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:

|  |
| --- |
| **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:

[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).

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a, b)** | **Comments** |
| Qualcomm | Option A | In the RAN2#116-bis-e meeting, we agreed that *timeConnSourceDAPSFailure* granularity is in the millisecond and the maximum value can be 1.023 seconds. However, the time elapsed between the DAPS HO initialization and the RLF in the source cell after fallback can be significantly larger than 1.023 seconds. Therefore, we argue to use represent timeConnFailure to indicate time elapsed between the DAPS HO initialization and the RLF in the source cell after fallback. |
| vivo | a | We think *timeConnFailure* is fine as it indicates the time elapsed between DAPS HO initialization and the RLF in the source cell after fallback. |
| Huawei, HiSilicon | a | If the UE successfully fallback to the source cell. It means the previous DAPS mobility ends. When new RLF occurs in source cell, the UE will clear the existing varRLF-report and log failure information related to the new RLF. In this way, it is reasonable to reuse the timeConnFailure. |
| Ericsson | A | Agree with previous comments. The usage of timeConnFailure “comes for free” in this case, and there is no need to use the timeConnSourceDapsFailure. |
| Sharp |  | We understand this may depend on whether this failure case (DAPS HOF then source RLF after fallback) is considered as consecutive failures or not.  If this is not a consecutive failure, then when source RLF occurs after fallback, UE clears the stored RLF-report and creats a new RLF report for this failure, then it is quite reasonable to reuse the timeConnFailure.  If this is a consecutive failure, failure information of both the DAPS HOF(1st failure) and source RLF after fallback(2nd failure) is included in a single RLF report. If reusing option a, there will be 2 timeConnFailure IEs, one for 1st failure, one for 2nd failure. So it seems to us option b is more reasonable for this case. |
| Lenovo |  | Agree with Sharp. Firstly, we want to check whether this issue is for the case that the UE fails to fallback to the source cell upon HOF happens due to source RLF, if yes, from our point of view, for this case, even the time elapsed from HO initialization to HOF is close to the time elapsed from HO initialization to RLF in source cell, the timeConnFailure IE needs to be used to represent the time elapsed from HO initialization to HOF as legacy, it is confused to use the timeConnFailure IE again to represent the time elapsed from HO initialization to RLF in source cell. So option B is better for this case. |
| CATT | b | For DAPS HO scenario, we think legacy timeConnFailure is used to represent in the RLF report the scenario of DAPS HOF or RLF in target cell, new timeConnSourceFailure is used to represent in the RLF report the time elapsed between DAPS HO execute and RLF in source cell no matter after fallback or before fallback as agreed in RAN2#115e meeting.  In addition, for DAPS HO consecutive failure scenario, e.g. DAPS HO failure, fallback to source cell, then RLF occurs in source cell, the timeConnFailure is used to represent the time elapsed between DAPS HO execute and DAPS HO failure, in this case, it is more suitable to use timeConnSourceFailure to represent the time elapsed between DAPS HO execute and RLF in source cell after fallback. |
| CMCC | b | Agree with CATT. In case UE experience DAPS HO failure first and then RLF in the source cell, timeConnFailure is used to represent the time elapsed between DAPS HO execute and DAPS HO failure, and timeConnSourceFailure to represent the time elapsed between DAPS HO execute and RLF in source cell after fallback. |
| NEC |  | Agree with Sharp. It depends on if the failure information of both failure is included in the same RLF-report. |
| LGE | a | The usage of timeConnSourceDAPSFailure is unnecessary in this case. We think timeConnFailure is sufficient to record the time between DAPS HO initialization and the RLF in the source cell after fallback. |
| Samsung | a |  |
| ZTE | a | First for this case we have agreed that we will not enhance failureInformation to carry RLF-report information. Then after fallback UE will have a stored DAPS HO failure in RLF-report. After fallback to source, if UE stays in source enough then failureInformation can be served as a implicit indication for NW to request the RLF-report. If source RLF is not stable NW can decide to HO UE to other cell based on the latest neighboring cell measurement reported. In this sense we tend to agree with Huawei that the source failure after fallback has not relationship from previous HO decision. However, we noted that in RAN3 it has been agreed that too early is defined as fallback to source in case of DAPS HO, while there is no information to explicitly or implicitly indicate whether fallback occurs or not. Therefore it is suggested to **include a one-bit indication in DAPS HO report to indicate whether fallback to source is performed or not.** |
| Nokia, Nokia Shanghai Bell | a | As this is a connection failure (e.g UE loses connectivity with both Target and Source) timeConnFailure makes most sense to be used |
| OPPO | a | For the case of RLF at source cell after the fallback, since the RLF at source cell occurs after the HOF towards the target cell, the value of the *timeConnFailure* IE initially set as the time between DAPS HO initialization and the HOF towards the target cell will be replaced by the time between DAPS HO initialization and the RLF at the source cell. |

**Rapporteur summary:**

Option a: 9/14 companies

Option b: 2/14:

It depends on the scenario: 3/14 companies

From the above replies, option a got the majority of support. To address comments from companies saying that it depends on the scenario, Rapporteur notes that in case of RLF after fallback, the UE will generate a new RLF-Report clearing the previous DAPS HOF report, according to the current running CR implementation.

1. The time elapsed between the DAPS HO initialization and the RLF in the source cell after fallback is represented by the timeConnFailure (no changes needed to the current running CR).

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.

