3GPP TSG-RAN WG2 #116bis-e DocNumber

Electronic meeting, 16th – 25th January 2022

Agenda Item: 8.13.2.1

Source: Ericsson

Title: Report of [Post116-e][887.5][SONMDT] Leftover issues on SON (Ericsson)

Document for: Discussion, Decision

# Introduction

This contribution addresses the following offline discussion:

* **[Post116-e][887.5][SON/MDT] Leftover issues on SON (Ericsson )**

Scope: Continue the discussion on the left issues in R2-2111507. Any other critical issues should also be included.

Intended outcome: report

Deadline: long

To aid better communication between the respective delegates handling this topic from different companies, it is requested to fill-in the contact information.

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# Discussion

In the following sections, we discuss for each topic the pending issues from previous meetings, as well as the editor´s note captured in the current version of the TS 38.331 running CR.

## CHO/DAPS related

### 2.1.1 Open issues from running CR

The following editor´s note related to CHO issue were captured in the TS 38.331 running CR

* Editor´s note: FFS how/if to represent the time between the CHO configuration in the cell and the RLF in the same cell, e.g. reuse *timeSinceCHOReconfig*.

The current field description of *timeSinceCHOReconfig* as captured in the running CR is based on the agreement from RAN2#114-e:

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| *From RAN2#114-e:*  To represent Timer C, i.e. the “Time elapsed between the first CHO execution and the corresponding latest CHO configuration received for the selected target cell” introduce a new timer, e.g. timeSinceCHOReconfig. |

However, RAN2 has not agreed on whether the UE should log the timeSinceCHOReconfig, if an RLF occurs in a cell after the CHO configuration is provided.

* **Q1: In case the UE experiences an RLF in a cell after being configured with CHO configuration, shall the UE log in the RLF-Report the time elapsed between the CHO configuration and the RLF?**
  + **Option A:** Yes, the UE shall reuse the timeSinceCHOReconfig as the time elapsed between the RLF in a given cell and the latest CHO configuration received while connected to that cell
  + **Option B:** Yes, the UE shall reuse the timeSinceCHOReconfig as the time elapsed between the RLF in a given cell and the first CHO configuration received while connected to that cell
  + **Option C:** The UE shall not log this information at all
  + **Option D:** Other. Please provide the description of your preferred option

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| **Company** | **Preferred option** | **Comments** |
| Ericsson | A | We can simply reuse the timeSinceCHOReconfig. This does not cause additional complexity to the UE, since anyhow the UE has to start the timeSinceCHOReconfig for the sake of Time C, when it receives the CHO configuration. If an RLF occurs before the CHO execution, the UE can simply include the current value of timeSinceCHOReconfig within the RLF-Report. |
| Huawei, HiSilicon | D | In the running SON CR, the timer *timeSinceCHOReconfig* has been defined as below:  3> set *timeSinceCHOReconfig* to the time elapsed between the execution of the last *RRCReconfiguration* message including *reconfigurationWithSync* for the target PCell of the failed conditional handover, and the reception in the source PCell of the last *conditionalReconfiguration* including the *condRRCReconfig* of the target PCell of the failed conditional handover;  Option A has some problems, e.g. the timer timeSinceCHOReconfig can be calculated based on CHO execution or RLF, so the network can not differentiate between two cases.  One clean way is to introduce a new timer dedicated for the case above. |
| SHARP | Option A | Share Ericsson’s view, and the failure type in RLF-report can be used to differentiate whether it is for RLF case or CHOF case. |
| CATT | Option D | We agree that the time elapsed between the latest CHO configuration and the RLF should be included in RLF report to help the network to optimize the CHO configuration.  If the UE is configured with CHO configuration and performs CHO to target cell successfully, then the target cell configures CHO configuration to the UE in short time, but UE experiences RLF at target cell soon, in this case, we think both the time elapsed between the CHO configuration(source cell configures) and the CHO execute ,and the time elapsed between the CHO configuration(target cell configures) and the RLF in target cell should be included in RLF report to help the network to analyze whether the RLF was caused due to too early handover/handover to wrong cell (i.e. CHO configuration which was configured by source cell is not good) or due to too late handover (i.e. CHO configuration which was configured by target cell is not good) or both.  Based on the above considerations, we prefer to introduce a new timer to represent the time elapsed between the latest CHO configuration and the RLF. |
| NEC | A | If CHO execution is not performed before RLF happens due to radio link failure or legacy handover, reusing the timeSinceCHOReconfig is the simplest way. Network can identify whether CHO execution is performed based on other filed. |
| Samsung | D | This way is really strange.  We have already implemented the legacy timer, timeConnFailure to indicate the time, i.e. elapsed since the reception of HO configuration until connection failure.  For CHO, we are not sure why the current definition of the legacy timer should be changed and consequently, a new timer should be introduced again, in order to replace the legacy timer. We have not assumed that it results in a critical problem to keep the legacy definition of timeConnFailure in CHO, i.e. it’s just a definition issue, rather than a technical issue.  Thus, this way-forward would lead to just unncessary timer and confusion. We should try to reuse current timers.  We prefer to keep the current definition of timeConnFailure also for CHO, and we can easily derive the time elapsed between the CHO execution and the RLF, while considering the current timers, the timeConnFailure and timeSinceCHOReconfig. |
| Qualcomm | A | Whether RLF happened before or after the CHO execution can be determined with the non-zero value of timeConnFailure. Therefore, in the scenario, where UE was configured with CHO but RLF happened before the execution of CHO, *timeSinceCHOReconfig* can be reused to report the time between CHO configuration and RLF. |
| vivo | Option A | An UE is able to receive CHO command but later suffers an RLF event before the CHO execution, this implies that the execution conditions are too stringent to be triggered by the UE, the parameters should be optimized/relaxed so that the UE can execute the CHO configuration more easily. So we think this information is useful and can be included in the report.  Among the options to indicate the information, we prefer to reuse timeSinceCHOReconfig, i.e., Option A.  According to the current CR, the two cases mentioned by HW can be differentiated by the *connectionFailureType*, i.e., the CHO failure case will be set to *hof* and the RLF case will be categorized into *rlf* instead.  1> if the failure is detected due to reconfiguration with sync failure as described in 5.3.5.8.3, set the fields in *VarRLF-report* as follows:  2> set the *connectionFailureType* to *hof*;  <\*text omitted\*>  2> if the the last executed *RRCReconfiguration* message including *reconfigurationWithSync* was concerning a conditional handover:  3> set *timeSinceCHOReconfig* to the time elapsed between the execution of the last *RRCReconfiguration* message including *reconfigurationWithSync* for the target PCell of the failed conditional handover, and the reception in the source PCell of the last *conditionalReconfiguration* including the *condRRCReconfig* of the target PCell of the failed conditional handover; |
| ZTE | D | The issue here is whether we need additional timer to present the time from CHO configuration to RLF failure even when the CHO is not configured. Based on RAN3 agreed MRO scenario, there is no use of such information.The too late CHO is defined as CHO configuration received but not executed and UE experience failure and re-attempt to candidate cell or a cell other than current camping cell. Which means, only one indication to indicate a CHO is configured but not executed is sufficient. For mixed CHO/HO scenario, together with timeConnFailure NW can still knows how to differentiate different scenario. While for the case CHO is executed, this information is implicitly derived. |
| CMCC | D | We prefer the solution that one indication to indicate that CHO is configured but not executed. |
| Nokia | Option A | At least start of timer should be the same for both cases. Time should be logged for root cause analysis . If we are discussing such solution for this timer (stops when one of two events happens – execution or failure), why was this approach not used for timer D as well? |

