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

Electronic meeting, 21th February– 3rd March 2022

Agenda Item: 8.13.3

Source: Ericsson

Title: SON related open issue list (Ericsson)

Document for: Discussion, Decision

# Introduction

This contribution lists all the open issues that needs to be addressed for the closure of the WI in Rel17.

* [Pre117-e][833][SON/MDT] SON related open issue list (Ericsson)

Deadline for comments: Feb 14th, 2359 UTC.

In the following document, the rapporteur has distinguished open issues that are more critical for the completion of the WI and for the running CR implementation (in Section 2), from other open issues that can be treated with lower priority and that can be seen as optimizations (in Section 3).

1. **Each open issue** should be associated with **suggested treatment/handling**.
   1. **Company input into Pre117-e-offline (i.e. no company tdocs)**
   2. Company tdocs invited.
   3. CR rapporteur handled issue (CR rapporteur will propose resolution as input to next meeting).
   4. Other, e.g. immature area, reference to dependency, unclear status etc.

For the below list of open issues, the latest email discussion post RAN2#116-e available in [37] and the summary of contributions submitted to RAN2#116bis-e in [38] are taken as baseline.

Below are the agreements reached in RAN2#116bis-e:

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| From RAN2#116bis-e:  Agreements  1 In case the UE experiences an RLF in a cell after being configured with CHO configuration in that cell (i.e., RLF in source while having CHO config), the UE shall log in the RLF-Report, the already agreed timeSinceCHOReconfig which represents in this case the time elapsed between the RLF in that cell and the latest received CHO configuration while connected to that cell.  2 The following granularities are adopted for the timers timeConnSourceDAPSFailure, timeSinceCHOReconfig, timeBetweenEvents:  a. timeConnSourceDAPSFailure: milliseconds  b. timeSinceCHOReconfig: hundreds of ms  c. timeBetweenEvents: milliseconds  3 Related to how to set the timeSinceFailure: keep the specification as-is (time since last failure).  4 For the inclusion of RA-InformationCommon in the SHR: RA-InformationCommon is included in SHR when T304 is above the threshold.  Observation 1 It is not possible for the network to identify that the SHR and RLF report are generated for the same HO.  5 The UP interruption time at HO is evaluated at PDCP layer without considering duplicates.  6 The UE is responsible for performing the user plane interruption time measurements at the HO i.e., inline with the agreement from RAN2#115 meeting.  Agreements  1 For the 2-step RA, the UE reports the payload size without considering the padding.  2 For the 2-step RA, the UE reports the payload size per RA procedure.  3 The UE includes intendedSIBs, ssbsForSI-Acquisition in the RA report also for a successfully completed on-demand SI procedure.  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. |

# Main open issues

## CHO/DAPS related

### Issue#1: Format of implementation in the running CR

In [2], it is is proposed to use the timer timeConnSourceDAPSFailure is included in RLF report in case of RLF occurs in source cell after fallback in DAPS HO scenario. Rapporteur notes that in the current running CR [7], the time between the DAPS HO execution and the radio ink failure in the source cell after the fallback to the source cell is already captured by the timeConnFailure, see below:

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| **From TS 38.331 Running CR [7]:**  1> else if the failure is detected due to radio link failure as described in 5.3.10.3, set the fields in *VarRLF-report* as follows:  2> set the *connectionFailureType* to *rlf*;  2> set the *rlf-Cause* to the trigger for detecting radio link failure in accordance with clause 5.3.10.4;  2> set the *nrFailedPCellId* in *failedPCellId* to the global cell identity and the tracking area code, if available, and otherwise to the physical cell identity and carrier frequency of the PCell where radio link failure is detected;  2> if an *RRCReconfiguration* message including the *reconfigurationWithSync* was received before the connection failure:  3> if the last *RRCReconfiguration* message including the *reconfigurationWithSync* concerned an intra NR handover:  4> include the *nrPreviousCell* in *previousPCellId* and set it to the global cell identity and the tracking area code of the PCell where the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was received;  4> if the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was concerning a DAPS handover:  5> set *lastHOType* to *daps*;  4> else if the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was concerning a conditional handover:  5> set *lastHOType* to *cho*;  4> set the *timeConnFailure* to the elapsed time since the execution of the last *RRCReconfiguration* message including the *reconfigurationWithSync*; |

Given the above, it seems that the usage of timeConnSourceDAPSFailure is unnecessary in this case. Note also that if it is agreed to use the timeConnSourceDAPSFailure in this case, then additional procedural text should be added to deprecate the use of timeConnFailure when there is an RLF after the fallback. It would be good to have a clear agreement in RAN2 about whether the existing implementation is fine or not:

1. [Pre117-e-offline] RAN2 to discuss whether the time elapsed between the DAPS HO initialization and the RLF in the source cell after fallback is represented by:
   1. The timeConnFailure (as in the current running CR)
   2. The timeConnSourceDAPSFailure (which according to running CR is just used in case of RLF in source while performing DAPS HO).

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The following topics have been brought up by various companies in the RAN2-116#887.5 email discussions. All of them are related to the way in which the RAN2 agreements have been implemented in the existing running CR.

1. [Pre117-e-offline] RAN2 to discuss whether there is any issue for the following topics related to CHO/DAPS, and whether those should be addressed in the next revision of running CR:
   1. Whether the latest changes in the running CR captures modeling of the UE actions in the case of consecutive failures.

Companies are invited to provide comments (if any) on the current modeling adopted in the running CR for the CHO consecutive failure.

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| **Company** | **Comments on the modeling of the CHO consecutive failures** |
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### Issue#2: timeUntilReconnection related

Still in [9], Oppo proposes to include the timeUntilReconnection for the latter failure in the RLF report for the consecutive CHO failure cases. Rapporteur notes that the timeUntilReconnection is used to log the time between reconnection and the connction failure (HOF or RLF) in legacy. The second CHO failure is not considered a reestablishment, so it is not clear what would be the purpose of this time in this case. The purpose of the timer timeUntilReconnection is to indicate if the reconnection cell should be treated for mobility robustness analysis or not and this decision is made by the source cell. Thus, it is more valuable if the timeUntilReconnection is the time between decalring first failure and the reconnection.