[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** |
| vivo | We think the current modeling is enough. |
| Huawei, HiSilicon | Based on the current modeling, the UE logs the failure info of the first failure. If the UE selects the CHO candidate cell, the UE stores the choCellId into the varRLF-report.   * If the UE detects HOF with the CHO candidate cell according to 5.3.5.8.3, the UE will keep the current info in the varRLF-report. * If the UE detects RLF with the CHO candidate cell according to 5.3.10.3 Detection of radio link failure, the UE will clear the information in the varRLF-report and store information of the second RLF with the CHO recovery cell.   In our understanding, if the second RLF occurs shortly with the CHO recovery cell, this should be considered as the consecutive CHO failure. Without the information of the first failure, this will be taken as a legacy too late HO.  The above is based on our understanding, and we have no strong view to revise the current modeling. |
| Ericsson | It is correct as Huawei mentions above that if an RLF occurs in the CHO recovery cell, the CHO HOF information previously stored in the RLF-Report will be overwritten. In order to avoid that, we should re-design the RLF-Report framework such that it can contain multiple RLF-Reports. That might be quite complicated, and it might also go a bit against the discussion/agreements we have had so far according to which the RLF-Report should contain information related to only one failure. |
| ZTE | We can make it as an exception that for CHO recovery rlf-report shall not be deleted, and have separate entries in RLFreport to contain first/second failure information. So that it is straightforward whether the timer starts from first failure or second failure. |
| Nokia, Nokia Shanghai Bell | The current way double failures are logged in RLF report is confusing and may be hard to read. Easier for some RLF report IEs to have double entries, each representing one failure and their order reprresenting the timeline. |
| OPPO | If the running CR we are talking about is the one included in R2-220004, there are several issues we need to address:   * After the second failure, when UE needs to record new content into the RLF report, the information previously included in VarRLF-Report will be cleared, according to the current status of 5.3.10.5, which does not suits the consecutive failure requirement:   ***5.3.10.5 RLF report content determination***  ***The UE shall determine the content in the VarRLF-Report as follows:***   1. ***clear the information included in VarRLF-Report, if any;***  * It is awkward why the CHO recovery failure cannot lead to the storing the handover failure information in Var-Report, as per the CR:  5.3.5.8.3 T304 expiry (Reconfiguration with sync Failure) 【omit….】  2> else:  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;  Generally, we are ok to let UE enter the section of 5.3.10.5 twice for recording different IEs for the RLF report for the consecutive failure cases. But the UE should not clear the RLF report previously stored when it suffers from the second consecutive failure, |

Rapporteur´summary:

One company would like to discuss how to capture the case in which the RLF occurs shortly after the CHO recovery. Three companies believe that in case of second failure, the previous RLF report associated to the first failure should not be deleted, but at the same time the RLF-Report should contain separate entries for the first and second failure. Rapporteur would like to point out that whether to have separate RLF entries for the second and first failure within the RLF-Report was discussed at length during previous meetings, but eventually it was agreed that there should not be a separate RLF entry for the second failure within the RLF-Report. That is to avoid repeating lots of information such as the measurement results of the neighbouring cells. Rather for the second failure, RAN2 agreed to only record the CHOCellID which represents the cell in which the UE performed the CHO recovery attempt.  
Given the above clarification, and considering that majority of companies did not reply to this question, Rapporteur believes that the current modeling of the UE actions in the case of consecutive failures can be kept as baseline, and further clarifications (if any) may be addressed during running CR review.

1. The modeling of the UE actions in the case of consecutive failures in the current running CR is considered as baseline. Further clarifications (if any) may be addressed during the running CR review.

### 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 connection 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 declaring 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.

[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
  3. Reuse existing *timeUntilReconnection* and introduce *timeBetweenFailures*

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| **Company** | **Preferred option (a, b)** | **Comments** |
| Qualcomm | Option B (however, with the modification) | Time from the last failure to the time of reconnection |
| vivo | a | Agree with Rapporteur analysis. |
| Huawei, HiSilicon | a | We agree that “The second CHO failure is not considered a reestablishment”.  Besides, from the UE implementation point of view, opt a is simpler than opt b. In opt a, the UE starts the timer since the first failure, this is the same as legacy UE behavior. For opt b, it introduces additional UE action to identify whether the failure is the first or second. |
| Ericsson | a | If b is selected that it is lost the original intention of the timeUntilReconnection which is used to capture the time gap between HOF/RLF and reconnection. |
| Sharp | a | Agree with rapporteur’s view. |
| Lenovo | a | Agree with Rapporteur. |
| CATT | a | Agree with Rapporteur’s view. |
| CMCC | Both a and b,  or C | If consecutive CHO failures happened, then both the first failure cell and the second failue cell should be treated for mobility robustness analysis, then we deem both the informarion of a and b are necessary.  Another alternative is to report the time between the two failures, which could also be used to optimize the timeSinceFailure. By reporting the time between the two failures, network could have sufficient time information of the two failures and do related optimization. |
| NEC | a |  |
| LGE | a | Agree with Rapporteur |
| Samsung | a |  |
| ZTE | Seem comments | The difference between a and c is whether we need to introduce timeBetweenFailure to help derive the timer between latest failure to until reconnects. We also share the same understanding that CHO recovery follows reconfiguration procedure, therefore its failure will be considered as reconfiguration failure instead of reestablishment failure. In that sense, if reuse legacy principle, timeUntilReconnection shall start from the second failure which applies the same principle as TimeSinceFailure as agreed last meeting.  But from the perspective of how timer intends to be used, it is also reasonable to count the timeUntilReconnection since the first failure. But we wonder if it is the same for timeSinceFailure? Another method would be to as suggested by CMCC to introduce timeBetweenTwoFailure where each part of timers can be derived based on different combination of timers to fulfil different optimization requirement. |
| ITRI | a | Agree with Rapporteur’s view. |
| Nokia, Nokia Shanghai Bell | b | After the first CHO failure, the UE does CHO recovery so it stays connected. In legacy TimeUntilReconnetion implies UE was idle for some period of time. If it is desired to log the time between CHO failure and CHO recovery failure, a new timer can be defined. |
| OPPO | b | *According to the current implementation, timeUntilReconnction* IE is only to be recorded upon reception of the *RRCSetup* msg from the network, and the value of this IE is the time elapsed since the last RLF or HOF, which implies, for the consecutive CHO/DAPS failure cases, only the time from the latter failure to the time moment UE receives a *RRCSetup* msg corresponding to the *RRCSetupRequest* msg is recorded. The spec description is indicated as follows:  TS 38.331  The UE shall perform the following actions upon reception of the RRCSetup:  [omit...]  1> if the UE has radio link failure or handover failure information available in *VarRLF-Report* and if the RPLMN is included in *plmn-IdentityList* stored in *VarRLF-Report*:  2> if *reconnectCellId* in *VarRLF-Report* is not set, and if the received *RRCSetup* is in response to an *RRCSetupRequest*:  3> set *timeUntilReconnection* in *VarRLF-Report* to the time that elapsed since the last radio link failure or handover failure;  This implementation already suits our demand to only record one ***timeUntilReconnection*** IE in the RLF report to save the space and bears the fact that the time period between two consecutive failures should be short enough so that there is no need to store the time between the first failure and the time moment UE returns to the RRC\_Connected by reception of the RRCSetup msg. |

Rapporteur´s summary:

Option a: 10/15 companies

Option b: 3/15 companies

Both Option a and b: 1/15 companies

Option C: 1/15 companies

Given the above outcome, Rapporteur proposes the following:

1. The *timeUntilReconnection* in the RLF report for the consecutive CHO failure cases represents the time from first failure to the time of reconnection.