**Rapporteur summary:**

To be added later

The next editor´s note in the running CR related to CHO is about the following:

* Editor´s note: FFS the granularity of the *timeConnSourceDAPSFailure*, e.g. seconds or milliseconds.
* Editor´s note: FFS the granularity of the *timeSinceCHOReconfig*, e.g. seconds or milliseconds
* Editor´s note: FFS the granularity of the *timeBetweenEvents*, e.g. seconds or milliseconds.

Rapporteurs notes that in most cases, the time value that should be captured by those timers might be very small. For example, the time between a DAPS execution and an RLF failure in the source while T304 is running might be in the order of few ms. Simlarly, the time between the fullfillment of an A3 (A5) event and an A5 (A3) event might be in the order of few ms. Also for the case of the *timeSinceCHOReconfig*, the time elapsed between the CHO configuration and the execution might be in the order of milliseconds in a network implementation.

* **Q2: Which granularity do you prefer for the timers timeConnSourceDAPSFailure, timeSinceCHOReconfig, timeBetweenEvents?**

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| **Company** | **timeConnSourceDAPSFailure**  **(seconds/milliseconds)** | **timeSinceCHOReconfig**  **(seconds/milliseconds)** | **timeBetweenEvents**  **(seconds/milliseconds)** |
| **Ericsson** | Milliseconds  The time between the DAPS HO execution and the RLF in the source while doing the DAPS HO might be very short, in the order of millisecond. If we specify this timer in seconds, that would not give useful information in most of the cases. | Milliseconds  The time between the CHO configuration and the execution may be short, i.e. less that a second, in a reasonable NW implementation. Hence if we specify this timer in seconds, that would not always give useful information in most of the cases, unless the time between CHO execution and configuration is already quite large. | Milliseconds  The time between the fullfillment of one event and the other event might be very short in most realistic situations. If we specify this timer in seconds, that would not give useful information in most of the cases. |
| Huawei, HiSilicon | 100ms  We think that the “milliseconds” granularity would introduce some overhead, so 100ms is preferred, e.g. following the definition of Rel-16 IE timeConnFailure.  ***timeConnFailure***  This field is used to indicate the time elapsed since the last HO initialization until connection failure. Actual value = field value \* 100ms. The maximum value 1023 means 102.3s or longer. | 100ms  The same reasons as for timeConnSourceDAPSFailure. | Milliseconds  The time interval may be small, so the “milliseconds” granularity is preferred. |
| SHARP | Milliseconds  The time of timeConnSourceDAPSFailure may not be long, so it’s ok with use millisecond. | Milliseconds  Same reason for timeConnSourceDAPSFailure. | Milliseconds  Same reason for timeConnSourceDAPSFailure. |
| CATT | **milliseconds** | **milliseconds** | **milliseconds** |
| NEC | Milliseconds  This time interval maybe very short, so “milliseconds” granularity can be used. | Milliseconds  This time interval maybe very short, so “milliseconds” granularity can be used. | Milliseconds  This time interval maybe very short, so “milliseconds” granularity can be used. |
| Samsung | 100 ms  similar with the granularity timeConnFailure | 100 ms  similar with the granularity timeConnFailure | Miliseconds |
| Qualcomm | 100ms  Same view as Huawei | 100ms or tens of milliseconds | Milliseconds  Same view as Huawei |
| vivo | 100ms | 100ms | Milliseconds |
| ZTE | **milliseconds** | **milliseconds** | **milliseconds** |
| CMCC | 100ms  similar with the granularity timeConnFailure | 100ms  similar with the granularity timeConnFailure | milliseconds |
| Nokia | ms | ms | ms |

**Rapporteur summary:**

To be added later

### 2.1.2 Other open issues related to CHO/DAPS

In this section, companies are invited to bring up other open issues. Note however that according to chairman recommendation, we should avoid discussing new issues unless there is some critical/outstanding problem.