Further, note also that it was discussed in the past whether to consider the time between the failures but that was not agreed.

1. [Pre117-e-offline] RAN2 to discuss how to handle the *timeUntilReconnection* in the RLF report for the consecutive CHO failure cases:
   1. Time from first failure to the time of reconnection
   2. Time from second failure to the time of reconnection

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### Issue#3: CHO candidate cell IDs handling

In [10] and in [18], Samsung and Qualcomm propose to remove the list of CHO candidate cells IDs in RLF Report from the running CR.

Rapporteur would like to highlight that as per the current procedural text, the UE includes the *choCandidateCellList* only when the corresponding candidate cells have not been included as part of the *measResultNeighCells.* when

3> set *choCandidateCellList* to include the global cell identity and tracking area code, if available, and otherwise to the physical cell identity and carrier frequency of each of the candidate target cells for conditional handover included in *condRRCReconfig* within *VarConditionalReconfig* at the time of the failed conditional handover, excluding the candidate target cells included in *measResulNeighCells*;

Further, this is inline with the existing RAN2 agreements.

Agreements (from RAN2#113bis):

1 Include in the RLF-report for CHO the following:

a. Configured CHO execution condition(s) (A3 and/or A5 event configuration, TTT values)

b. Fulfilled CHO execution condition(s), i.e. whether A3 and/or A5 event was fullfilled, for the cell(s) in which CHO execution was triggered.

c. Latest radio measurement results of the candidate target cells

Inclusion of a) and c) are subject to the RAN3 reply to the RAN2 LS R2-2102149.

Agreements (from RAN2#115) in 113bis are confirmed as:

1 Include in the RLF-report for CHO the following:

a. Configured CHO execution condition(s) (A3 and/or A5 event configuration, TTT values)

c. Latest radio measurement results of the candidate target cells

Thus, the CHO candidate inclusion in RLF report has already been agreed. Further, there are discussions to align the CHO candidate related information to be included in the SHR with the RLF report. Two companies want to align the ASN.1 of SHR content and the RLF report content, for example CHO configuration aspects which is included in both places. Rapporteur believes this is a good suggestion to avoid repeated IEs and thus this will be implemented in the latest running CR.

Thus, rapporteur believes the following discussion is needed.

1. [Pre117-e-offline] Related to the inclusion of the CHO candidate cell list and CHO configuration, RAN2 to discuss whether:
   1. To keep the CHO candidate cell list and the CHO configuration only in the RLF-Report (as in the current running CR)
   2. To include the CHO candidate cell list and the CHO configuration both in the RLF-Report and SHR
   3. To exclude the CHO candidate cell list both from the RLF-Report and the SHR

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| **Company** | **Preferred option (a,b,c)** | **Comments** |
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### Issue#5: New RLF cause

In [26], Ericsson proposes to include the t312-expiry as rlf-cause in the RLF-Report **as in LTE**, and to also let the UE include the frequency whose associated T312 expired.

1. [Pre117-e-offline] Related to T312, RAN2 to discuss the inclusion of the following information in the RLF-Report:
   1. ‘t312-expiry’ as a new rlf-cause in the RLF-Report

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| **Company** | **Yes/No to the inclusion of t312-expiry** | **Comments** |
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## SHR related

### Issue#6: Solutions to resolve the issue of SHR and RLF report being generated for the same HO

Several proposed solutions have been mentioned by companies to resolve the issue of SHR and RLF report being generated for the same HO. They are summarized in the following with the cons according to the rapporteur´s understanding.

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| Solution | Solution description | Cons |
| A | Indicator in the RLF-Report (SHR) indicating that the SHR (RLF-Report) has been already sent to the network for this HO | If it is assumed that a specific SHR needs to be linked to a specific RLF-Report, this solution does not guarantee such a link. |
| B | Indicator in the RLF-Report (SHR) indicating that there is an SHR (RLF-Report) associated to the same HO | Might not work for scenarios wherein SHR is sent before the RLF occurs |
| C | C-RNTI to be included in the SHR, RLF-Report | The UE has to include the C-RNTI as allocated in target cell, but this C-RNTI might be reused by the target cell. Hence there is no guarantee that an SHR and RLF-Report indicating the same C-RNTI are really associated to the UE, i.e. to the same HO event. |
| D | Timestamps in the SHR and RLF-Report to link them in time | Overhead. The SHR should always include the timestamp since at the time of SHR generation it is unknown whether an RLF will happen in the target cell |
| E | RLF-Report should be merged with the SHR if the SHR has not been sent yet at the moment of RLF-Report generation, or the SHR should be merged in the RLF-Report | It does not work if the SHR has been already sent to the network at the time of RLF. |
| F | If RLF occurs within a certain time window after the generation of the SHR, the SHR should be discarded if not yet transmitted | It does not work if the SHR has been already sent to the network at the time of RLF. |
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Based on the above, rapporteur would propose to discuss the following.

1. [Company-tdoc] RAN2 to consider one or more of the following solutions to address the issue of SHR and RLF report are generated for the same HO:
   1. Indicator in the RLF-Report (SHR) indicating that the SHR (RLF-Report) has been already sent to the network for this HO
   2. Indicator in the RLF-Report (SHR) indicating that there is an SHR (RLF-Report) associated to the same HO
   3. C-RNTI to be included in the SHR, RLF-Report
   4. Timestamps in the SHR and RLF-Report to link them in time
   5. RLF-Report should be merged with the SHR if the SHR has not been sent yet at the moment of RLF-Report generation, or the SHR should be merged in the RLF-Report.
   6. If RLF occurs within a certain time window after the generation of the SHR, the SHR should be discarded if not yet transmitted

This issue is marked for further discussion during the meeting.

### Issue#7: User plane interruption measurements in SHR

RAN2 has agreed to include the UP interruption time to be reported by the UE. However, under which scenarios does the UE perform this measurement is still an open issue. There are two camps in this regard.