### 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.

[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
  4. To exclude the CHO candidate cell list and the CHO configuration both from the RLF-Report and the SHR

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| --- | --- | --- |
| **Company** | **Preferred option (a,b,c)** | **Comments** |
| Qualcomm | Option D (Preferred)  Option C (Acceptable) | As discussed through the email, we never agreed to include the CHO candidate cell list or CHO configuration in the RLF report. We have alternative solutions for both, therefore, we argue for option D. |
| vivo | d | Agree with QC |
| Huawei, HiSilicon | Option c (modified) | For RLF-report, we prefer to include the CHO configuration and CHOcandidate indicator into the existing MeasResultNR-r16, instead of introducing the new MeasResultNR-r17 in the current running CR. |
| Ericsson | A (preferred)  B, C (acceptable) | The reason for having the CHO candidate cell list is for the case in which the UE was configured with multiple CHO candidate cells, but only some of those were included in the neighbouring measurement results.  Related to Huawei comment, we agree that the MeasResultNR-r17 is not needed and the fields therein can be copied in the legacy MeasResultNR-r16. That can be implemented by the rapporteur in a revised version of the running CR, since it is not a functional change. |
| Sharp | Option a | Agree with Ericsson’s view. |
| Lenovo | Option a | For candidate cell list, it is beneficial for the source node to understand whether the candidate cell is proper or not based on the candidate cell list in the RLF report. The current running CR is fine to us. |
| CATT | Option a | Agree with Ericsson. |
| CMCC | a | Agree with Ericsson. |
| DOOCMO | Option b or a |  |
| NEC | Option C or D |  |
| Samsung | Option c or d |  |
| ZTE | A | Same view as Ericsson |
| Nokia, Nokia Shanghai Bell | b | Alignment of content of RLF report and SHR ok. However, we do not see the added value of reporting the measurments belonging to ALL candidate cells. If other, non candidate cells are better and reported as part of *measResultNeighCells* that should provide enough information to the network in order to imprive CHO preparation. |
| OPPO | A |  |

### Rapporteur´s summary:

Option A: 8/14 companies

Option B: 3/14 companies

Option C: 5/14 companies

Option D: 4/14 companies

Given the above outcome, option A got the majority of support. Hence the following is proposed:

1. Keep the CHO candidate cell list and the CHO configuration only in the RLF-Report (not in the SHR), as in the current running CR.

### 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.

[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** |
| Qualcomm | Agree |  |
| vivo | Agree |  |
| Huawei, HiSilicon | Agree |  |
| Ericsson | Yes |  |
| Sharp | Yes |  |
| Lenovo | Yes |  |
| CATT | Yes |  |
| CMCC | Yes |  |
| DOCOMO | Yes |  |
| NEC | Yes |  |
| LGE | Yes |  |
| Samsung | Yes |  |
| ZTE | Yes |  |
| ITRI | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |

Rapporteur’s summary:

Yes: 15/15 companies

Given the above outcome, Rapporteur proposes the following:

1. To include the ‘t312-expiry’ as a new rlf-cause in the RLF-Report.

## 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.

|  |  |  |
| --- | --- | --- |
| 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. |
|  |  |  |

Based on the above, rapporteur would propose to discuss the following.

[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.

[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)

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b)** | **Comments** |
| Qualcomm | Both are acceptable |  |
| vivo | B |  |
| Huawei, HiSilicon | A | The requirement from RAN3 only refers to DAPS HO.  For opt b, the UE will be mandated to include interruption measurements for ordinary HO and CHO if the UE supports SHR. This brings additional UE complexity.  For DAPS, it aims at 0 interruption mobility. The parameter is collected for the network to optimize the DASP function. For ordinary HO and CHO, the robustness may be more important than the HO interruption time. |
| Ericsson | B | In our view, the UP interruption time is useful to evaluate the performances of any HO.  Knowing the UP latency measurements of an ordinary HO can be instrumental for an operator to enable DAPS, i.e. if the UP interruption time of an ordinary HO is satisfactory, the operator does not need to configure DAPS bearers, otherwise it may do it. Additionally, once the DAPS is configured, the operator can also evaluate whether DAPS brings enough benefits compared to an ordinary HO, because that may vary depending on the HO scenarios and deployments.  Just knowing the UP interruption time for DAPS will not bring that much help, because the operator will not have any benchmark with which to compare the DAPS HO performances, and it will not know whether it is really worthwhile enabling DAPS HO (which anyhow comes with a cost from resource utilization perspective).  Whether to have a UE capability for the UP interruption is a separate discussion, but we do not understand why there is additional complexity from the UE perspective if this feature is supported also for the ordinary HO. If the UE is capable of measuring the UP interruption, it should be able to do it irrespective of whether the HO is a DAPS HO or ordinary HO. |
| sharp | B is preferred | No strong view, and b is sligntly preferred, as can leave it to the network to decide which handover will be configured with this measurement. |
| Lenovo | A | Agree with Huawei. |
| CATT | Both are acceptable | Depend on RAN3’s requirement. |
| CMCC | No strong view |  |
| DOOCMO | Both are acceptable | B has more benefits for UP interruption measurement regardless it is a DAPS HO or ordinary HO. |
| NEC | A is preferred | No strong view, but A is slightly preferred, since the requirement from RAN3 only refers to DAPS HO. |
| Samsung | a |  |
| ZTE | B is preferred but can accept A |  |
| ITRI | Both are acceptable | Both are acceptable but b is slightly preferred. No matter what kind of HO is performed, the UP interruption time is a useful performance metric for subsequent optimization. |
| Nokia, Nokia Shanghai Bell | A, possibly B | UP interruption definitely makes sense for DAPS HO. However, the current definition of how this should be computed needs some improvement as we have identified several issues:  a) As DAPS HO is configured per DRB, the interruption time should be reported per DRB or per DRB group (one value for DAPS bearers and another value non-DAPS bearers)  b) Interruption time may also take into account gaps between packets on the Source link (current definition only takes into account interrution time between last packet from source and first from target)  c) find a solution to differentiate interruption time due to poor link quality (should be logged) and no data being to transmit to the UE (should not be logged)  For CHO, UE interruption time could be used for improving data forwarding. Not clear what the added benefit would be for ordinary HO. |

Rapporteur´s summary:

Option A: 11/14 (including “no strong view” and “both acceptable”)

Option B: 10/14 (including “no strong view” and “both acceptable”)

Given the above outcome, there is not clear majority to draw a conclusion yet. Hence, Rapporteur proposes the following:

1. RAN2 to keep discussing 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)

### 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].

[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

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b)** | **Comments** |
| Qualcomm | A | Should be based on configuration. |
| vivo | a | Only if the UE is configured to do so. |
| Huawei, HiSilicon | a |  |
| Ericsson | A |  |
| Sharp | a |  |
| Lenovo | a | To have a unified and NW-controlled solution, it is better to guarantee that all SHR trigger conditions are explicitly configured by the network. |
| CATT | a |  |
| CMCC | a |  |
| DOCOMO | a |  |
| NEC | a |  |
| Samsung | a |  |
| ZTE | A |  |
| ITRI | a |  |
| Nokia,Nokia Shangai Bell | a | To allign with all other cases, SHR should only be generated if configured. For this particular case, a new triggering condition for SHR may need to be introduced. TDB how SHR config is signaled to the UE though. |
| OPPO | a |  |

Rapporteur´s summary:

Option a: 15/15 companies

Given the above outcome, Rapporteur proposes the following:

1. The UE shall generate the SHR due to RLF in the source cell during a DAPS HO, only if it is configured to do so in the SHR configuration (i.e. in the *successHO-Config*).

### 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.

[Pre117-e-offline] RAN2 to discuss which RRC message/configuration carries the SHR configuration.

* 1. otherConfig (current implementation)
  2. RRCReconfiguration including reconfigurationWithSync

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b)** | **Comments** |
| Qualcomm | Option B | SHR should only be configured in the Handover command. If a misbehaving gNB configures it in otherConfig way before the actual requirement of the HO, the network can be flooded with SHR. At the same time, UE will keep generating SHR unnecessarily even if the handover is not in progress, e.g., the network configures T310 threshold and T310 threshold condition can meet even if the handover is not in process.  To avoid such scenarios, we argue to configure using RRCReconfiguration including reconfigurationWithSync. |
| vivo |  | No strong view |
| Huawei, HiSilicon | Opt a: T312  Opt b: T304 and the new triggering condition in the above P8  Opt a or b: T310 | For T312, it seems more reasonable to configure in otherConfig, so that the UE can generate SHR if the T312 related triggering condition is met.  For T304, it is configured by the target and only supported in opt b RRCReconfiguration including reconfigurationWithSync. For the new triggering condition in proposal 8, it should also be configured in opt b RRCReconfiguration including reconfigurationWithSync.  For T310, both options can work. |
| Ericsson | a | We agree with HW analsys. In the current implementation, the otherConfig can be transmitted by the source cell (for T312/T310), or by the target cell within the RRCReconfigurationWithSync (for the T304).  Just having this information in the RRCReconfigurationWithSync will put a requirement the source cell to transmit the T312/T310 configuration at HO. It would give more flexibility if the source cell is allowed to transmit the SHR configuration much earlier than the HO. |
| Sharp |  | No strong view. |
| Lenovo |  | Opt a for T310 and T312;  Opt b for T304 and the new triggering condition mentioned in above P8. |
| CATT | Option B | Agree with Qualcomm, the SHR is for logging successful handover related information, if the SHR configuration is configured before handover command, it will introduce some complexity which is not suitable in current discussion stage. Therefore, we suggest focusing on the SHR configuration together with handover command. |
| CMCC |  | Agree with Huawei and Ericsson. |
| DOCOMO |  | Agree with Huawei’s analysis. |
| NEC | Have concern on if SHR configuration generated by the source gNB can be carried in HO command | For the SHR triggering condition generated by the target gNB (e.g. T304), it should only be transmitted by HO command (option b);  For SHR triggering conditions generated by the source gNB (e.g. T310), it is possible to transmitted in RRCReconfiguration before HO command, or in HO command. But note that if they are transmitted in HO command, the source gNB needs to forward the information to the target gNB to include them into HO command, which requires interworking between source gNB and target gNB. We wonder if this can be supported. |
| Samsung | b |  |
| ZTE | B for T304 and DAPS trigger, a for others. |  |
| Nokia, Nokia Shanghai Bell | b | This way it is clear that the SHR is logged only for this HO. |
| OPPO | b |  |

Rapporteur´s summary:

Only B: 5/14

Option A and Option B depending on the specific SHR triggering condition: 7/14

No strong view: 2/14 companies

1 company wonders if interworking between source and target gNB is needed.

From the above outcome, majority of companies believe that it depends on the specific triggering condition whether the SHR configuration should be included by the source cell in the otherConfig, or by the target cell in the HO command (i.e. in the RRCReconfiguration including reconfigurationWithSync). Rapporteur notes that in the current CR implementation, the SHR configuration is included in the otherConfig. The otherConfig can be included by the source cell before the HO, and/or by the target cell in the HO command (i.e. in the RRCReconfiguration including reconfigurationWithSync). Hence the current running CR implementation seems aligned with the views from the majority of companies.   
However, some companies pointed out that it should be clarified which node (source/target) configures the certain SHR triggering condition. Some companies believe that the target should only be in charge of configuring the T304, some other companies believe that the target may also configure the T310, and the new DAPS source RLF triggering condition in Proposal 7. Rapporteur notes however that RAN2 has already agreed that the T310/312 are configured by the source, whereas the T304 is configured by the target:

|  |
| --- |
| From RAN2#115-e:  2: For the thresholds of T310/T312 in the source cell, the source cell configures the values. FFS source cell or target cell can configure the threshold for T304.  From RAN2#116-e:  2 The value of the T304 threshold to be provided in the SHR configuration is configured by the target cell. |

To this end, Rapporteur notes that the procedural text in 5.7.10.X reflects the above agreements (i.e. that the T304 threshold is configured by the target, and the T310/312 thresholds are configured by the source). It is however proposed to further clarify the above agreements in the field descriptions of the successHO-Config IE, and also further discuss which node configures the DAPS source RLF, since that was not discussed before.

1. The SHR configuration is provided in the otherConfig which can be provided by the source cell before the HO, and/or by the target cell as part of the HO command (as in the current running CR).
2. Clarify in the field descriptions of the successHO-Config IE which node (source/target) configures the specific triggering condition:
   1. T312/T310 thresholds are configured by the source (confirm agreement from RAN2#115)
   2. T304 threshold is configured by the target (confirm agreement from RAN2#116)
   3. FFS which node(s) configure(s) the DAPS source RLF condition

### 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.

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

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Ericsson | Yes |  |
| Sharp | Yes |  |
| Lenovo | Yes |  |
| CATT | Yes |  |
| CMCC | Yes |  |
| DOCOMO | Yes |  |
| NEC | Yes |  |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Nokia | Yes |  |
| OPPO | Yes |  |

Rapporteur´s summary:

Yes: 14/14 companies

Given the above outcome, Rapporteur proposes the following:

1. To include PLMN checking before sending the availability indicator for the SHR (as in RLF Report).

### 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.

[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.

