3GPP TSG-RAN WG2 #113bis-e R2-21xxxxx

Electronic meeting, April 12th – 20th 2021

Agenda Item: 8.13.2.3

Source: CATT

Title: [Post113-e][852][NR R17 SON/MDT] 2 step RA and other SON changes (CATT)

Document for: Discussion

# 1 Introduction

This document captures the outcome of the following email discussion [1]

* [Post113-e][852][NR17 SON/MDT]  2 step RA and other SON changes (CATT)

- Scope:

2 step RA report enhancements (also potentially reply to RAN3 LS in R2-2008731)

Mobility history information enhancements

RA report related enhancements (from RAN2#113 contributions and RAN3 LS R2-2008723)

Other SON functions as proposed by companies for RAN2#113 meeting

Intended outcome: Report

Deadline: Long

Please provide your comments before Wednesday 24/03/2021 23:59 UTC, to leave time for preparing the summary.

This document is organized as the following. The discussions are in section 2, and the summary and proposals are in section 3.

# 2 Discussion

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

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| Company | Contact: Name (E-mail) |
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## 2.1 2-step RA report enhancements

In RAN2 #113-e meeting, many contributions [2]-[11] were submitted on 2-step RA report enhancements, and the following agreements were made [1]:

Agreements

1 The reporting granularity of whether the DL beam quality, associated to the used 2 step RA resource, is above or below the msgA-RSRP-ThresholdSSB is per-RA-attempt.

2 The RA report includes an indication that enables the network to know that the fallback from 2 step RA to 4 step RA was performed by the UE. FFS: Implicit vs explicit indication.

3 Choose ‘per RA procedure’ for the granularity of RA type (2 step RA vs 4 step RA) indication. FFS: Implicit vs explicit indication.

Agreement:

UE includes the measured RSRP of DL pathloss reference obtained just before performing RACH procedure in 2step RA report. FFS how to reduce the report overhead.

There are FFSs regarding fallback indication and RA type indication. Furthermore, some companies discuss the switching information from 2-step RA to 4-step RA [2]-[9]. In the reminder of this section, we discuss the following issues. Once these issues are concluded, RAN2 can further discuss the reply LS to RAN3 in [12].

* Issue 2.1-1: Fallback indication
* Issue 2.1-2: RA type indication
* Issue 2.1-3: Switching information
* Issue 2.1-4: DL beam quality
* Issue 2.1-5: Any other issues to discuss for sending reply LS to RAN3

### **Issue 2.1-1 Fallback indication**

According to the previous agreement, the remaining open issue is how exaclty the indication is done. There are options as well summarized in [13].

In the following, we aim at collecting companies’ views on the possible options.

**Q1: Which option do you prefer for fallback indication?**

* **Option 1 – implicit indication (details to be clarified)**
* **Option 2 – explicit indication, the fallback indication is per RA attempt**
* **Option 3 – explicit indication, a single notification as to in which RA attempt did the UE performed the fallback**
* **Other options, if any**

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| **Company** | **Preferred Option** | **Comments/explainations on your preferred option if any** |
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**Summary of issue 2.1-1**

**to be updated**

### **Issue 2.1-2 RA type indication**

RAN2 agreed to use ‘per RA procedure’ for the granularity of RA type (2 step RA vs 4 step RA) indication, FFS Implicit vs explicit indication. While the explicit indication per RA procedure is straightforward, how exactly the implicit indication is done may be clarified.

In the following, we aim at collecting companies’ views on the possible options.

**Q2: Which option do you prefer for RA type indication?**

* **Option 1 – implicit indication (details to be clarified)**
* **Option 2 – explicit indication**

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| **Company** | **Preferred Option** | **Comments/explainations to your preferred option if any** |
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**Summary of issue 2.1-2**

**to be updated**

### **Issue 2.1-3 Switching information**

In [2]-[9], it is proposed that UE should report the switching information, so that the network knows whether the UE switched from 2-step RA to 4-step RA in one RA procedure.

On the other hand, in RAN3 LS in [12]‎, it is required to include information that can distinguish 2-step RA from 4-step RA in the granularity of ***per-RA attempt***. ‎One may argue that since RAN2 agreed to choose ‘per RA procedure’ for the granularity of RA type (2-step RA vs 4-step RA) indication‎, it is unclear how network knows the RA type per RA attempt without switching information.