* **Q3: Is there any further issue related to CHO/DAPS you would like to discuss? Please describe it below:**

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| **Company** | **Comments** |
| Huawei, HiSilicon | 1. We prefer to discuss the UE actions for CHO with consecutive failures to capture the following agreements:   Agreements in RAN2#115-e:  1 The following signalling model for the RLF-Report of CHO:  Use separate IEs within the existing RLF-report to represent the second failure, and the first failure can be represented by reusing as much as possible existing IEs   1. How to set the timeSinceFailure, is it started from the first connection failure or the second in case of two consecutive failures in both CHO and DAPS?   1> if *rlf-ReportReq* is set to *true*:  2> if the UE has radio link failure information or handover failure information available in *VarRLF-Report* and if the RPLMN is included in *plmn-IdentityList* stored in *VarRLF-Report*:  3> set *timeSinceFailure* in *VarRLF-Report* to the time that elapsed since the last radio link failure or handover failure in NR;  3. how about the case that RLF@src + RLF @trg？This is not included in the agreements in RAN2#115-e. In our understanding, all the failure info for this case can be the same as the following case a.  4 The RLF report is used to log the failure related measurement in these scenarios:  a. Failure at the source (RLF) while performing access to DAPS target cell and failing to access the target (HOF)  b. Failure at the target cell (HOF) and failing to perform fallback (RLF at source) |
| NEC | UE also want to discuss how to capture the case of CHO/DAPS with consecutive failures. Currently, the UE clears the information included in *VarRLF-Report* first before set the field. We need behaviors that the UE adds more information in the *VarRLF-Report* for the second CHO/DAPS related failure without clearing the RLF information of the first failure.  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; |
| Samsung | Issue1：  ***timeConnSourceDAPSFailure***  This field is used to indicate the time that elapsed between the last DAPS handover execution and the radio link failure detected in the source cell while T304 is running.  “last DAPS handover execution” is unclear to us. “Execution” is normally used for the CHO. For DAPS, the handover is performed as long as HO CMD is received, which is described as HO initialization. Thus, we prefer to change it as “the last DAPS handover initialization” as in legacy HO.  Issue2：  We see the different field descriptions of *rlfInSource-DAPS* in RLF Report and SHR:  *rlfInSource-DAPS* under RLF report  *rlfInSource-DAPS*  This field indicates whether a radio link failure occurred at the source cell while T304 was running, prior to a DAPS handover failure.  *rlfInSource-DAPS* under success HO report  *rlfInSource-DAPS*  This field indicates whether a radio link failure occurred at the source cell while T304 was running, prior to a successful DAPS HO.  We can merge the decriptions as follow:  This field indicates whether a radio link failure occurred at the source cell while T304 was running, prior to a DAPS handover failure or a successful DAPS HO.  And, the updated field description is sufficient to be introduced under either RLF Report or SHR.  Cf. as an example, we can see the field description of *ra-InformationCommon* for RA Report and RLF Report. |
| Nokia | How is timer D logged in the case CHO is not triggered? Replaced by timer C with new definition? |
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**Rapporteur summary:**

To be added later

## SHR related

### 2.2.1 Open issues from RAN2#116 meeting

#### 2.2.1.1 RA Info in SHR

A topic discussed in #899 email discussion and in offline#850 is related to if and when the UE includes the RA-InformationCommon in the SHR.

Proposal 5 RAN2 to further discuss whether RA-InformationCommon is included in SHR when T304 is above the threshold.

The following technical reasonings are mentioned in the respones of the #899 email discussion:

1. Companies supporting option-A
   1. RA-InformationCommon corresponding to SHR could be replaced or deleted from RA report.
   2. There is currently no way to link a specific RA report in the RA report list with the SHR
   3. There is no indicator or timestamp to associate the SHR to a specific entry in the RA-Report
2. Companies supporting option-B
   1. Already part of RA-report. No need to duplicate it..

During RAN2#116 meeting, it was not possible to reach any conclusion on this topic as companies’ views were split halfway. The proponents point out that it is not possible to correlate the RA related information in the RA report and a SHR if SHR does not include the RA related information. However, opponents argue that the cellID in the SHR and RAReport should suffice to do such a correlation.

Based on the above reasoning from the companies, rapporteur believes that same question can be reposed as more technical arguements from RAN2#116 meeting might have changed each company’s position on this topic.

* **Q4: Which is the option do you prefer for the inclusion of RA-InformationCommon in the SHR?**
  + **Option A: RA-InformationCommon is included in SHR when T304 is above the threshold**
  + **Option B: RA-InformationCommon is not included in SHR**

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| **Company** | **Option-A / Option-B** | **Comments** |
| Ericsson | A | If the T304 timer goes beyond the configured t304 threshold, it means that the UE suffered RA problems when accessing the target cell. Hence it is beneficial, to include the RAInformationCommon in the SHR. The network can not pinpoint the root cause of the issues in the RA procedure let to SHR, because neither the RA-Report nor the SHR contains timestamps information that can allow the network to correlated the SHR with an entry of the RA-Report. Additionally, the SHR and the RA-Report may be delivered to the source cell at different points in time, especially considering that the SHR can only be fetched by Rel.17 nodes, while any node can retrieve the RA-Report. |
| Huawei, HiSilicon | B | This has been inlcuded in RA-report. We can depend on network implementation to correlate two reports, rather than the duplication in the SHR. |
| SHARP | B | Agree with Huawei. |
| CATT | Option B | RA-report is enough. |
| NEC | B | We think network can obtain RA-information form RA-report based on the cell ID information, rapurpose and etc. So there is no need to have a duplicate report. |
| Samsung | A | A simple option is preferable. Linkage with RA Report would result in just additional considerations, e.g. new fields and/or new behavior. |
| Qualcomm | B | Same understanding as Huawei. |
| vivo | A | Though the cellID included in the SHR and RA report can be considered a link for the correlation, this does not mean the entries recorded in the respective reports were for the same event. The same cellID only means that the successful HO event and the successful RACH event happened in the same cell, but not literally time-complied.  We also would like to avoid any extra burden on the UE side, but it seems currently Option A is the only feasible solution. |
| ZTE | A | Both SHR and RA report is not required to be reported immediately, therefore it is possible part of the information can be lost, especially considering there are multiple entries of RA-report, if the RA report and SHR is retrieved separately afterwards, there is no additional information can be used to link the two reports together. |
| CMCC | A | It seems not easy to link HSR and RA Report. |
| Nokia | B | RA-InformationCommon is already part of the ra-Report and we should not duplicate the information by including it into two reports. Network can retrieve ra-Report when it needs to obtain the rach related content included in the ra-InformationCommon field and correlate it with SHR reporting. |
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**Rapporteur summary:**

To be added later

#### 2.2.1.2 SHR and RLF-Report being generated for same HO

Another topic discussed in Offline#850 discussion is related to the impact of SHR and RLF report being generated for the same HO event.

Proposal 6 RAN2 to further discuss whether and how to handle the scenario of SHR and RLF-Report being generated for the same HO.

The scenario under consideration is the following.