1. Only at DAPS HO – This is specific to DAPS as the main target of DAPS HO is to achieve 0ms HO interruption time and therefore, this is useful for DAPS HO evaluation for the operators.
2. For all HO types- This also ensures that the operator can check the DAPS HO performance but also allows for the operators to know where to deply and whether to deploy DAPS HO as the HO interruption in normal HO can be obtained by this method.

Based on the above, rapporteur lists the following as an open issue.

1. [Pre117-e-offline] RAN2 to discuss in which HO scenarios the UP interruption measurements should be considered:
   1. Only at DAPS HO
   2. For all HO types (ordinary HO, DAPS, CHO)

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### Issue#8: SHR trgigger configuration during source RLF but successful DAPS execution.

The SHR is generated by the UE only upon explicit configuration during a normal HO or for CHO. However, for the DAPS HO, if the UE declares RLF at the source while T304 is running and if the UE successfully completes the HO to the target cell, then it has been agreed that the UE should store the source RLF related indication in the SHR. However, it has not been discussed if the UE generates the SHR only upon explicit network configuration or always i.e., without any network configuration. There are two proposals under discussion.

1. UE shall always generate SHR due to RLF in source during DAPS HO
   1. Pros: Less configuration overhead
   2. Cons: All the rest of the SHR triggers are explicit configuration based while this scenario would be an exception
2. UE shall generate SHR due to RLF in source only if network has configured the UE to do so.
   1. Pros: Ensures that all SHR genaration triggers are explicitly configured by the network.
   2. Cons: One additional configuration.

During the previous discussions, some companies indicated that the T310 related threshold can be taken as an implicit configuration for SHR generation at the source cell. However, rapporteur would like to indicate that the T310 might not be running at the source and the UE might declare RLF in the source for maximum number of RLC retransmissions. Thus, rapporteur believes that RAN2 should discuss the problem in its entirety. Rapporteur also invites companies to take into account the discussion we had in the email discussion [37].

1. [Pre117-e-offline] RAN2 to discuss when the UE shall generate a SHR due to RLF in the source cell during a DAPS HO:
   1. Only if it is configured to do so in the SHR configuration (i.e. in the *successHO-Config*)
   2. The UE shall always generate a SHR due to RLF in the source cell during a DAPS HO

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### Issue#9: Other CR implementation related open issues.

One company expressed concern over the implementation of the SHR configuration in the running CR. The current running CR includes the SHR configuration in the otherConfig which can be delivered to the UE at any point in time. Some companies would like to include SHR configuration in the HO command explicitly. This can be discussed.

1. [Pre117-e-offline] RAN2 to discuss which RRC message/configuration carries the SHR configuration.
   1. otherConfig (current implementation)
   2. RRCReconfiguration including reconfigurationWithSync

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### Issue#10: PLMN ID checking for SHR reporting.

In [11], Samsung proposes the the UE should check the PLMN before sending the availability indicator in the case of SHR, as in RLF Report. Rapporteur believes this is needed to ensure no cross-PLMN SHR reporting is performed.

1. [Pre117-e-offline] RAN2 to agree to include PLMN checking before sending the availability indicator for the SHR, as in RLF Report.

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### Issue#11: T312 related SHR triggering configuration

In [26], Ericsson claims that the T312 is running per measurement object according to legacy specifications, and there might be different T312 values that the UE is handling for different measurement objects. Related to the T304 value used for the SHR generation, it is proposed then to discussed whether the UE should log the SHR whenever there is at least a T312 value associated to any measurement identity above the threshold, or if only the T304 associated to the measurement identity of the target cell should be considered. Rapproteur believes this needs to be calrified in the specification as the T312 is configurable per measObject.

1. [Company-tdoc] Given that the T312 is associated to the measurement identity, RAN2 to discuss whether to clarify in the specification in which cases the SHR is generated, e.g. one of the following:
   1. The UE shall log the SHR always when a T312 is running for any measurement identity configured to the UE. In this case, the UE shall indicate which frequency related measurements had triggered the timer T312.
   2. The SHR shall be generated only if the T312 associated to the measurement identity associated to the target cell is running

This issue is marked for further discussion during the meeting.

Similarly, it is proposed to discuss if the T312 threshold should be common to any measurement identity configured to the UE, or if it should be configured per measurement identity.

1. [Company-tdoc] RAN2 to discuss whether the T312 threshold for the SHR generation should be configured per measurement identity or if that can be common for all measurement identities configured to the UE.

This issue is marked for further discussion during the meeting.

## RA report related

### 2-step RA

#### Issue#12: Payload size reporting related

During RAN2#116bis-e it was agreed that for the 2-step RA, the UE reports the payload size without considering the padding. However what it remains to be addressed is whether the payload reported in the RA-Report is equivalent to the amount of UL data sent over the PUSCH resources in msgA or to the amount of UL data available in the UE buffer at the time of initiating the 2 step RA procedure. Rapporteur notes that if the first is selected, it will not be possible for the network to become aware of the overall buffer size at the time of msgA transmission and hence it cannot properly adjust the UL grant of the msgA to e.g. accommodate more data:.

1. [Pre117-e-offline] For the 2-step RA, the payload reported by the UE in the RA-Report is equivalent to:
   1. The overall payload without padding available in the UE buffer size at the time of initiating the 2 step RA procedure.
   2. The payload without padding sent by the UE over the PUSCH resources in the msgA.

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Further regarding the format of encoding the payoad size, during the RAN2#116-887.5 email discussion, there was a large support for ENUM based approach. However, Ericsson in [7] indicated that another possible alternative is to report the message size as a bit string of 8 bits, where the values mirror the BSR indexes used in the MAC specification. This would similar to what already specified in the RRC specification for the *messageSize* field used within *SL-TrafficPatternInfo*. In one company’s contribution [5], rs-MsgA-SizeGroupA based reporting of the payload size is provided. Based on this, rapporteur proposes discussing the following options.