Firstly, companies are invited to share their views regarding whether switching information is included in RA report.

**Q3: Do you agree that network should know whether switching from 2-step RA to 4-step RA is performed by UE due to reaching a configured MSGA transmission times?**

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| **Company** | **Yes/No** | **Comments if any** |
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If your feedback to the above question is YES, please further comment on the preferred report information.

**Q4: Which Option do you prefer if your feedback to the previous question is YES?**

* **Option 1 - Network knows implicitly whether the switching is performed [3], [13]**
* **Option 2 - The configured maximum MSGA transmission number is included in the RA report [2]**
* **Other options, if any**

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| **Company** | **Preferred option** | **Comments and explainations** |
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**Summary of issue 2.1-3**

**to be updated**

### **Issue 2.1-4 DL beam quality**

RAN2 has agreed that UE includes the measured RSRP of DL pathloss reference obtained just before performing RACH procedure in 2step RA report. While from RAN3 LS [12], information about whether the DL beam quality is above or below the *msgA-RSRP-Threshold-r16* should be included in RA report.

For whether the DL beam quality is above or below the *msgA-RSRP-Threshold-r16*, all companies agree that this information should be included, but view is split on the granularity, i.e. whether it should be per-RA-procedure or per-RA-attempt.

The RAN3 requirement can be met if network is aware of the previously configured *msgA-RSRP-Threshold*. This however depends on RAN3 understanding, and it is the rapporteur’s understanding that it is meaningful to indicate this in the reply LS to RAN3. Companies are invited to share their views regarding this aspect.

**Q5: Do you agree to the following**

**a) RAN2 already agreed “UE includes the measured RSRP of DL pathloss reference obtained just before performing RACH ‎procedure in 2step RA report. FFS how to reduce the report overhead.‎” With this agreement, RAN2 assumes it sufficient to address RAN3’s request on indication of whether DL beam quality is above or below the *msgA-RSRP-Threshold-r16* (per RA procedure)‎, as the configured *msgA-RSRP-Threshold-r16* is known by the network.**

**b) RAN2 asks RAN3 to clarify if any issue is identified in such assumption.**

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| **Company** | **Yes/No** | **Comments if not agreeable** |
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**Summary of issue 2.1-4**

**to be updated**

### **Issue 2.1-5 Any other issues to reply to RAN3 LS‎**

Companies are invited to share their comments if they see any other issues that need to be handled, to reply to RAN3 LS in [12]‎.

**Q6: Do you see any other issues that need to be handled, to reply to RAN3 LS in [12]?**

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| **Company** | **comments if any** |
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**Summary of issue 2.1-5**

**to be updated**

## 2.2 Mobility history information enhancements

Mobility history information enhancement was listed as one topic to further investigate in RAN2#112-e [14]. In [15], RAN3 agreed on the following

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| UE History Information in EN-DC  UE History Information (UHI) of SN does not include HO Cause  Wait for RAN2 agreements before discussing UE History Information from UE  Enhancement of UE History Information for Secondary Node does not apply to LTE DC scenarios  Include SN UHI in the SN addition and change messages (modification FFS); information flow in both directions is not precluded at this stage |

Basically, RAN3 has concluded some guidelines about this topic, and then RAN3 will wait for RAN2 agreements about the UE history information before further discussion.

Several issues have been discussed in company contributions on the topic in RAN2#113-e, i.e.,

* Issue 2.2-1 Structure of PSCell MHI (PSCell MHI together with PCell MHI or as a separate report) [18][23][28][30][33][34][36]
* Issue 2.2-2 Where to report PSCell related MHI [18][23][28][30][31][33]
* Issue 2.2-3 ‎Main content to report for PSCell MHI [18][23][28][30][31][33][34][36]
* Issue 2.2-4 Which ‎Message is used to report the PSCell MHI [23]
* Issue 2.2-5 ‎Applicable scenarios [18][34]

### **Issue 2.2-1 Structure of PSCell MHI**

This issue has been well summarized in [12], where two options are listed

* Option 1: PSCell MHI nested within the PCell MHI [18][23][28][33].
* Option 2: PSCell MHI as a separate report from PCell MHI [30][34][36]

For option 1, in each entry of PCell, multiple PSCells could be recorded. The correlation of the PCell and each PSCell is clear. From the information, the network can know the addition, release or change of the PSCell.