1. UE is being handed over from cell-A to cell-B
2. The handover is successful and the UE also generates a SHR report
3. SHR report is fetched by cell-B and sent to Cell-A
4. UE declares RLF in Cell-B and generates the RLF report
5. UE reports the RLF report to Cell-X (this could be very late in time compared to when RLF was declared i.e., timeSinceFailure is a large value).
6. Cell-A receives the RLF report and realizes that it was a *HO to wrong cell* from Cell-A to Cell-B

The problem identified is that the same HO has resulted in both SHR generation and RLF report generation and both these reports would result in correcting HO parameters i.e., SHR might result in reducing the A3Offset whereas RLF report might result in increasing the A3Offset. Opponents of this proposal believe that there is no possibility at the network side to identify that both reports are for the same HO.

The following technical reasonings are mentioned in the respones of the Offline#850 discussion:

1. Companies who believes there is an issue:
   1. Since the two reports were caused by the single event, it may be beneficial to correlate them for further parameters analysis
   2. The UE will report to the network both the SHR and the RLF-Report for the same HO event.
   3. It is not clear how the network implementation can fix this issue, given that there will not be any indicator or timestamp linking the RLF-Report to the SHR (and viceversa).
2. Companies who believe there is no issue:
   1. The two reports have different optimization objectives
   2. This is related to network implementation issue
   3. The network needs to collect enough SON reports and then can do a full anaysis on the issues.

Based on this, rapporteur would like to ask the following question.

* **Q5: Is it possible for the network to identify that the SHR and RLF report are generated for the same HO in the scenario described above?**
  + **If YES, please indicate how in the comments, and how you intend to perform such a correlation**
  + **If NO, please indicate what additional information is needed to perform such a correlation**

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| **Company** | **Yes/No** | **Comments** |
| Ericsson | No | There is no information, e.g. timestamps, in the RLF-Report and in the SHR that allow the network to correlate the two reports to the same HO. Additionally, the RLF-Report and the SHR might be received by the source cell at very different points in time, since the SHR can only be fetched by Rel.17 nodes. Given the above considerations, it is not clear how the network implementation can tackle this issue. The network may for example first receive the RLF-report, tune the current HO parameters, and then receive the SHR. Without correlating these two reports, the network will end up tuning again erroneously the HO parameters.  Regarding the bullet 2c, even if may SHR/RLF-Reports are used for optimizing the HO parameters, the problem remains. If many SHR and RLF-Reports are generated for HOs to one source cell to a certain target cell, there is the risk of frequent tuning back and forth of the HO parameters, which in turn may make the HO performances unstable.  Thus, we would like to somehow address this problem in the specification, e.g. via timestamps, or flag in the SHR (RLF-report) indicating that the RLF-Report (SHR) has been already sent to the network. |
| Huawei, HiSilicon | No | We think the UE should provide an indicator in the RLF-report for the network to know whether to link the RLF-report to the SHR(and vice versa). Upon receiving RLF-report with the indicator, the NW will decide how to optimize the parameters, e.g.,   * based on RLF-report, then the NW should identify the related SHR and may discard it (and vice versa); or * basded on both: the NW need to wait for the related SHR and perform the analysis on both reports |
| SHARP | No | The NW may not able to identify that the SHR and RLF report are generated for the same HO, but the NW does not have to correlate the 2 reports to the same HO. Based on the reasons listed by the raportaur(e.g. the two reports have different optimization objectives), we are still not convinced to handle this scenario. |
| CATT | No | UE ID information could be included in SHR and RLF report. |
| NEC | No | We understand that by timeSinceFailure and timeConnFailure in RLF-report, the network can identity when the handover event before the RLF of target happened. However there is no time information in SHR for the network to correlated the corresponding SHR. So we can add time information in SHR for the network to correlated the two events. How does the network use the information in SHR and RLF is up to network implementation. |
| Samsung | No |  |
| Qualcomm | No | Yes, the correlation may be useful. However, RAN3 has the following agreement:  RAN3 considers a UE Identifier (e.g. AP ID) for SHR in F1AP beneficial if there is no RAN2/RRC UE identifier inside the SHR; RAN3 needs to wait for RAN2 progress before the final decision.  Based on the C-RNTI (in RLF report) and UE identifier, the network can correlate the RLF and SHR report, and take appropriate action. |
| vivo | No | The event shall be differentiated based on the premise that it is introduced by the same UE, so we think the UE identity should be included in SHR, together with timestamp or other flags. |
| ZTE | No | We prefer to includes the failure information together with the successful information in one report since it corresponds the the same event so that NW can obtain both information with a single request. |
| CMCC | No | Share same view with ZTE. |
| Nokia | No | If the UE context is erased by the time the RLF report is received, how to link the two reports? Additional information can be used such as last HO config.  Is this the only scenario of interest or are other possible, relating to CHO for example? I.e UE executes CHO from A to B, CHOF (UE generates RLF report), then UE successfully does CHO recovery to cell C (generates SHR). |
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**Rapporteur summary:**

To be added later

#### UP measurements in SHR

User plane interruption time was one of the topics for which we could not make any agreement in RAN2#116 meeting. Based on the inputs from the companies, it seemed agreeable that the UP interruption time is measured at the PDCP layer and the measurement is based on the non-duplicated packets i.e., duplicated packets should not be considered.

* **Q6: Do you agree that the UP interruption time at HO is evaluated at PDCP layer without considering duplicates?**

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| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes | By measuring the UP interruption time at PDCP layer, the measurement would represent the time without new packets being forwarded to upper layers. Hence, it indicates the actual interruption perceived by upper layers in the UE. |
| Huawei, HiSilicon | Yes |  |
| SHARP | Yes |  |
| CATT | Yes |  |
| NEC | Yes |  |
| Samsung | No | There may be no UP packet in buffer before HO. For that case, we are not sure if we can calculate it as UP interruption time at HO. Thus, the definition and motivation is unclear.  Furthermore, since it would lead to additional complexity, e.g. need to count in packet level, we cannot support it with poor clarification. |
| Qualcomm | Yes | Clarification is needed for the scenarios outlined by samsung |
| vivo | Yes |  |
| ZTE | Yes |  |
| CMCC | Yes |  |
| Nokia | Yes |  |
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**Rapporteur summary:**

To be added later

Further, RAN3 LS (R3-212935) had asked for UE based UP interruption time measurements and RAN2 has already agreed that the UP interruption time is part of the SHR as agreed in RAN2#115 meeting.