1. [Pre117-e-offline] RAN2 to agree on one of the following method of reporting the payload size.
   1. A 8-bit bit string in RA report, where the value of the 8-bit bitstring refers to the index of the BSR table in TS 38.321 (similar to the definition of the *messageSize* field within *SL-TrafficPatternInfo*)
   2. The payload size is reported as ENUMERATED {noPayload, sizeRange1, sizeRange2, sizeRange3, sizeRange4, sizeRange5, spare1, spare0} wherein each RANGE is known, e.g. hardcoded in the specification. FFS the values for each range
   3. Exactly following the definition of ra-MsgA-SizeGroupA [5]
   4. Simplified definition of ra-MsgA-SizeGroupA by removing some size ranges[5]

#### Issue#13: PUSCH resource related information

Further, some companies have indicated that the UE should include the PUSCH configuration related information as the network might not have the UE context available in its memory when the RAReport is received from the UE. Thus, companies propose the following.

* Include following PUSCH resource allocated for msgA in the RA-Report (CMCC, ZTE [4]):
  + F: the MCS index
  + G: the number of PRB per PO of the PUSCH resource
  + H: the combination of start symbol and length and PUSCH mapping type
  + I: offset of lowest PUSCH occasion in frequency domain with respect to PRB 0
  + J: the number of msgA PUSCH occasions FDMed in one time instance
* Introduce PUSCH configuration related information in 2-step RA report in granularity of per RA procedure (Huawei [5])
  + msgA-MCS (4 bits)
  + nrofPRBs-PerMsgA-PO (5 bits)
  + msgA-PUSCH-TimeDomainAllocation (4 bits)
  + frequencyStartMsgA-PUSCH (9 bits)
  + nrofMsgA-PO-FDM (2 bits)

This topic is under discussion for some time now. Therefore the following proposal is made.

1. [Pre117-e-offline] RAN2 to discuss the inclusion of one or more of the following PUSCH resource parameters:
   1. msgA-MCS (4 bits)
   2. nrofPRBs-PerMsgA-PO (5 bits)
   3. msgA-PUSCH-TimeDomainAllocation (4 bits)
   4. frequencyStartMsgA-PUSCH (9 bits)
   5. nrofMsgA-PO-FDM (2 bits)

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| **Company** | **Preferred option (a,b,c,d,e, nothing needed)** | **Comments** |
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#### Issue#14: When to include 2 step RA related frequency resources’ information

Concerning the topic of when the UE shall include the msgA related PRACH resource information in the RA report has been brought up by multiple companies.

* MSGA PRACH resource should be included in RA report in the case of the following conditions ( CATT- [1]):  
  1) random access procedure with only 2-step RA attempt; or  
  2) 2-step RA is switched to 4-step RA and at least one value among frequency start, FDM, and SubcarrierSpacing of the MsgA RACH occasion is different to the corresponding value of MSG1 RACH occasion
* Confirm that when setting RA resource information in RA report, UE only include the parameters of RA resource that is configured in corresponding RACH configuration and used in the RA procedure (e.g., Msg1-FDM/Msg1-FrequencyStart is included for 2stepRA if shared RO is used)( R2-2200900 – CMCC, ZTE [4]).

Based on the above, RAN2 can discuss the conditional inclusion aspects of msgA related PRACH resources.

1. [Pre117-e-offline] RAN2 to confirm that the UE includes the RA resource related parameters (frequency start, FDM, and SubcarrierSpacing of the msgA RA resource) only under following scenarios:
   1. RA procedure involves only 2 step RA (i.e. no switching to 4-step RA)
   2. When 2 step RA to 4 step RA switching occurs, only those parameters that are different in 4 step RA resources compared to the 2 step RA resources are included.

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### SgNB related RA report

#### Issue#17: Cross RAT RA reporting

During the Rel-17, it has been agreed that a UE in DC can report the SN related RA report to the MN. When the UE is in EN-DC, this requires changes to LTE specification and considering, the limited time, rapporteur would like to check if companies are happy to restrict the SN RA reporting to MN only for NR-DC or should this also cover EN-DC.

1. [Pre117-e-offline] RAN2 to discuss whether the TS 36.331 modifications are introduced to handle the scenario of LTE MN fetching the list of NR RA reports.

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| **Company** | **Yes (change to LTE needed)**  **No (changes to LTE not needed)** | **Comments** |
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Further, if previous proposal is agreeable, then one has to decide if a UE that reports NR RA reports to LTE needs to indicate this as a separate capability or not. Also, associated to the RA report handling between different RATs, one company proposes the following (ZTE [6]).

* Confirm that UE reports all available RA-information (LTE RA information as well as SgNB RA-report if available) to LTE node regardless if it is in DC or not.
* When reporting stored SgNB RA-report, the cell identity of stored SgNB RA-report is encoded in LTE format and put outside the SgNB RA-report container.

Based on this, the following proposals are made.

1. [Pre117-e-offline] If it is agreed to support NR RA reporting to LTE in Proposal 17, RAN2 to agree whether capability bit for NR RA report is needed in LTE specification

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| **Company** | **Yes (capability bit needed)**  **No (capability bit not needed)** | **Comments** |
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1. [Pre117-e-offline] If it is agreed to support NR RA reporting to LTE in Proposal 17, RAN2 confirms that UE reports all available RA-information (LTE RA information as well as SgNB RA-report if available) to LTE node regardless if it is in DC or not.

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| **Company** | **Yes/No** | **Comments** |
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1. [Pre117-e-offline] If it is agreed to support NR RA reporting to LTE in Proposal 17, when reporting stored SgNB RA-report, the cell identity of stored SgNB RA-report is encoded in LTE format and put outside the SgNB RA-report container.

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| **Company** | **Yes/No** | **Comments** |
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## Other WID related

### MRO for SN

#### Issue#18: Inclusion of RA information in SCGFailureInformation

During RAN2#116-887.5 email discussion, almost all companies agreed to include RA information associated to a SCG failure in the SCGFailureInformation. This can be finalized to complete the MRO for SN related enhancements.