For option 2, the lists of PCell(s) and PSCell(s) are recorded separately, which may be more flexible. But on the other hand, the network may not know the association between the PScell and PCell based on the report.

Furthermore, the cell number of current PCell MHI list cannot exceed 16. This may also be taken into account in down selection between the options.

Companies are invited to share their preference between the options.

**Q7: Which option do you prefer for the structure of PSCell MHI enhancement?**

* **Option 1: PSCell MHI nested within the PCell MHI**
* **Option 2: PSCell MHI as a separate report from PCell MHI**

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| **Company** | **Option 1 or 2** | **Comments if any** |
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**Summary of issue 2.2-1**

**to be updated**

### **Issue 2.2-2 Where to report PSCell related MHI**

Two options have been listed according to company proposals:

* Option 1: PSCell MHI is reported to both PCell and PSCell MHI [23][30][31].
* Option 2: PSCell MHI is reported only to PCell [18] [28][34][33]

Based Option 1, the UE is allowed to send *mobilityHistoryAvail* indicator the SN node, and the SN node is also allowed to request for MHI result from UE.

For option 2, the UE reports all the MHI to the MN node. After receiving the MHI, the MN node could make use of the MHI itself to improve its corresponding configuration, and it may also forward the information to the SN.

Companies are invited to share their preference on the options.

**Q8: Which option do you prefer regarding where to report the PSCell related MHI?**

* **Option 1: PSCell MHI is reported to both PCell and PSCell MHI**
* **Option 2: PSCell MHI is reported only to PCell**

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| **Company** | **Preferred option** | **Comments if any** |
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**Summary of issue 2.2-2**

**to be updated**

### **Issue 2.2-3 Main content for PSCell MHI**

The content of PSCell MHI was also discussed in company contributions, where possible information include

1. PSCell ID (may include CGI or frequency+PCI);[18][23][28][30][33]
2. The time UE stayed in each PSCell; [18][23][28][30][33]
3. Beam related information; [36]
4. Sensor information, location information; [31]
5. Mobility state; [31]
6. RRC state;[31]
7. Deployment characteristics(e.g. size of the cell);[31]
8. Other information, if any.

Companies are invited to share their preference on the necessary content in PSCell MHI.

**Q9: Which information can be included in PSCell MHI?**

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| **Company** | **Preferred information** | **Comments if any** |
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As there are proposals to also enhance PCell MHI (entries c-g in the list above).‎ Companies are invited to share their preference on the necessary enhancements to PCell MHI.

**Q10: Which information can be added to PCell MHI?**

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| **Company** | **Preferred information** | **Comments if any** |
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**Summary of issue 2.2-3**

**to be updated**

### **Issue 2.2-4 Message used to convey PSCell MHI**

Furthermore, which message could carry the PSCell MHI has also been discussed [23]. Note this issue may depend on the conclusion of the previous questions.

1. UEAssistanceInformation;
2. UEInformationResponse;
3. SCGFailureInformation (QC: Include the available flag in this message[30])

**Q11: Which message should be used to convey the PSCell MHI?**

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| **Company** | **Preferred option** | **Comments if any** |
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**Summary of issue 2.2-4**

**to be updated**

### **Issue 2.2-5 Applicable scenarios**

It is RAN3 agreement that “Enhancement of UE History Information for Secondary Node applies to all MR-DC scenario” and “Enhancement of UE History Information for Secondary Node does not apply to LTE DC scenarios”. Therefore it is also meaningful to discuss the appropriate DC scenario in RAN2.

The possible scenarios proposed by companies include:

1. EN-DC; [18][34]
2. (NG)EN-DC; [18]
3. NR-DC; [18]
4. NE-DC.

Companies are invited to share their view on this issue.