Therefore, RAN3 respectfully asks RAN2 to further study the introduction of User Plane measurements (e.g. user plane interruption time at HO) in the SHR.

R2-2108419 LS Reply On user plane masurements for successful handover report Ericsson discussion NR\_ENDC\_SON\_MDT\_enh-Core

Agreement from RAN2#115:

1 UP measurements for Successful Handover Report will be introduced as RAN3 required. FFS the details.

However, during RAN2#116 meeting some companies indicated that network based solution should be introduced. Therefore, rapporteur would like to ask the following question.

* **Q7: Do you agree that the UE should perform the user plane interruption time measurements at the HO i.e., inline with agreements from RAN2#115 meeting?**

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| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes | The RAN3 LS clearly states that “RAN3 respectfully asks RAN2 to further study the introduction of User Plane measurements (e.g. user plane interruption time at HO) in the SHR”.  Hence, RAN2 should just focus on the information to be included by the UE in the SHR. |
| Huawei, HiSilicon | Yes | Share similar views as Ericsson. |
| SHARP | Yes |  |
| CATT | Yes | The UE based reporting is needed. |
| NEC | Yes |  |
| Samsung | No | If supported, it has to be measured by gNB. Usually, most L2 measurements are measured by gNB. |
| Qualcomm | No | Same view as Samsung |
| vivo | Yes |  |
| ZTE | Yes |  |
| CMCC | Yes |  |
| Nokia | Yes |  |
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**Rapporteur summary:**

To be added later

Further, during RAN2#116 meeting one company indicated that the user plane interruption time measurement should be limited to DAPS handover.

* **Q8: Under which scenarios, should the ’user plane interruption time’ measurements be computed?**
  + **Option A: For both ordinary HO and DAPS HO**
  + **Option B: Only at DAPS HO**
  + **Option C: For all HO types (ordinary HO, DAPS, CHO)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option-A/B/C** | **Comments** |
| Ericsson | C (preferrable)  A (acceptable) | The DAPS HO is supposed to be configured by the network to reduce the HO interruption time of an ordinary HO.  Hence knowing the user plane interruption time is particularly beneficial for the ordinary HO, so that the network can use this information to determine whether to configure a DAPS HO to improve performances, or to keep the ordinary HO if performances are already satisfactory. |
| Huawei, HiSilicon | Option B | In the LS from R3-212935, it is clear that this is only applied for successful DAPS HO, which aims at 0ms interruption.  *RAN3 has concluded that the introduction of User Plane measurements in the Successful Handover Report, such as e.g. user plane interruption time at HO, will help the network evaluate the performance of successful DAPS HO.* |
| SHARP | Option C | It can be left to the NW to deside whether to configure the UE to do this UP interruption time measurements, so it should be allowed for all HO types in the spec. |
| CATT | Option C | There does not seem to be a lot of extra work required for other HO types except DAPS HO. |
| NEC | Option B | Agree with HW |
| Qualcomm | Option B | Agree with HW |
| vivo | Option B | Same view with HW. |
| ZTE | Option C | Same view as CATT |
| CMCC | Option C | Although the ’user plane interruption time’ is firstly proposed for successful DAPS HO, it is easy to extend it to all HO types. |
| Nokia | Option B |  |
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**Rapporteur summary:**

To be added later

### 2.2.2 Open issues from running CR

Related to SHR, the following editor´s note was captured in the TS 38.331 running CR:

* Editor’s NOTE: FFS on whether we need an indication in successHO-Config for triggering of SHR when source RLF is declared in DAPS

The SHR configuration includes as agreed the T304/T310/T312 thresholds. Additionally, as agreed, the successful handover information are logged by the UE only if the UE was configured with the SHR configuration.

|  |
| --- |
| From current TS 38.331 running CR:  SuccessHO-Config-r17 SEQUENCE {  thresholdT304 ENUMERATED {s0dot4, s0dot6, s0dot8, spare5, spare4, spare3, spare2, spare1 } OPTIONAL, --Need M  thresholdT310 ENUMERATED {s0dot4, s0dot6, s0dot8, spare5, spare4, spare3, spare2, spare1 } OPTIONAL, --Need M  thresholdT312 ENUMERATED {s0dot2, s0dot4, s0dot6, s0dot8, spare4, spare3, spare2, spare1 } OPTIONAL, --Need M  ...  }  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; |

The above implies that in the current running CR, there is no configuration for the reporting of the RLF in source cell during the DAPS handover, i.e. for the report of the “*rlfInSource-DAPS-r17*” in the SHR. Hence, if the UE is configured with any of the above thresholds T304/T310/T312, the UE shall always generate a SHR to include the *rlfInSource-DAPS-r17* if the RLF occurs in the source cell during the DAPS handover, even if the values of T304/T310/T312 were below the thresholds.   
For example, according to the current running CR, if the SHR configuration only contains the T304 threshold configured by the target, then the UE may log the *rlfInSource-DAPS-r17*, even if the source cell was not interested in the SHR.

* **Q9: Shall the UE generate a 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*)?**
  + If the answer is yes, an additional configuration field will be included the successHO-Config, e.g. *dapsRlfInSource-trigger*. Otherwise no changes are needed to the current running CR.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes | We should add a specific field in the successHO-Config for the inclusion of “rlfInSource-DAPS“. Otherwise, the source cell would receive this information also when not required. In particular, in case the UE is only configured with the T304 threshold by the target cell, the source cell may also receive the SHR even if it did not configure the SHR at all. |
| Huawei, HiSilicon | No | In the above description, we wonder whether it may happen or not.  *if the RLF occurs in the source cell during the DAPS handover, even if the values of T304/T310/T312 were below the thresholds*  We think the UE can log SHR based on T310 in this case. |
| SHARP | No | Share Huawei’s view, UE can log SHR based on T310 for this case. |
| CATT | Yes | An indication in successHO-Config could be needed for the UE to trigger SHR in case of RLF in source cell during a DAPS HO. |
| NEC | Yes | We have agreed that SHR will not be triggered if triggering condition is not set by the network, so we support to add one source RLF as one triggering condition for SHR of DAPS HO. |
| Samsung | No | Share with Huawei’s view. |
| Qualcomm | Yes | Same understanding as Ericsson. |
| vivo | No | Share with Huawei’s view. |
| ZTE | Yes | We see benefits in this particular case since in such case source has experience RLF which means UE cannot fallback to source if HO target is successful, which can be a result of too late DAPS HO but if NW doesn’t configure T310/t312 then this information can be lost. Therefore we support this proposal. |
| CMCC | Yes | We think the configuration is necessary. |
| Nokia | Yes | If RLF@Src happened during DAPS HO, it is useful for the network to know as this impacts interruption time which should be close to 0 in case of DAPS. So we either use SHR to report this (as per current agreements) or UE generates RLF report including new flag *rlfInSource-DAPS-r17* .  The T304 threshold may be configured by the target cell but the SHR configuration is still under the control of the Source cell. |