1. [Pre117-e-offline] The RA Information associated to a SCG failure are included in the SCGFailureInformation.

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| **Company** | **Yes/No** | **Comments** |
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1. [Pre117-e-offline] The RA Information associated to a SCG failure are included in the SCGFailureInformation for which following scenarios:
   1. when failureType is set to randomAccessProblem
   2. when failureType is set to beamFailureRecoveryFailure
   3. when failureType is set to synchReconfigFailureSCG

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| **Company** | **Preferred option (a,b,c)** | **Comments** |
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1. [Company-tdoc] RAN2 to discuss the necessity of inclusion of previousPSCellID, failedPSCellID, timeSCGFailure in the SCGFailureInformation message.

This issue is marked for further discussion during the meeting.

#### Issue#19: Associated to failureType in SCGFailureInformation

Further, in the same email ddiscussion, most companies have agreed that the UE sets the failureType to randomAccessProblem if the UE initiates transmission of the SCGFailureInformationNR message to indicate the reason for declaring failure to be the random access problem from the SCG MAC even if T304 is running. This needs to be configrmed in RAN2.

1. [Pre117-e-offline] RAN2 to confirm (UE behaviour from Rel-15/Rel-16) that the UE sets the failureType to randomAccessProblem if the UE initiates transmission of the SCGFailureInformationNR message to indicate the reason for declaring failure to be the random access problem from the SCG MAC even if T304 is running. Otherwise, if no random access problem has been detected at T304 expiry, the UE sets the failureType to synchReconfigFailureSCG.

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| **Company** | **Yes/No to the above understanding** | **Comments** |
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Associated to the same scenario, it was also discussed about the inclusion of a 1-bit flag to indicate the running of T304 at the time of SCG failure declaration due to randomAccessProblem. With the presence of the flag, the network node receiving the SCGFailureInformation can identify whether the SCG failure w declared due to too late PSCell change (e.g., if the T304 was not running) or too early PSCell change (e.g., if T304 was running) thus helping RAN3 to resolve their issues.

1. [Company-tdoc] The UE includes a 1 bit flag in the SCGFailureInformation to indicate that the T304 was running when the UE declared the SCG failure due to random access problem indication in the SCG MAC.

This issue is marked for further discussion during the meeting.

### MHI

#### Issue#20: PSCell MHI related capability indication

During RAN2#116-887.5 email discussion, the necessity to have an explicit capability indicator to indicate the PSCell related MHi was discussed and was part of the majority view. This needs to be finalized during Rel-17.

1. [low] RAN2 to discuss the need to introduce an explicit capability indicator that indicates that the UE is capable of storing the PSCell related MHI.

#### Issue#21: Number of PSCell related MHI

During RAN2#116-887.5 email discussion, companies discussed amongst 16/32/64 PSCell related MHI information but there was no clear majority support for any of the proposal. This is also something that needs to be finalized.

1. [Pre117-e-offline] RAN2 to discuss the total number of PSCell (across all PCells) related information that should be stored by the UE in the MHI:
   1. 16 PSCells
   2. 32 PSCells
   3. 64 PSCells

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| **Company** | **Preferred option (a,b,c)** | **Comments** |
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#### Issue#22: Handling addition/release of PSCells in MHI

In [35], ZTE proposes that the UE creates a new PCell entry if upon PSCell transition while being on same PCell and the maximum PSCell number of the PCell entry has reached. On the other hand, Ericsson [34] and Huawei [17] propose that when the UE reaches the maximum number of PSCell, if it gets a new PSCell, the UE removes the oldest stored PSCell entry and stores the newly configured PSCell entry.

1. [Pre117-e-offline] RAN2 to discuss how to handle addition/release of PSCells, e.g.
   1. The UE should create a new PCell entry if upon PSCell transition while being on same PCell and the maximum PSCell number of the PCell entry has reached.
   2. When the UE reaches the maximum number of PSCell, if it gets a new PSCell, the UE removes the oldest stored PSCell entry and stores the newly configured PSCell entry

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| **Company** | **Preferred option (a,b)** | **Comments** |
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In [17] [34] [36], Ericsson, Huawei, CATT propose to include the time spent with no PScell, besides the time duration when there are both Pcell and PScell (already captured in the running CR).

1. [Pre117-e-offline] RAN2 to discuss the inclusion of the time spent with no PSCell in the MHI, when connected to a certain PCell.

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| **Company** | **Yes (include the time spent with no PScell in the MHI)**  **No (not include the time spent with no PScell in the MHI)** | **Comments** |
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# Additional proposals that rapporteur believes as not essential

In this section, it is collected a list of proposals related to topics that can be treated as lower priority if time allows.

## timeConnFailure related

In [9], Oppo proposes that the timeConnFailure for the first CHO failure is not needed to be recorded and that the the timeConnFailure IE corresponding to the second CHO failure is proposed to be recorded in the RLF report. Rapporteur notes that the timeConnFailure is used by the network to better understand the reason of an HOF. If the second CHO failure is instead taken into account for the timeConnFailure, then this information will be lost.

Please note that in the current procedural text, the UE does not overwrite the varRLF-Report contents upon experiencing the second failure associated to CHO and thus the timeConnFailure as stored in the RLF report is associated to the first failure which rapporteur believes to be the correct implementation.

3> revert back to the UE configuration used in the source PCell;

3> if the associated T304 was not initiated as per the cell selection procedure performed in subclause 5.3.7.3:

4> store the handover failure information in *VarRLF-Report* as described in the subclause 5.3.10.5;

Therefore, Rapporteur proposes not to discuss this again.

1. [low] RAN2 to discuss if there is the need to not record the timeConnFailure for the first CHO failure, and just record it for the second.

## Related to condFirstEventFulfilled and condSecondEventFulfilled

In [10], Samsung proposes that the the fields, condFirstEventFulfilled and condSecondEventFulfilled are discarded from Running CR and that the inclusion of timeBetweenEvents and firstTriggeredEvent implies that all execution condition(s) are fulfilled.