**Q12: Which scenario(s) are applicable for PSCell MHI enhancements?**

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| **Company** | **Preferred scenario(s)** | **Comments if any** |
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**Summary of issue 2.2-5**

**to be updated**

## 2.3 RA report related enhancements

### 2.3.1 SgNB RACH report

RAN3 has sent LS [40] to RAN2, which indicates:

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| RAN3 discussed the use cases of RACH report for SgNBs, and observed that there was no means for the SgNB to retrieve from UE in MR-DC any information on RACH access procedure at SgNB, and thus there was no input for SON algorithm to adjust the RA related parameters in SgNBs. |

RAN3 asks RAN2 to consider UE RACH report for SgNBs and provide feedback to RAN3. This topic was only briefly discussed in RAN2#112-e. In RAN3#113-e, several contributions discuss on the topic, which covers the basic options for SgNB RACH report, as well as detailed signalling enhancements.

As listed in [17], there are two basic options for SgNB RACH report

* Option 1: UE reports the SN RACH report to the MN, and then MN sends the SN RACH report to the SN;
* Option 2: SN requests SgNB RACH report, and then UE reports the SN RACH report to the SN, directly via SRB3 or via SRB1;

First of all, in order for RACH configuration optimization, the RACH report may need to be forwarded by either the MN (in Option 1) or by the SN (in Option 2), to the SN for which the RACH procedure actually occurred. Therefore the following observation is made.

**Observation 2.3.1-1 The mechanism that the current MN or SN forward the SN RACH report to the SN for which the RACH procedure actually occurred is anyway needed, no matter whether Option 1 or 2 is used.**

Then, based on companies contributions [9][17][20], the RAN2 specification impact of Option 1 and 2 can be summarized as the following.

Specification impact of Option 1 [17]:

* For NR-DC case, current *rapurpose* already supported SN related RACH report, so there is no specification impact;
* For EN-DC case, the LTE RACH Report may need to include a NR container about SgNB UE RACH Report content.

Specification impact of Option 2 [20]:

* Legacy UEInformationRequest message can be embedded in EUTRA/NR DLInformationTransferMRDC to enable the interaction between SN and UE;
* Enhancements on the support of SgNB RACH report are required, potential solutions include:

a) The UE tr*a*nsfers the SN-related RACH report to SN via *ULInformationTransferMRDC*.

b) A new message, e.g., UEInformationReponseSCG, is used to transfer the SN RACH report to SN via SRB1 or SRB3 (if configured).

Companies are invited to provide their views regarding the above specification impact analysis of the options.

**Q13: Do you agree with the above specification impact analysis of Option 1 and 2?**

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| **Company** | **Yes/No** | **Comments if any** |
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Companies are invited to share their preference between Option 1 and 2, based on the previous discussions.

**Q14: Which option do you prefer for SgNB RACH report?**

* **Option 1: UE reports the SN RACH report to the MN, and then MN sends the SN RACH report to the SN;**
* **Option 2: SN requests SgNB RACH report, and then UE reports the SN RACH report to the SN, directly via SRB3 or via SRB1;**

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| **Company** | **Preferred option** | **Comments if any** |
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**Summary of SgNB RACH report**

**to be updated**

### 2.3.2 Other RACH Optimization

There are other possible RACH optimizations, e.g., in [31] several aspects have been proposed:

1. UE also includes the PCell in the RA report in case the RA occurred in an SCell;
2. UE includes the location information and the radio measurement in the RA report depending on the *raPurpose*, e.g. in case of SR failure, beam recovery failure, UL synchronization issues.
3. Introduce raPurpose into RLF report, if the RLF cause is *randomAccessProblem*.
4. Introduce the information related to whether the UE selected the RA group A or B;
5. Introduce the indication or information about the msgA/msg3 payload size and the passloss;
6. Introduce the reason of the contention detection, i.e. “collision” reasons or radio reasons.

Companies are invited to provide their views on necessary enhancements on RACH report, if not already discussed in the previous sections. The intention of such discussion is to form a possible list of enhancements that receive wide support.

**Q15: Do you see any other RACH enhancements, if not already discussed in previous sections?**

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| **Company** | **Potential RACH enhancements** |
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**Summary of Other RACH Optimization**

**to be updated**

## 2.4 Other SON functions as proposed by companies

### 2.4.1 UL/DL coverage imbalance

In RAN2#111-e the following was captured [16]:

=> Study the necessity of introducing new method for more precise identification of the DL coverage quality during the UL coverage outage.