[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:.

[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.

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b)** | **Comments** |
| Qualcomm | Option B | The success or failure of RACH is dependent on how much payload is included in msgA, therefore, the RA report should include the payload size without padding sent by the over the PUSCH resources in the msgA. |
| vivo | b |  |
| Huawei, HiSilicon | Option A | As if the network is aware of the overall buffer size at the time of msgA transmission, it can take actions, e.g., adjust the UL grant of the msgA accordingly to accommodate more data.  On the other hand, the payload included in the msgA can be derived by NW with the introduction of PUSCH configuration related information（msgA-MCS, nrofPRBs-PerMsgA-PO, msgA-PUSCH-TimeDomainAllocation, frequencyStartMsgA-PUSCH, nrofMsgA-PO-FDM）which has been proposed by multiple companies.  For the purpose of collecting the most valuable information and meanwhile avoiding duplicated information to be reported in RA-report, it is reasonable to say that option A makes more sense. |
| Ericsson | A | Agree with Huawei analysis. If the UE has still many remaining data after the msgA transmission, such an information will not be conveyed in the RA-Report if only the actual msgA payload is reflected in the RA-Report (option B). As a consequence, the network cannot for example make the UL grant included in the msgA larger, so that the UE could fit more data into it.  So A should be selected. |
| Sharp | A | Agree with Huawei. |
| Lenovo | A | Agree with Huawei. |
| CATT | B |  |
| CMCC | A | Agree with Huawei. |
| NEC | A | Agree with Huawei. |
| Samsung | B | Actually, the option a means UE data volume in UE buffer.  We are not sure why we have used the terminology “payload without padding” in the previous discussions. |
| ZTE | A |  |
| OPPO | b |  |

Rapporteur´s summary:

7/12 Option-A

5/12: Option-B

Companies supporting option-A indicate that this would aid the network to optimize the msgA related PUSCH resource configurations as the contents of option-A is something unknown to the network while the contents of option-B can be collected by the network without further UE reporting.

Companies that support option-B indicate that the success or the failure of the 2 step RA attempt depends on the size of the payload transmitted over the air and therefore, the payload used for that attempt is more useful.

Rapporteur further highlights that in RAN2#116bis meeting, it was agreed that the payload related information is reported per RA procedure. Thus, if the option-B is to be made useful for the network then the UE should include the payload size per RA attempt (as it can vary per RA attempt). However, this goes against the agreement from RAN2#116bis meeting.

Based on the above analysis and based on having slight majority support, the rapporteur proposes to go with option-A.

1. For the 2-step RA, the payload reported by the UE in the RA-Report is equivalent to the overall payload without padding available in the UE buffer size at the time of initiating the 2 step RA procedure.

Further regarding the format of encoding the payload 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.

[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]

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b)** | **Comments** |
| Huawei, HiSilicon | Opt a if opt a in proposal 13 is selected  Opt c or d if opt b in proposal 13 is selected | If payload size indicates the overall UE buffer size at the time of msgA transmission, a bit string of 8 bits (option a) shoud be adopted.  Otherwise, rs-MsgA-SizeGroupA based format(option c) or simplified rs-MsgA-SizeGroupA based format(option d) applies. |
| Ericsson | Option A | Option A is simpler, since it avoids discussing and specifying new ranges in the RRC specification. With option A, we can simply copy the messageSize definition in SL-TrafficPatternInfo and refer to the BSR index in the MAC spec.  Compared with option B, and C, option A would allow also for more granular/accurate values, which can help the network to find a very suitable msgA grant size. |
| Samsung | b | B seems better in bit consumption aspect |
| Nokia | b | We support to send the payload without padding. If you know the payload sent over the PUSCH resource, the gNB can know which preamble type A or B was used for the transmission and therefore gNB (CU) can optimize preamble groups |

Rapporteur´s summary:

2/4 Option-A

2/4: Option-B

Based on the above, there seems to be a split between option-A and option-B. Option-A provides better granularity of the reported payload size and it also allows the UE to reuse the computation it has performed for BSR reporting. Option-B uses less number of bits. Thus, rapporteur proposes to discuss this topic again.

1. RAN2 to agree on one of the following methods 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.

#### 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]):
  1. F: the MCS index
  2. G: the number of PRB per PO of the PUSCH resource
  3. H: the combination of start symbol and length and PUSCH mapping type
  4. I: offset of lowest PUSCH occasion in frequency domain with respect to PRB 0
  5. 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])
  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)

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

[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)

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b,c,d,e, nothing needed)** | **Comments** |
| Qualcomm | Nothing needed | Based on the payload size, network can optimize other PUSCH parameters listed above. |
| vivo | None | Nothing is further needed |
| Huawei, HiSilicon | a,b,c,d, e | The ultimate purpose of introducing the payload size transmitted in MSGA in 2-step RA report is to help the network optimize the PUSCH resource allocation accordingly. The optimization could only be possibly done with the knowledge of PUSCH configuration. Besides, Knowing the PUSCH configuration also enables the network to derive the total transmitted PUSCH size. |
| Ericsson |  | We see benefits to include this information. In order to reduce the size of the RA-Report, it should be discussed whether to include this information only when it cannot be derivable by the network. For example, only if the UE performed the RA in the dedicated random access resources. |
| CATT | - | No strong view, respect to majority view. |
| CMCC | a,b,c,d, e | These information is beneficial for the optimization of PUSCH resource allocation. |
| Samsung | Nothing needed |  |
| ZTE | All | Same view as Huawei.But this shall not just limited to CFRA case as in CBRA there still possible two sets of PUSCH resource configured with different configuration. Since we have agreed no preamble group information is expected to be included, NW still cannot associate the report to used PUSCH configuration even in CBRA case unless we re-open the discussion to include the group information, otherwise such information is needed for all cases. |
| Nokia | A,b,c,d,e | All of those parameters seem useful to optimize PUSCH resources |
| OPPO | Nothing needed |  |

Rapporteur´s summary:

10 companies replied to this question and 4 companies support the inclusion of these parameters and further one company has indicated their support for the inclusion. One more company is fine with majority view. 4 companies believe that nothing is needed. Based on this, rapporteur proposes further discussing this issue:

1. RAN2 to discuss the inclusion of one or more of the following PUSCH resource parameters (4/10 do not support, 4/10 support, 2/10 support it tentatively):
   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)

#### 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.

[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.