The claimed reason is that in CHO both events should be fulfilled for the target cell. Note however, that when only one of the event has been satisfied but not the other, then the UE does not include timeBetweenEvents and firstTriggeredEvent. The UE only includes either the condFirstEventFulfilled and condSecondEventFulfilled. Having said that,rapporteur sees some optimization possibilities i.e., the fields condFirstEventFulfilled and condSecondEventFulfilled are required only when timeBetweenEvents and firstTriggeredEvent are not included and thus they can be added under some conditional presence in the procedural text. Thus, rapporteur proposes the following.

1. [low]The field s condFirstEventFulfilled and condSecondEventFulfilled are included only when timeBetweenEvents and firstTriggeredEvent are not included from Running CR.

## CHO candidate cell IDs removal from RLF report

In [10] and in [18], Samsung and Qualcomm propose to remove the list of CHO candidate cells IDs in RLF Report from the running CR.

Rapporteur would like to highlight that as per the current procedural text, the UE includes the *choCandidateCellList* only when the corresponding candidate cells have not been included as part of the *measResultNeighCells.* when

3> set *choCandidateCellList* to include the global cell identity and tracking area code, if available, and otherwise to the physical cell identity and carrier frequency of each of the candidate target cells for conditional handover included in *condRRCReconfig* within *VarConditionalReconfig* at the time of the failed conditional handover, excluding the candidate target cells included in *measResulNeighCells*;

Further, this is inline with the existing RAN2 agreements.

Agreements (from RAN2#113bis):

1 Include in the RLF-report for CHO the following:

a. Configured CHO execution condition(s) (A3 and/or A5 event configuration, TTT values)

b. Fulfilled CHO execution condition(s), i.e. whether A3 and/or A5 event was fullfilled, for the cell(s) in which CHO execution was triggered.

c. Latest radio measurement results of the candidate target cells

Inclusion of a) and c) are subject to the RAN3 reply to the RAN2 LS R2-2102149.

Agreements (from RAN2#115) in 113bis are confirmed as:

1 Include in the RLF-report for CHO the following:

a. Configured CHO execution condition(s) (A3 and/or A5 event configuration, TTT values)

c. Latest radio measurement results of the candidate target cells

Thus, rapporteur believes that there is not need to further discuss this topic.

1. [low] RAN2 to discuss if it is needed to remove the CHO candidate cells IDs from the RLF Report in the running CR.

## Retainment of RLF report contents

In [17], it is proposed that in case there is a failure in the CHO recovery cell, the UE should not delete the previous HOF information associated to the CHO. Rapporteur notes that in the current running CR if there is a failure in the CHO cell, that will be treated as a normal RLF and thus the UE rewrtires the contents of the RLF report. Rapporteur also wants to indicate that the replacing only part of the RLF report and keeping the rest would also cause issues in how the single RLF report is interpreted by the source cell at a later point in time. Based on this, rapporteur believes there is no need to change the existing behaviour of overwriting the RLF report if the UE declares RLF in the reconnect cell ID.

1. [low] RAN2 to discuss if the UE should keep the previous RLF-Report if a failure occurs in the CHO recovery cell.

## CHO configuration in RLF report

In [17], Huawei proposes that the UE includes the CHO configuration of the cell where RLF is detected in the RLF Report. Rapporteur notes that in the current running CR, the CHO configuration at RLF is provided for each candidate target cell. In the CHO context, it is not clear what is the CHO configuration of the cell where the RLF is detected, since the CHO configuration is for target cells not for the source cells.

1. [low] RAN2 to discuss the need to include in the RLF-Report the CHO configuration of the cell where RLF is detected

## DAPS fallback related

In [17], related to DAPS, it is proposed to refine the information provided in the RLF-Report in case of DAPS fallback. Rapporteur believes that in the current implementation of DAPS related HOF, the UE includes the reestablishmentCellID only when the UE experiences dual failures (source RLF followed by HOF). If the UE experiences a HOF while executing DAPS HO, then the UE always sets *dapsHOF* to *true*. If the UE has not set *rlfInSource-DAPS* to *true* then it is an indciation that the UE would have performed the fallback to the source cell and the *nrPreviousCell* is the same as the source PCell on which the UE performs the fallback. Thus rapporteur believes there is no need to add reestablishmentCellId to indicate fallback or to indicate any explicit fallback indication.

1. [low] RAN2 to discuss the need to refine the information in the RLF-report for the scenario of DAPS fallback, e.g.:
   1. Redefine the reestablishmentCellId to support the fallback cell information
   2. Introduce a new IE, e.g., fallbackIndicator to indicate the successful fallback information
   3. No changes are made as this information can be derived implicitly

## Misc

In [18], Qualcomm proposes that the timeConnFailure should be set to 0 in case the failure occurs before the CHO execution. Rapporteur notes that, we should keep the principles that we have in legacy as agreed in last RAN2#116-meeting, i.e. if the failure occurs in cell B, the timeConnFailure is set to the time elapsed since the last HO execution from A->B, and the RLF in cell B. If the timeConnFailure is set to 0, the network will think that the failure occurred immediately after the HO from cell A to cell B, while this might not be true. Rapporteur proposes not further discussing this.

In [18], Qualcomm proposes that if there is an RLF in a target cell after the DAPS HO, a possible RLF in the source encountered during the DAPS HO will not be reported. Rapporteur notes that the running CR is already like that, i.e. the RLF in source can only be captured either if the SHR is generated or if an HOF occurs, otherwise for it is not included for RLF (please check the procedures related to *rlfInSource-DAPS* in the running CR). Rapporteur proposes not further discussing this.

In [20], LG proposes that in case of successive CHO failure, the UE shall not clear the RLF-Report associated to the first CHO failure. Rapporteur notes that this is already the way it is captured in the specification, i.e. if the second CHO failure occurs, the UE does not initiate a new RLF-Report, rather it just appends the new info (i.e. the choCellID in the existing RLF-Report). See the part below in yellow:

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| From running CR:  3> if the associated T304 was not initiated as per the cell selection procedure performed in subclause 5.3.7.3:  4> store the handover failure information in *VarRLF-Report* as described in the subclause 5.3.10.5; |

Rapporteur proposes not further discussing this.