**Rapporteur summary:**

To be added later

### 2.2.2 Other open issues related to SHR

In this section, companies are invited to bring up other open issues. Note however that according to chairman recommendation, we should avoid discussing new issues unless there is some critical/outstanding problem.

* **Q10: Is there any further issue related to SHR you would like to discuss? Please describe it below:**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| NEC | 1.As proposed during last meeting, in case that SHR is genereated but the HO fails finally, the UE needs to discard the corresponding SHR of this HO event.  2. We have agreed that both source gNB and target gNB can configured SHR, but it is not clear if the SHR configuration can be only included HO command (RRCReconfiguration with reconfigurationwithSync) or also RRC message before HO command. |
| Nokia | Further alligment needed with content of RLF report, e.g. CHO config, value of timer that triggered SHR generation, etc |
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**Rapporteur summary:**

To be added later

## RA report related

### 2.3.1 Open issues from RAN2#116 meeting

#### 2.3.1.1 2-step RA related

During RAN2#116 meeting, the following agreement was made.

3 Introduce MSGA PUSCH resource related information in 2-step RA report and the details within the following information: the payload size transmitted in MSGA for a 2-step RACH attempt. FFS the detail and how to reduce overhead.

It has been agreed that the UE shall include the payload side transmitted in MSGA. However, it is FFS regarding how to reduce the overhead. There are three issues (at least from rapporteur point of view) associated to this FFS.

1. Whether the payload size to be reported is with padding or without padding?
2. Whether the payload size is reported ’per RA procedure’ or ’per RA attempt’?
3. How to represent the payload size?

These questions are included as part of the questions below.

Based on the discussions in RAN2#116 meeting, it was found beneficial to report msgA payload size as this reduces the need to include all the aditional information. However, it was also said during online session that the payload size without padding is the most valuable information. As this has not been agreed yet, the following question is proposed.

* **Q11: Which of the following contents of payload size is reported by the UE?**
  + **Option-1: With padding**
  + **Option-2: Without padding**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option-1 / Option-2** | **Comments** |
| Ericsson | Option-2 | The padding related addition is performed by the UE to match the TB size. Knowing the exact amount of data that the UE intended to transmit gives the most valuable information as the network can allocate the PUSCH resource accordingly. |
| Huawei | Option-2 | More useful information shall be the payload size without padding for the purpose of optimizing PUSCH configuration |
| SHARP | Option-2 | The actual payload size without pading is more useful. |
| CATT | Option-2 | The payload size without padding reflects the size of atual MSGA PUSCH contents, it is more useful for NW to optimize the PUSCH resource. |
| NEC | Option-2 | Only the payload size without padding is useful to the network. |
| Samsung | Option 2 |  |
| Qualcomm | Option 2 |  |
| vivo | Option-2 |  |
| **ZTE** | **-** | In our understanding the intention to report payload without padding is to help improve the configuration of PUSCH while currently no PUSCH configuration is included, therefore even with this information, NW is till unable to perform optimization. Especially considering if only rough size can be reported due to consideration on the report size, this information is actually less than report the PUSCH configuration. At least with the PSUCH configuration NW can still be able to derive the PUSCH size. Together with the per RA attempt information NW can adjust the configuration of PO, e.g., MCS based on the DL RSRP information included.  Therefore we still would like to report the PUSCH related information:   * msgA-MCS * nrofPRBs-PerMsgA-PO * msgA-PUSCH-TimeDomainAllocation * frequencyStartMsgA-PUSCH * nrofMsgA-PO-FDM   To know whether the PUSCH configuration fits the TB size properly, one additional bit per RA procedure can be included to indicate whether the padding is used or not. |
| CMCC | See comments | The payload size without padding is beneficial for the purpose of optimizing PUSCH configuration, **only when the actual size is reported**. Otherwise, option-1 is also acceptable, for example, by reporting following information:   * MCS index (4 bits) * the number of PRB per PO of the PUSCH resource (5 bits) * the number of msgA PUSCH occasions FDMed in one time instance (2 bits) |
| Nokia | Option-2 | No need to include the padding in the payload size. All that matters is what is the amount of data that the UE wants to send. |

**Rapporteur summary:**

To be added later

The current agreement indicates that the payload size is transmitted per RA attempt.

1. Introduce MSGA PUSCH resource related information in 2-step RA report and the details within the following information: the payload size transmitted in MSGA for a 2-step RACH attempt

As including msgA size per RA attempt could increase the size of the RA report, rapporteur would like to ask if it is correct understanding from all companies as to whether the msgA payload size is included per RA attempt or RA procedure.