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b,both)** | **Comments** |
| Qualcomm | Both |  |
| vivo | both |  |
| Huawei, HiSilicon | Both | To avoid duplicated information to be reported in RA report, the reporting conditions of msgA related PRACH resource information should be clarified.  For scenario b, the potential way to detect the duplication of information in shared RO scenarios can be:   * Opton1:compare the corresponding value between in MsgA RACH occasion and in MSG1 RACH occasion; * Option2: check if RACH configuration parameters are configured present and also used in RA procedure. |
| Ericsson | Both | Agree with Huawei |
| Sharp | Both |  |
| Lenovo | Both |  |
| CATT | Both |  |
| CMCC | Both |  |
| DOCOMO | Both |  |
| NEC | Both |  |
| Samsung | Both |  |
| ZTE | Both | Same view as Huawei. Detailed UE behavior in procedure and field description will be needed to avoid confusion and duplicated information. Option 2 seems to have less specs impact. But no strong view. |
| Nokia, Nokia Shanghai Bell | Both | Both scenarios should be considered. |
| OPPO | both |  |

Rapporteur´s summary:

All companies (14/14) agree with the RA report size reduction enhancements. Further, one company has provided some indications on clarifying both in the field description and the procedural text. This can be taken care by the rapporteur in the latest CR version to be edited during the meeting. Based on this, the rapporteur proposes the following.

1. RAN2 to confirm that the UE includes the RA resource related parameters (frequency start, FDM, and SubcarrierSpacing of the msgA RA resource) 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.

### 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.

[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.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes (change to LTE needed)**  **No (changes to LTE not needed)** | **Comments** |
| Qualcomm | Agree with rapporteur | We can postpone EN-DC to rel-18. |
| vivo | No strong view |  |
| Huawei, HiSilicon | No | We can postpone EN-DC to rel-18. |
| Ericsson | No | We are concerned about the limited time left. |
| Sharp | No | Ok to postpone. |
| Lenovo | No | Postpone EN-DC to R18. |
| CATT | Yes with comment | If due to time limit in RAN2, we can accept to postpone the EN-DC case to Rel-18 RACH enhancement.  But the two facts listed below we think is necessary to remind:  1) RAN2 reply LS to RAN3 has indicate that the EN-DC case will be supported;  2) RAN3 has already agreed to introduce the X2AP change for EN-DC case for the SgNB RA report in Rel-17, so for responsibility we need to add the EN-DC case. |
| CMCC | No | We can postpone EN-DC to rel-18. |
| NEC |  | OK to postpone |
| Samsung | No |  |
| ZTE | Yes | Same view as CATT |
| Nokia, Nokia Shanghai Bell | No | We propose to prioritize NR-DC given the time limitations. No changes to LTE need to be introduced under this assumption. Maybe EN-DC can be considered in Rel. 18. |
| OPPO | NO |  |

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.

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

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes (capability bit needed)**  **No (capability bit not needed)** | **Comments** |
| Qualcomm | Yes | For cross-RAT reporting, we argue to have additional UE capability. |
| vivo | No strong view |  |
| Huawei, HiSilicon | Yes |  |
| Ericsson | Yes |  |
| Sharp | Yes |  |
| Lenovo |  | Agree with the capability bit, but we can postpone EN-DC to R18. |
| CATT | Yes | If it is agreed to support NR RA reporting to LTE, the capability bit seems necessary. |
| CMCC | Yes |  |
| NEC | Yes |  |
| ZTE |  | This can be optional supported without capability signalling. If NR report is included, since the cell id is encoded in LTE format then NW can know how to forward the RA-report. But we are also fine to accept capability bit if it is majority view. |
| Nokia, Nokia Shanghai Bell | No | Focus on NR-DC and postpone discussions to Rel.18. |

[Pre117-e-offline] If it is agreed to support NR RA reporting to LTE, 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.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | FFS |  |
| Ericsson | FFS | It can be discussed together with P20 below. |
| Sharp | Yes |  |
| Lenovo |  | We can postpone EN-DC to R18. |
| CATT | Yes |  |
| CMCC | Yes |  |
| NEC | FFS |  |
| ZTE | Yes | This has been discussed and agreed before. And RAN3 has specified signalling to support this behavior based on the understanding RAN2 will design signalling to support this function. |
| Nokia |  | Focus on NR-DC and postpone discussions to Rel.18. |

[Pre117-e-offline] If it is agreed to support NR RA reporting to LTE, 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.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes | However, I am wondering about ASN.1 structure. NR RA report is a list of RA entries. |
| vivo | Yes |  |
| Huawei, HiSilicon | FFS |  |
| Ericsson | FFS | This may require lots of specification changes and impact in the UE in terms of encoding. More discussion is required. |
| Sharp | FFS |  |
| Lenovo |  | We can postpone EN-DC to R18. |
| CATT | Yes |  |
| CMCC | FFS |  |
| NEC | FFS |  |
| ZTE | Yes |  |
| Nokia, Nokia Shanghai Bell |  | Focus on NR-DC and postpone discussions to Rel.18. |

Rapporteur´s summary:

11/13 companies have indicated that we should prioritize NR-DC scenario in Rel-17 and 2/13 companies are okay to prioritize NR-DC as well. Based on this and considering we have only the current meeting to finalize the Rel-17 functional scope, the rapporteur proposes to go with the majority and prioritize only the NR-DC scenario in Rel-17.

1. TS 36.331 modifications are not introduced to handle the scenario of LTE MN fetching the list of NR RA reports in Rel-17.
2. TS 38.331 modifications are not introduced to handle the scenario of NR MN fetching the LTE RA report in Rel-17.