In [22], Sharp would like to clarify the implications of the following agreement. “Successful CHO recovery while initial failure” is part of the RLF-Report. Rapporteur interpretation is that SHR should not be triggered if the CHO fails, no matter if the recovery is successful or not. This was already discussed in the past, and it is the way it is implemented in the CR already.

In [12] and in [15], Lenovo and CMCC propose to add further information to the RLF-Report for the case of CHO. Rapporteur notes however that radio measurements are already included in the RLF-Report for the candidate target cells as well as their CHO configuration and information on event´s fulfilment.

1. [low] RAN2 to discuss the need of the following additional information to be included in the RLF-Report for the case of CHO:
   1. Whether the entry condition of the second condition is met or not when the first condition is considered as ‘fulfilled’
   2. Whether the second condition is also satisfied during TTT but the status of the first event has been changed to ‘not satisfied’
   3. The measurement result of the corresponding serving cell and candidate cell associated with the second event when the first condition is considered as ‘fulfilled’
   4. The measurement result of the corresponding serving cell and candidate cell when the first condition is considered as ‘not fulfilled’
   5. For the case that two CondEvent A3 or two CondEvent A5 are configured, then the reported first satisfied event or condition includes the corresponding measurement quantity, e.g., RSRP or RSRQ
   * On the definition of timeConnSourceDAPSFailure, i.e. whether last DAPS handover ‘execution‘ or the last DAPS handover ‘initialization‘ should be used
   * Merging the field description of the rlfInSource-DAPS in the RLF-Report with the one under the SHR

In [11] and [13], Samsung and Lenovo proposes to include the actual values of the T304, T312, T310 in the SHR. Additionally Samsung propose to capture the time between the RLF in source during the DAPS HO and the successful random access in the targe. Rapporteur notes that the need for this information was already discussed in the past, but not agreed. The following proposal is anyhow added in case there is now more support.

1. [low] RAN2 to discuss the need of including the following information in the SHR:
   1. T310 value in source cell when T310 stops
   2. T312 value in source cell when T312 stops
   3. T304 value in target cell when T304 stops
   4. UE reports the time between RLF@source and successful RACH with the target in DAPS handover in SHR

In [13], Lenovo further wonders what happens in case multiple triggering conditions for the SHR generation are fulfilled. According to the running CR, all the triggering conditions will be represented in the generated SHR. So it seems that no further discussion is needed.

During the previous discussions, companies has raised the following implementation related issues. One such issue is related to how the discarding of the SHR happens when the HO fails. In the current implementation, the UE generates the SHR when the UE generates the *RRCReconfigurationComplete* message. As can be seen from the highlighted text below, the UE generates the SHR only if the UE successfully completes the RA procedure towards the target cell. This way of implementation is done to reduce the over specification of exactly when the UE generates the SHR contents as this can be simply left to UE implementation. Otherwise, we would need to handle the generation of the SHR when any of the conditions occurs, and then delete it if the HO is successful. That would require a major impact to the procedural text because the SHR generation function should be invoked from many different places. Rapporteur wonders if this re-modeling is required from a specification point of view.

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| From SON Running CR:  3> if the UE was configured with *successHO-Config* when connected to the source PCell:  4> perform the actions for the successful handover report determination as specified in clause 5.7.10.x, upon successfully completing the Random Access procedure triggered for the *reconfigurationWithSync* in *spCellConfig* of the MCG;  3> if the UE has successful handover information available in *VarSuccessHO-Report*:  4> include *successHO-InfoAvailable* in the *RRCReconfigurationComplete* message; |

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1. [low] RAN2 to discuss how to discard the SHR that is generated at the formation of RRCReconfigurationComplete message and if the corresponding T304 expires.

## Inter-RAT SHR

Still in [11], inter-RAT SHR has been proposed. This has not been discussed before and can be down prioritized for Rel-17.

1. [low] RAN2 discusses if inter-RAT SHR is supported in this release. If so, RAN2 studies the encoding format for inter-RAT SHR.

## SHR triggering conditions.

In [16], CMCC proposes the enhance the content of the SHR about the BFR when none of beams in *candidateBeamRSList* could meet the measurement requirement. As this topic is a new issue but not very essential, rapporteur believes this can be treated with low priority.

1. [low] RAN2 to discuss the need to include BFR related information in the Successful Handover Report, when none of beams in candidateBeamRSList could meet the measurement requirement, e.g.
   1. Indication that none of beams in candidateBeamRSList could meet the measurement requirement
   2. ID and measurements of beams whose measurement higher than the threshod rsrp-ThresholdSSB but not within the configured list candidateBeamRSList
   3. Measurements of reference signals that within the configured list candidateBeamRSList

## Additional SHR contents

In [23], Sharp proposes to investigate whether for the case of SHR, the network needs to know whether the UE was configured with split SRB1 when the SHR was generated. This is a new topic and not essential for the Rel17 closure. Therefore rapporteur believes this can be treated with low priority.

1. [low] RAN2 to discuss whether the UE needs to indicate in the SHR whether the UE was configured with split SRB when the HO occurred.

## ContentionDetectedFlag for 2 step RA

One company has brought up the clarification regarding when the UE shall set the contentionDetected flag to TRUE while using the 2 step RA procedure. Their argument for doing so is that this condition is not clear in the MAC specification.

* The field contentionDetected corresponding to 2-Step RA is set to TRUE (Samsung [3]),
  + if msgB-ResponseWindow expires (and/or UE has received successRAR but does not include its contention resolution identity), or
  + if fallbackRAR is received for this attempt and contention resolution timer expires

Rapporteur believes this clarification is not an essential one as the interaction between the MAC and the RRC layers at the UE side are left for UE implementation.

