL,

 upInterruptionTimeAtHO-r17 UPInterruptionTimeAtHO-r17 OPTIONAL,

 c-RNTI-r17 RNTI-Value OPTIONAL,

 ...

}

MeasResultList2NR-r16 ::= SEQUENCE(SIZE (1..maxFreq)) OF MeasResult2NR-r16

MeasResultList2EUTRA-r16 ::= SEQUENCE(SIZE (1..maxFreq)) OF MeasResult2EUTRA-r16

MeasResult2NR-r16 ::= SEQUENCE {

 ssbFrequency-r16 ARFCN-ValueNR OPTIONAL,

 refFreqCSI-RS-r16 ARFCN-ValueNR OPTIONAL,

 measResultList-r16 MeasResultListNR

}

MeasResultListLogging2NR-r16 ::= SEQUENCE(SIZE (1..maxFreq)) OF MeasResultLogging2NR-r16

MeasResultLogging2NR-r16 ::= SEQUENCE {

 carrierFreq-r16 ARFCN-ValueNR,

 measResultListLoggingNR-r16 MeasResultListLoggingNR-r16

}

MeasResultListLoggingNR-r16 ::= SEQUENCE (SIZE (1..maxCellReport)) OF MeasResultLoggingNR-r16

MeasResultLoggingNR-r16 ::= SEQUENCE {

 physCellId-r16 PhysCellId,

 resultsSSB-Cell-r16 MeasQuantityResults,

 numberOfGoodSSB-r16 INTEGER (1..maxNrofSSBs-r16) OPTIONAL

}

MeasResult2EUTRA-r16 ::= SEQUENCE {

 carrierFreq-r16 ARFCN-ValueEUTRA,

 measResultList-r16 MeasResultListEUTRA

}

MeasResultRLFNR-r16 ::= SEQUENCE {

 measResult-r16 SEQUENCE {

 cellResults-r16 SEQUENCE{

 resultsSSB-Cell-r16 MeasQuantityResults OPTIONAL,

 resultsCSI-RS-Cell-r16 MeasQuantityResults OPTIONAL

 },

 rsIndexResults-r16 SEQUENCE{

 resultsSSB-Indexes-r16 ResultsPerSSB-IndexList OPTIONAL,

 ssbRLMConfigBitmap-r16 BIT STRING (SIZE (64)) OPTIONAL,

 resultsCSI-RS-Indexes-r16 ResultsPerCSI-RS-IndexList OPTIONAL,

 csi-rsRLMConfigBitmap-r16 BIT STRING (SIZE (96)) OPTIONAL

 } OPTIONAL

 }

}

MeasResultSuccessHONR-r17::= SEQUENCE {

 measResult-r17 SEQUENCE {

 cellResults-r17 SEQUENCE{

 resultsSSB-Cell-r17 MeasQuantityResults OPTIONAL,

 resultsCSI-RS-Cell-r17 MeasQuantityResults OPTIONAL

 },

 rsIndexResults-r17 SEQUENCE{

 resultsSSB-Indexes-r17 ResultsPerSSB-IndexList OPTIONAL,

 resultsCSI-RS-Indexes-r17 ResultsPerCSI-RS-IndexList OPTIONAL

 }

 }

}

ChoCandidateCellList-r17 ::= SEQUENCE(SIZE (1..maxNrofCondCells-r16)) OF ChoCandidateCell-r17

ChoCandidateCell-r17 ::= CHOICE {

 cellGlobalId-r17 CGI-Info-Logging-r16,

 pci-arfcn-r17 PCI-ARFCN-NR-r16

}

SHR-Cause-r17 ::= SEQUENCE {

 t304-cause-r17 ENUMERATED {true} OPTIONAL,

 t310-cause-r17 ENUMERATED {true} OPTIONAL,

 t312-cause-r17 ENUMERATED {true} OPTIONAL,

 sourceDAPS-Failure-r17 ENUMERATED {true} OPTIONAL,

 ...

}

TimeSinceFailure-r16 ::= INTEGER (0..172800)

MobilityHistoryReport-r16 ::= VisitedCellInfoList-r16

TimeUntilReconnection-r16 ::= INTEGER (0..172800)

TimeSinceCHO-Reconfig-r17 ::= INTEGER (0..1023)

TimeConnSourceDAPS-Failure-r17 ::= INTEGER (0..1023)

UPInterruptionTimeAtHO-r17 ::= INTEGER (0..1023)

-- TAG-UEINFORMATIONRESPONSE-STOP

-- ASN1STOP