## 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.

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

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Ericsson | No | We are concerned about the increased size of the SCGFailureInformation message, which is a legacy message and should not be misused to send information not related to SON. Please also not that the RA-InformationCommon is increasing significantly in this release, due to the 2-step RA, and it may keep increasing in Rel.18 when conditional PSCell change information may be included. |
| Sharp | Yes |  |
| Lenovo | Yes |  |
| CATT | Yes |  |
| CMCC | Yes |  |
| DOCOMO | Yes |  |
| NEC | Yes |  |
| LGE | Yes |  |
| ZTE | Yes |  |
| ITRI | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes | We have already agreed on the following, which in our view indicates that SCGFailureInformation is used as failureType IE is in the SCGFailureInformation:  *The UE needs to include RA information in case that failureType is set to randomAccessProblem or beamFailureRecoveryFailure-r16.* |
| OPPO | Yes |  |

Rapporteur´s summary:

15/16 companies support the proposal. One company has expressed some concern over the overhead of increased size of a mandatory message like SCGFailureInformation:

1. The RA Information associated to a SCG failure are included in the SCGFailureInformation.

[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**

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b,c)** | **Comments** |
| Qualcomm | All |  |
| vivo | A,b,c |  |
| Huawei, HiSilicon | A,b,c |  |
| Ericsson | A only while T304 timer is running  C | The RA Information should be included in the SCGFailureInformation only for MRO purposes, according to RAN3. Hence if the T304 timer is not running, the RA-Information should not be included.  This can be a compromise between those who want to keep the size of the SCGFailureInformation small and those who want to add more information in the SCGFailureInforamtion. |
| Sharp | All |  |
| Lenovo | All |  |
| CATT | All |  |
| CMCC | All |  |
| DOCOMO | All |  |
| NEC | All |  |
| LGE | a, b, c |  |
| ZTE | All |  |
| ITRI | All |  |
| Nokia, Nokia Shanghai Bell | a,c | We have already agreed on the following that proposed to include for all cases a,b and c:  *The UE needs to include RA information in case that failureType is set to randomAccessProblem or beamFailureRecoveryFailure-r16*  *The condition “failureType is set to synchReconfigFailureSCG” for including RA information.*  If the intention is to reconsider the agreements, in our view, (b) is set by the UE in the SCGFailureInformation only in case of beam related problems, i.e., not relevant for PSCell changes. So, we would prefer to exclude (b). |
| OPPO | all |  |

Rapporteur´s summary:

Option-A: (14+1)/15 companies, 1 company has conditional inclusion of the corresponding RAInformation

Option-B:13/15 companies, two companies do not want to include the RAInformation in the SCGFailureInfomration as this does not concern the SCG MRO scenario.

Option-C: 15/15 companies

Though there are some concerns on the increase of the size of SCGFailureInformation message, given the above outcome, Rapporteur proposes the following:

1. The RA Information associated to a SCG failure are included in the SCGFailureInformation for the following scenarios:
   1. when failureType is set to randomAccessProblem
   2. when failureType is set to beamFailureRecoveryFailure
   3. when failureType is set to synchReconfigFailureSCG.

[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.

[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.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No to the above understanding** | **Comments** |
| Qualcomm | Yes | Agree. |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Ericsson | Yes |  |
| Sharp | Yes |  |
| Lenovo | Yes |  |
| CATT | Yes |  |
| CMCC | Yes |  |
| DOCOMO | Yes |  |
| NEC | Yes |  |
| LGE | Yes |  |
| ZTE | Yes |  |
| ITRI | Yes |  |
| Nokia, Nokia shanghai Bell | Yes for understanding. | A rewording is needed for clarification:  *RAN2 to confirm (UE behaviour from Rel-15/Rel-16) that the UE sets the failureType to randomAccessProblem in the SCGFailureInformationNR, when the UE experiences random access problem indication from the SCG MAC whileT304 is running for the SCG. Otherwise, if the UE initiates transmission of the SCGFailureInformationNR message to provide reconfiguration with sync failure information for an SCG, the UE sets the failureType to synchReconfigFailureSCG.* |

Rapporteur´s summary:

All of the companies (14/14) agree with the proposed understanding of the current specification. One company provided some rewording of the proposal for clarification.

Given the above outcome, Rapporteur proposes the following:

1. RAN2 confirms (UE behaviour from Rel-15/Rel-16) that the UE sets the failureType to randomAccessProblem in the SCGFailureInformationNR, when the UE experiences random access problem indication from the SCG MAC whileT304 is running for the SCG. Otherwise, if the UE initiates transmission of the SCGFailureInformationNR message to provide reconfiguration with sync failure information for an SCG (T304 expiry), the UE sets the failureType to synchReconfigFailureSCG.

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.

[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.

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

Nokia: UE capability will be needed to ensure the UE is capable of storing different structure of the VisitedCellInfo.

Rapporteur´s summary:

As per chairman recommendation, all the capability discussions will happen together and that’s why it is not considered in this email discussion.

#### 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.

[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

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b,c)** | **Comments** |
| Qualcomm | A | UE memory is concern here. |
| vivo | a | Agree with QC, 16 is enough. |
| Huawei, HiSilicon | a |  |
| Ericsson | A |  |
| Sharp | a |  |
| Lenovo | a |  |
| CATT | A |  |
| CMCC | A |  |
| DOCOMO | A |  |
| NEC | a |  |
| Nokia, Nokia Shanghai Bell | none | We think 16 cells isn’t optimal choice for some use cases, while for the others it can be too much. Also considering Rel-16 MHI was by default recorded by the UE, with no prior configuration, its increased size by of these numbers may lead to unexpected results/records. The memory is concern, but also impacts to signaling overhead become unpredictable. Thus, we believe it should be configurable by the operator depending on the use case where 16 could be a maximum value (though not always – up to network decision) |

Rapporteur´s summary:

Majority of the companies (10/11) support the option-a i.e., the UE can store up to 16 PSCell related MHI information. One company propose that this number should be configurable by the network. Considering, MHI is not a configurable feature until now and this being the last meeting, rapporteur proposes to go with majority and have a fixed value.

Given the above outcome, Rapporteur proposes the following:

1. The total number of PSCell (across all PCells) related information that should be stored by the UE in the MHI in 16.

#### 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.

[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

|  |  |  |
| --- | --- | --- |
| **Company** | **Preferred option (a,b)** | **Comments** |
| Qualcomm | Option B | Same UE behavior as for PCell is desired. |
| vivo | b | Better to align with PCell case. |
| Huawei, HiSilicon | b |  |
| Ericsson | B | Agree with above comments, with B the UE behaviour would be the same as in legacy for the PCell. |
| Sharp | b |  |
| Lenovo | b |  |
| CATT | B |  |
| CMCC | B |  |
| DOCOMO | b |  |
| NEC | b |  |
| Nokia, Nokia Shanghai Bell | b | With some remarks/constraints: UE should be able to inspect and detect that max number has not been reached with pingpong-ing between and sends an alarm or report (e.g. SHR to PCell), since with “remove oldest” the ping pong problem could get lost with new or different movement. And the max number should be flexible and configurable depending on use case. |
| OPPO | b |  |

Rapporteur´s summary:

All companies (12/12) support the option-b i.e., 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.

Given the above outcome, Rapporteur proposes the following:

1. 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.

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).