Then in RAN2#112-e RAN2 the following was captured [14]:

=> RAN2 to investigate UL/DL coverage imbalanced.

In RAN2#113-e, possible enhancements are proposed:

* Option 1: Extend RLF report
  + Option 1.1: Extended with “DL quality” information [19]
  + Option 1.2: Add conditions to identify UL availability [34]
* Option 2: Introduce a list of CEF reports [28][33]
* Option 3: Include the location information and the radio measurement in the RA report, for some of the *raPurpose* [31]
* Other Options, if any

Companies are invited to share their views on its necessity and their preference on these enhancements if any.

**Q16: Whether and if yes, which option(s) should be supported to identify and solve the problem about UL/DL coverage imbalance?**

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| **Company** | **Preferred option(s)** | **Comments if any** |
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**Summary of UL/DL coverage imbalance**

**to be updated**

### 2.4.2 Enhancement related to MCG/SCG failure

#### **Issue 2.4.2-1 RLF triggered by MCG/SCG failure**

For RLF triggered by MCG/SCG failure, the contents below are proposed by [26] to be included in RLF report:

1. a new failure type of *rlfOfBothMCGAndSCG* in *connectionFailureType*;
2. container of *SCGFailureInformation*, if RLF is triggered by SCG and MCG transmission is suspended;
3. container of *MCGFailureInformation* or *measResultSCG*, if RLF is triggered by MCG and SCG transmission is suspended;

Companies are invited to share their views on these enhancements.

**Q17: Whether and if yes, which content should be supported in RLF report for MCG/SCG failure enhancement?**

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| **Company** | **Preferred option(s) if any** | **Comments if any** |
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**Summary of issue 2.4.2-1**

**to be updated**

#### **Issue 2.4.2-2 Enhancement for SN change failure**

In RAN2#113 meeting, companies provided several scenarios about the SCG failure, and propose to introduce indications or information. But for SN change failure, it has been pointed out in [28] that the feature are still under discussed in RAN3 and RAN2 can wait for the progress in RAN3. Therefore the following question is raised.

**Q18: Whether to wait for RAN3 progress about SN change failure?**

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| **Company** | **Yes/No** | **Comments** |
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Some enhancements to the contents are provided:

1. Introduce a new failure type of *reconfigureWithSyncFailurSCG* in *connectionFailureType* [26]
2. Include *perRAInfoList* field related to SCG failures in NR in a separate message, rather than the current SCG failure message [31]
3. Include *previousPSCellID*, *failedPSCellID*, *connectionFailureType* and *timeConnFailure* related to SCG failures in NR and EUTRA in a separate message, rather than the current SCG failure message [31]
4. Others if any

Companies are invited to provide their preference on these content if their answer to the previous question is NO.

**Q19: Which of the above enhancement(s) to the content do you prefer for SN change failure?**

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| **Company** | **Preferred option** | **Comments** |
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**Summary of issue 2.4.2-2**

**to be updated**

### 2.4.3 Fast MCG Recovery

In RAN2#113-e, companies provided several scenarios about the fast MCG recovery.

Since the fast MCG Recovery is not part of the WID, first companies are invited to provide their view on whether to introduce fast MCG link recovery related information in RLF report.

**Q20: Do you see it necessary to introduce fast MCG link recovery related information in RLF report?**

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| **Company** | **Yes/No** | **Comments if any** |
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Several potential enhancements are proposed in company contributions, i.e.,

1. Add a new failure type of “*Fast-MCG-Recovery-Failure”* in *connectionFailureType* [34][38][39]
2. Add *“t316-expiry”* and *“scg-failure”* as new rlf-cause [38]
3. Add SCG CGI and reason for SCG-failure in the RLF-report, if the RLF-cause is set as *“scg-failure”* [38]
4. others enhancements if any

Companies are invited to share their preference on these contents, if their feedback to the previous question is YES.

**Q21: Which content(s) should be supported in RLF report for fast MCG Recovery?**

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| **Company** | **Preferred option** | **Comments** |
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**Summary of Fast MCG Recovery**

**to be updated**

### 2.4.4 Other Optimizations

Some other optimizations are proposed in company contributions, e.g.,

1. Introduce failure information of Inter-RAT HO from NR to E-UTRA/UTRA into RLF report, for the voice fallback purpose [27],
2. Introduce cause value *t312-Expiry* into RLF report [28],
3. Introduce the report of conditional PSCell addition/change failure [24], and
4. NR-U related enhancement [30][31].