1. [low] RAN2 to discuss whether it is necessary or not to clarify when the UE sets the contentionDetected flag to TRUE for 2 step RA procedure, e.g.
   1. if msgB-ResponseWindow expires (and/or UE has received successRAR but does not include its contention resolution identity)
   2. if fallbackRAR is received for this attempt and contention resolution timer expires.

## Additional RA report contents

One of the company had the proposal to add the reason for changing the RA procedure from 2 step RA to 4 step RA. For example, this could be due to LBT issues or due to fallback RAR. Considering this is a new feature that has not been discussed and more of an optimization, rapporteur proposes this to be of lower priority.

1. [low] Consider to capture other reasons for changing the procedure from 2-step to 4-step, e.g. due to LBT, due to fallback RAR reception

Further, one company would like to consider the case of fallback from 2 step CFRA to 4 step CBRA. This is something that can be derivable based on the RAReport contents (e.g., contention detected flag) and therefore, rapporteur believes this can be treated with low priority.

1. [low] Consider to capture fallback from 4-step CFRA to 4-step CBRA

One company brings up the topic of impact of power sharing on RA procedure (Samsung [3]).

* The UE indicates whether the UE could not transmit a PRACH due to the power limitation arising from the power allocation related to MR-DC (e.g., EN-DC, NE-DC, or NR-DC). The UE indicates whether the UE had to reduce its PRACH transmission power due to the power limitation arising from the power allocation related to MR-DC

This topic has not been discussed before in RAN2. Thus, rapporteur believes it might be too late for this release and therefore can be treated with low priority.

1. [low] RAN2 to decide whether to discuss the following new topic associated to RA report:
   1. The UE indicates whether the UE could not transmit a PRACH due to the power limitation arising from the power allocation related to MR-DC (e.g., EN-DC, NE-DC, or NR-DC). The UE indicates whether the UE had to reduce its PRACH transmission power due to the power limitation arising from the power allocation related to MR-DC

## MHI

In [34], Ericsson proposes to clarify how to handle the time spent in case of DAPS.

1. [low] RAN2 to discuss whether to clarify the handling of the time spent in the MHI in case of DAPS, e.g. the time spent in previous PCell is captured as the time spent from entering the source cell until receiving the source DAPS release message.

Further, in [36], CATT proposes to add the PScell MHI also to the LTE specifications. Considering we have very little time left, rapporteur believes LTE specification should be left unchanged.

1. [low] RAN2 to discuss if the PSCell MHI should extended to LTE as well.

### New RLF cause

In [26], Ericsson proposes to include the t312-expiry as rlf-cause in the RLF-Report **as in LTE**, and to also let the UE include the frequency whose associated T312 expired.

1. Related to T312, RAN2 to discuss the inclusion of the following information in the RLF-Report:
   1. [low] Indication of the frequency whose associated T312 expired

## Capability discussion

### RLF report enhancements related capability

In [20], LG claims that there is no way to differentiate legacy RLF-Report and R17 enhanced RLF-Report because there is only single indicator in UE-MeasurementsAvailable.

In addition, it has been proposed by Huawei in [29] to introduce new UE capability bits for the following enhancements and they are optional without capability signalling:

* DAPS failure reporting
* CHO failure reporting
* PSCell change failure reporting

Rapporteur believes, the enhancement to RLF report need not have any explicit capability indication or any explicit availability flag as the additions to RLF report in LTE was never introduced with new capabilities. The same principles can be continued in NR as well as long as the changes to the report are not very significant (in terms of report size). Based on the above papers, Rapporteur proposes the following.

1. [low] Related to capabilities, RAN2 to discuss the need of the following:
   1. Release indicator for each report version, representing that there exists a SON related report needed to be exchanged
   2. Capability bits for DAPS/CHO/PSCell change failure reporting
   3. No changes as additions are not very large

### Capability bit for on-demand SI related RA report enhancements

In [29], it has been discussed to introduce a new capability bit for the on-demand SI request related enhancement as part of RA reporting. Based on that, rapporteur wonders if companies agree to introduce a new capability bit for the on-demand SI request enhancement in the RA reporting.

1. [low] RAN2 discuss the necessity of a new capability bit for on-demand SI request enhancement of the RA reporting.

### UE capability of SN RA reporting to MN

Some companies have brought up the issue of whether the feature of SN RA Reporting to MN is a mandatory feature or is it an explicit capability from the UE side. This issue needs to be resolved.

Concerning the capability bit for the RA report, following have been proposed in [29],[30],[31]:

* Neither additional capability bit nor optional feature is needed for SgNB RACH Report for NR-DC case, while in EN-DC scenarios additional capability bit is needed for NR RA report enhancement in LTE [31].
* New UE capability bits for 2-step RA report enhancement and SN RA report are needed, and they are optional with capability signalling [29].
* Due to the time constrains prioritize NR DC scenarios and avoid changes in LTE spec for the time being [30].

Based on the above, rapporteur would like to propose the following proposal.

1. [low] RAN2 discuss whether a capability bit is needed for the RA report enhancements in Rel 17 (i.e., enhancement on 2-step RA information and SN related RA information).

# 4 Conclusion

To be updated

# 5 References

1. R2-2200393 The left issues on 2-step RA Report, CATT
2. R2-2200392, Further Discussion on Handover Related SON Aspects, CATT
3. R2-2200670, 2-step Random Access Optimization, Samsung
4. R2-2200900, Remaining issues for 2-step RA CMCC,ZTE

1. [R2-2200967](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200967.zip), [Discussion on 2 step RA related SON aspects](https://ericsson.sharepoint.com/R2-2200967.zip), Huawei, HiSilicon
2. R2-2201327, Remaining issues on RA-report enhancements, ZTE Corporation, Sanechips
3. R2-2201604, 2-Step RA information for SON purposes Ericsson
4. [R2-2200004](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200004.zip), [Running 38.331 for introducing R17 SON](https://ericsson.sharepoint.com/R2-2200004.zip), Ericsson

1. [R2-2200560](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200560.zip), [Further consideration of SON of HO related aspects](https://ericsson.sharepoint.com/R2-2200560.zip), OPPO

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