* **Q12: Which of the following granularity of payload size is reported by the UE?**
  + **Option-1: Per RA attempt**
  + **Option-2: Per RA procedure**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option-1 / Option-2** | **Comments** |
| Ericsson | Option-2 is okay to reduce the size | Though the current agreement is for “per RA attempt“, one can provide this information per RA procedure i.e., the size of the payload (without padding) that initiated the 2-step RA procedure. |
| Huawei | Option-2 | Payload only needs to be reported per RA procedure not per RA attempt, since once the preamble group or PUSCH group is decided UE will not switch the group again and won’t rebuilt the PUSCH payload. |
| SHARP | Option 2 | Agree with Huawei. |
| CATT | Option-2 | The UE determines the MSGA payload when transmit MSGA using MSGA PUSCH configuration and the MSGA payload cannot be changed in a RA procedure, therefore, the granularity of per RA procedure is sufficicent. |
| NEC | Option-2 | To reduce size of RA-report, we think only the payload information of the first RA attempt of the 2-step RA procedure is sufficient. |
| Samsung | Option 2 |  |
| Qualcomm | Option-2 |  |
| vivo | Option-2 |  |
| ZTE | Option-2 | UE will not rebuild the TB during RA, therefore no need to report this information per RA-attempt |
| CMCC | Option-2 |  |
| Nokia | Option-1 | We have already agreed that the payload size transmitted in MSGA for a 2-step RACH is per RA attempt. |

**Rapporteur summary:**

To be added later

How to represent the payload size is not yet agreed. A few options are listed below on the method that can be used for reporting the payload size. Companies are requested to indicate which one they prefer and if they have additional way to indicate the same, then it is most welcome.

* **Q13: Which of the following options is used to report payload size?**
  + **Option-1: Actual size of the payload in bytes (with a maximum of ’X’ bytes i.e., if the payload size is large than ’X’ then the UE reports ’X’ but if the payload size is less than ’X’ then it reports the actual value)**
  + **Option-2: ENUMERATED {noPayload, sizeRange1, sizeRange2, sizeRange3, sizeRange4, sizeRange5, spare1, spare0} wherein each RANGE is known, e.g. hardcoded in the specification**
  + **Option-3: Others. Please add and describe your option**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option-1 / Option-2 / Option-3** | **Comments** |
| Ericsson | Option-2 is preferred but option-1 is acceptable |  |
| Huawei | Option-2 | Option-1 and option-2 have pros/cons, so it may be good to see more details for both options. |
| SHARP | Option 2/option 1 | Option 2 has lower overhead. But option 1 is also fine, |
| CATT | Option 2 | Option-2 could be signalling saving. |
| NEC | No strong view |  |
| Samsung | Option 2 (with further code point) | If option 2 is supported, we would like to add a code point to indicate whether MSGA PUSCH was transmitted or not due to any problem, e.g. SSB/PRACH occasion corresponding to MSGA PUSCH occasion may be invalid, or in NR-U, the LBT failure may happen in the MSGA PUSCH occasion. |
| Qualcomm | Option-2 |  |
| vivo | Option-2 | Minimization of overhead. |
| ZTE | Option 3 | If only rough TB size can be reported, we prefer to report the PUSCH configuration and have the total transmitted PUSCH size derived. |
| CMCC | Option 3 | Neither option-1 nor option-2 could report the actual payload size. We propose to report following PUSCH configuration information, so that not only the payload size could be estimated, but also the gNB could optimize the PUSCH corresponding configuration.   * MCS index (4 bits) * the number of PRB per PO of the PUSCH resource (5 bits) * the number of msgA PUSCH occasions FDMed in one time instance (2 bits) |
| Nokia | Both options could work | Option 2 describes payload more accurately but Option 1 is simpler. We should list the pros and cons of each option before we take a decision. |

**Rapporteur summary:**

To be added later

#### On-demand SI related

The following aspect associated to on-demand SI was postponed in RAN2#115 meeting.

Proposal 5 Decision on inclusion of an indicator in the on-demand SI request related report indicating whether the on-demand SI request was successful or not is postponed to next RAN2 meeting.

While implementing the running CR, it was noticed that there is no further changes equired to the ASN.1 while supporting successful on-demand SI as the RA report is already included for successful msg1 based SI request and successful msg-3 based SI request. Only the procedural text needs to be changed so that the SI related information included for failed on demand SI (*intendedSIBs*, *ssbsForSI-Acquisition*) are also included for successful on demand SI procedure. Based on this rapporteur would like to ask the following.

* **Q14: Do you agree to include *intendedSIBs*, *ssbsForSI-Acquisition* in the RA report for a successfully completed on-demand SI procedure?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes | The UE already includes the RA Report for the successful msg1 based and msg3 based on demand SI request procedure. The only missing contents in such a RA report would be *intendedSIBs* and *ssbsForSI-Acquisition*. Again, these parameters are also already there in the RA report (for failed on demand SI procedure related RA report). So, it should be very straightforward to include these two parameters also for successful on demand SI procedure in the RA report. |
| Huawei, HiSilicon | Yes | Share similar views as Ericsson. |
| SHARP | Yes |  |
| CATT | Yes |  |
| NEC | Yes |  |
| Samsung | Yes |  |
| Qualcomm | No | I agreed that ASN.1 wise there may not be much difference. However, in the successful ODSI, the network can develop statistics without UE assistance. Therefore, to avoid wasting UE memory and for the logging of RACH procedure information in other important scenarios (like initial access, beam failure recovery, and others), UE should only log ODSI in the failed scenario. |
| Vivo | Yes |  |
| ZTE | Yes | Successful SI request from UE can include SIBs that UE doesn’t intend to request, this information can help improve the SI-SIB mapping in SI configuration. |
| CMCC | Yes |  |
| Nokia | Yes | It could be easily extended |

**Rapporteur summary:**

To be added later

#### Other RA report related

In offline#802 in RAN2#113, including the PCell in the RA report in case RA occurred in an Scell was discussed, but eventually this was not agreed in RAN2#113bis-e due to lack of time although there was marge support:

a): UE also includes the Pcell in the RA report in case the RA occurred in an Scell.

**[Step1-Q4] Is Proposal 12 agreeable to you?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments if any proposal(s) not agreeable** |
| **CATT** | No strong view. |  |
| Sharp | Yes |  |
| vivo | No strong view. |  |
| ZTE | Yes | We think this is useful since for RA initiated in Scell, UE will monitor the RARs in SpCells. |
| Ericsson | Yes |  |
| Qualcomm | No strong view. |  |
| Samsung | Yes | As a generic enhancement, we also suggest that the UE identifies the type of the cell such as Pcell, Scell, and PSCell in which RA occurred. |
| Intel |  | Try to understand why the gNB cannot identify gNB/Scell based on scell ID and the frequency. And how can Pcell ID help. |
| Huawei, HiSilicom | Yes | There is a majority support for this so we are OK to go with that. |
| OPPO | No strong view |  |
| CMCC | Yes |  |
| Nokia | Yes |  |
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The issue is as follows.