Companies are invited to provide their views on other necessary optimizations, if not already discussed in the previous sections. The intention of such discussion is to form a possible list of enhancements that receive wide support.

**Q22: Do you see any other necessary optimizations, if not already discussed in the previous sections?**

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| **Company** | **Please explain if any other necessary optimimations** |
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**Summary of other SON optimization**

to be updated

# 3 Conclusion

To be updated

# 4 References

1. Draft RAN2#113-e Chairman Notes, see https://www.3gpp.org/ftp/tsg\_ran/WG2\_RL2/TSGR2\_113-e/Report
2. R2-2100192 Discussion on RACH Report for 2-step RACH CATT
3. R2-2100286 Further discussion on SON aspects of 2-step RA China Telecommunication
4. R2-2100601 RACH report logging of 2-step and 4-step RACH information Nokia, Nokia Shanghai Bell
5. R2-2100710 Discussion on RA information for 2-step RA SHARP Corporation
6. R2-2101252 Discussion on 2 step RA related SON aspects Huawei, HiSilicon
7. R2-2101439 2-Step RA information for SON purposes Ericsson
8. R2-2101641 SON Enhancement for 2-step RA CMCC
9. R2-2101603 RA Report Enhanements for 2-step RA Samsung
10. R2-2100698 Discussion on contents and signalling model of 2-step RACH report vivo
11. R2-2101587 RA related enhancements ZTE Corporation, Sanechips
12. R2-2008731 LS to RAN2 on RACH report for 2-step RACH
13. R2-2102265 Summary of AI 8.13.2 Ericsson
14. R2-2100001 Report of 3GPP TSG RAN2#112-e meeting, Online
15. RP-202322 Status report for WI on enhancement of data collection for SON\_MDT in NR and EN-DC CMCC, Ericsson
16. R2-2008701 Report of 3GPP TSG RAN2#111-e meeting, Online
17. R2-2100193 Further Consideration on the UE RACH Report for SN CATT
18. R2-2100194 Enhancement on Mobility History Information CATT
19. R2-2100602 Refined UL Coverage Outage Detection Nokia, Nokia Shanghai Bell
20. R2-2100699 Discussion and reply on R3 LS for SgNB RACH report vivo
21. R2-2100700 Discussion on SON enhancements for Successful HO vivo
22. R2-2100748 Discussion on successful handover report NEC
23. R2-2100774 Discussion on collection of UE history information in EN-DC NTT DOCOMO, INC.
24. R2-2100779 Discussion on conditional PSCell addition/change failure report NTT DOCOMO, INC.
25. R2-2100845 Consideration on successful handover report and UE history information in EN-DC OPPO
26. R2-2101082 Discussion on rel-17 Radio Link Failure Report enhancement NTT DOCOMO INC.
27. R2-2101104 SON enhancement for Inter-RAT handover Lenovo, Motorola Mobility
28. R2-2101253 Discussion on other SON aspects Huawei, HiSilicon
29. R2-2101348 Successful Handover Report QUALCOMM INCORPORATED
30. R2-2101350 Open Issues in Other WID related SON features QUALCOMM INCORPORATED
31. R2-2101440 Other WID related SON features Ericsson
32. R2-2101588 Considerations on successful HO report
33. R2-2101589 Consideration on MHI and UL/DL imbalance ZTE Corporation, Sanechips
34. R2-2101604 SON Enhancements Samsung
35. R2-2101643 Discussion on Successful Handover Report CMCC
36. R2-2101644 Enhancement for Mobility History Information CMCC
37. R2-2100776 Discussion on successful handover report NTT DOCOMO, INC.
38. R2-2101343 SON aspects of DAPS HO and Fast MCG Recovery Optimizations QUALCOMM INCORPORATED
39. R2-2101105 SON enhancement for fast MCG link recovery Lenovo, Motorola Mobility
40. R3-205662 LS to RAN2 on RACH report for SgNB RAN3