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

|  |  |  |
| --- | --- | --- |
| **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** |
| Qualcomm | Yes | UE can record (PSCell ID, t1) -> (PSCell absent, t2) -> (PSCell absent, t3) and so on. |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Ericsson | Yes | It is important to know in the MHI if there is any gap in the DC configuration while connected to a certain PCell |
| Sharp | Yes |  |
| Lenovo | Yes |  |
| CATT | Yes |  |
| CMCC | Yes |  |
| DOCOMO | Yes |  |
| NEC | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes | In order to get visits of PCell and PSCell synced in spatial domain it will be needed |

Rapporteur´s summary:

All companies (11/11) support the inclusion of time spent with no PSCell in the PSCell related MHI.

Given the above outcome, Rapporteur proposes the following:

1. The UE includes the time spent with no PSCell in the MHI, when connected to a certain PCell.

# 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.

[low prio Proposal] 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.

[low prio Proposal] The fields condFirstEventFulfilled and condSecondEventFulfilled are included only when timeBetweenEvents and firstTriggeredEvent are not included from 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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:

|  |
| --- |
| 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.

[low prio Proposal] 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
  6. On the definition of timeConnSourceDAPSFailure, i.e. whether last DAPS handover ‘execution‘ or the last DAPS handover ‘initialization‘ should be used
  7. 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.

[low prio Proposal] 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.

|  |
| --- |
| 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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[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] Related to T312, RAN2 to discuss the inclusion of the following information in the RLF-Report:

1. 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.

[low prio Proposal] 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.

[low prio Proposal] 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.

[low prio Proposal] 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

Based on the discussion in the previous sections we propose the following:

[Proposal 1 The time elapsed between the DAPS HO initialization and the RLF in the source cell after fallback is represented by the timeConnFailure (no changes needed to the current running CR).](#_Toc95839240)

[Proposal 2 The modeling of the UE actions in the case of consecutive failures in the current running CR is considered as baseline. Further clarifications (if any) may be addressed during the running CR review.](#_Toc95839241)

[Proposal 3 The *timeUntilReconnection* in the RLF report for the consecutive CHO failure cases represents the time from first failure to the time of reconnection.](#_Toc95839242)

[Proposal 4 Keep the CHO candidate cell list and the CHO configuration only in the RLF-Report (not in the SHR), as in the current running CR.](#_Toc95839243)

[Proposal 5 To include the ‘t312-expiry’ as a new rlf-cause in the RLF-Report.](#_Toc95839244)

[Proposal 6 RAN2 to keep discussing in which HO scenarios the UP interruption measurements should be considered:](#_Toc95839245)

[a. Only at DAPS HO](#_Toc95839246)

[b. For all HO types (ordinary HO, DAPS, CHO)](#_Toc95839247)

[Proposal 7 The UE shall generate the SHR due to RLF in the source cell during a DAPS HO, only if it is configured to do so in the SHR configuration (i.e. in the *successHO-Config*).](#_Toc95839248)

[Proposal 8 The SHR configuration is provided in the otherConfig which can be provided by the source cell before the HO, and/or by the target cell as part of the HO command (as in the current running CR).](#_Toc95839249)

[Proposal 9 Clarify in the field descriptions of the successHO-Config IE which node (source/target) configures the specific triggering condition:](#_Toc95839250)

[a. T312/T310 thresholds are configured by the source (confirm agreement from RAN2#115)](#_Toc95839251)

[b. T304 threshold is configured by the target (confirm agreement from RAN2#116)](#_Toc95839252)

[c. FFS which node(s) configure(s) the DAPS source RLF condition](#_Toc95839253)

[Proposal 10 To include PLMN checking before sending the availability indicator for the SHR (as in RLF Report).](#_Toc95839254)

[Proposal 11 For the 2-step RA, the payload reported by the UE in the RA-Report is equivalent to the overall payload without padding available in the UE buffer size at the time of initiating the 2 step RA procedure.](#_Toc95839255)

[Proposal 12 RAN2 to agree on one of the following methods of reporting the payload size:](#_Toc95839256)

[a. 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*)](#_Toc95839257)

[b. 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.](#_Toc95839258)

[Proposal 13 RAN2 to discuss the inclusion of one or more of the following PUSCH resource parameters (4/10 do not support, 4/10 support, 2/10 support it tentatively):](#_Toc95839259)

[a. msgA-MCS (4 bits)](#_Toc95839260)

[b. nrofPRBs-PerMsgA-PO (5 bits)](#_Toc95839261)

[c. msgA-PUSCH-TimeDomainAllocation (4 bits)](#_Toc95839262)

[d. frequencyStartMsgA-PUSCH (9 bits)](#_Toc95839263)

[e. nrofMsgA-PO-FDM (2 bits)](#_Toc95839264)

[Proposal 14 RAN2 to confirm that the UE includes the RA resource related parameters (frequency start, FDM, and SubcarrierSpacing of the msgA RA resource) under following scenarios:](#_Toc95839265)

[a. RA procedure involves only 2 step RA (i.e. no switching to 4-step RA)](#_Toc95839266)

[b. 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.](#_Toc95839267)

[Proposal 15 TS 36.331 modifications are not introduced to handle the scenario of LTE MN fetching the list of NR RA reports in Rel-17.](#_Toc95839268)

[Proposal 16 TS 38.331 modifications are not introduced to handle the scenario of NR MN fetching the LTE RA report in Rel-17.](#_Toc95839269)

[Proposal 17 The RA Information associated to a SCG failure are included in the SCGFailureInformation.](#_Toc95839270)

[Proposal 18 The RA Information associated to a SCG failure are included in the SCGFailureInformation for the following scenarios:](#_Toc95839271)

[a. when failureType is set to randomAccessProblem](#_Toc95839272)

[b. when failureType is set to beamFailureRecoveryFailure](#_Toc95839273)

[c. when failureType is set to synchReconfigFailureSCG.](#_Toc95839274)

[Proposal 19 RAN2 confirms (UE behaviour from Rel-15/Rel-16) that the UE sets the failureType to randomAccessProblem in the SCGFailureInformationNR, when the UE experiences random access problem indication from the SCG MAC whileT304 is running for the SCG. Otherwise, if the UE initiates transmission of the SCGFailureInformationNR message to provide reconfiguration with sync failure information for an SCG (T304 expiry), the UE sets the failureType to synchReconfigFailureSCG.](#_Toc95839275)

[Proposal 20 The total number of PSCell (across all PCells) related information that should be stored by the UE in the MHI in 16.](#_Toc95839276)

[Proposal 21 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.](#_Toc95839277)

[Proposal 22 The UE includes the time spent with no PSCell in the MHI, when connected to a certain PCell.](#_Toc95839278)

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