1. UE has its PCell as Cell-X.
2. UE performs a RA procedure on Scell, cell-A of Frequency-1
3. UE stores the corresponding RAReport and includes only the associated PCI and the frequency
   1. Ue includes only PCI + ARFCN because it does not have CGI info of Scells as the UE is not required to read the SIB1
4. UE changes its PCell (via handover or via cell reselection after transitioning to Idle/Inactive) and comes to connected in Cell-N
5. UE reports the RA report to cell-N but cell-N does not know where to forward RA report associated to PCI-A of frequency-1.

To resolve this, it was suggested to include the Pcell ID for the RA procedure performed on a Scell of MCG and to include the PSCell ID for the RA procedure performed on a Scell of SCG as the UE is aware of CGI of Pcell and PSCell via reading the SIB1.

Based on this , apporteur would like to ask the following.

* **Q15: Do you agree to include the PCell ID for the RA procedure performed on a Scell of MCG and to include the PSCell ID for the RA procedure performed on a Scell of SCG?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes | This is needed to forward the RA report to the correct node. |
| Huawei, HiSilicon | Yes |  |
| SHARP | Yes |  |
| CATT | No strong view | If the cell-N is not so far, the freqency+PCI can be used to find the cell-A. |
| NEC | Yes |  |
| Samsung | Yes |  |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| CMCC | Yes |  |
| Nokia | Yes | This is necessary to forard the RA report where needed |

**Rapporteur summary:**

To be added later

### 2.3.2 Open issues from running CR

The running CR captures the following Editor’s Note associated to the RS report enhancements.

* Editor´s note: Whether to include RA report entry upon successful completion of on demand system information acquisition is FFS.

This issue has been already brought up in section 2.3.1.2.

* Editor’s Note: FFS- How to encode the msgA-PUSCH-PayloadSize

This issue has been already brought up in section 2.3.1.1.

### 2.3.3 Other open issues related to RA-report

In this section, companies are invited to bring up other open issues related to the RA-Report. Note however that according to chairman recommendation, we should avoid discussing new issues unless there is some critical/outstanding problem.

* **Q16: Is there any further issue related to the RA-Report you would like to discuss? Please describe it below:**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | At RAN2#115-e, it was agreed:  ***RA Report to the SN:***  1 UE reports the SN RACH report to the MN, and then MN sends the SN RACH report to SN.  We think it is open whether it is mandatory for the UE to log SN RACH report. |
| ZTE | How to store SgNB RACH report and report it to LTE MN still requires further discussion. |
| Nokia | Currently in the RACH Report the field msgA-Transmax is included in RA-InformationCommon IE to indicate RA type switching point in the 2-step RA report. However, there are more reasons why a 2-step RACH procedure may change to 4-step RACH which aren’t yet addressed. For example, a RACH may fail due to LBT when UE does a separate LBT to send the PRACH preamble and then another one for sending PUSCH for payload transmission. In this case, the UE can change the RACH type to 4-step RACH because the channel is unavailable and not because of failure in PUSCH detection. As another example, the UE may receive a FallbackRAR from the network in which case it performs a fallback from 2-step to 4-step RACH.  Besides fallback from 2-step to 4-step RACH, another possibility is fallback from 4-step CFRA to 4-step CBRA in the event that no suitable beam is found by the UE. We haven’t yet discussed the available options to reflect in the ra-Report a more general reason for changing (switching or falling-back) of a RACH procedure. |
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**Rapporteur summary:**

To be added later

## SCG related MRO

### Open issues from RAN2#116 meeting

During RAN2#116 meeting, we have agreed the following.

Agreements:

1: The UE needs to include RA information in case that failureType is set to randomAccessProblem or beamFailureRecoveryFailure-r16.

2: RA-InformationCommon-r16 is used as a baseline to indicate random-access related information set by the PSCell.

3: The parameter connectionFailureType could reuse the current failureType in SCG failure message. FFS on enhancements.

4 The condition “failureType is set to synchReconfigFailureSCG” for including RA information.

=> FFS: Introduce one bit flag to indicate whether T304 is running or not in SCG failure message.

There are two issues that needs to be addressed here. One is regarding which message carries the RA information associated to the SCG failure and the other is associated to the T304 running flag.

There are two messages that can be used to carry the RA information.

1. SCGFailureInformation
   1. Pros: The network gets all the failure related information in a single message
   2. Cons: The size of a mandatory message increases significantly.
2. RA report
   1. Pros: The size of a mandatory message is kept to its original size
   2. Cons: The network needs to coordinate the collection of RA report and SCGFailureInformation.

Based on the above, rapporteur requests companies to provide their views on the following question.

* **Q17: Which message would you prefer to carry the RA Information associated to a SCG failure (when failureType is set to randomAccessProblem or beamFailureRecoveryFailure-r16)?:**
  + **Option-1: SCGFailureInformation**
  + **Option-2: RA report**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option-1 / Option-2** | **Comments** |
| Ericsson | Option-2 | The RA report is already used for both successful RA procedures and failed RA porcedures (i.e., failed on-deamnd SI acquisition).  It has also been agreed that the SN related RA report it sent to the MN.  Therefore, we believe include the RA Information associated to a SCG failure in the RA report is the most straight forward way and this keeps the size of the mandatory message (*scgFailureInformation*) to its original size. |
| Huawei, HiSilicon | Option-1 | For RA report, it only includes the RA info for the successful RACH procedure, and the RA issue described in Q17 is a failure so that this will not trigger the RA report. So we prefer option-1. |
| SHARP | Option 1 | Option 1 is prefered to include RA info together with other failure info in SCGFailureInformation, this is similar to the case of RLF-report in which RA info is included together with other failure info. |
| CATT | Option-1 | SCG failure is an immediate procedure, the SCG failure message will be transmitted to network once the SCG failure is occurred at UE, but the RA report is a UE triggered NW request procedure, and the RA report can be stored in UE and requested by the NW after some hours. We think it is hard to merge them together considering the specific content in the RA report and SCG failure message to perform the MRO/SON optimizations, it may need large memory to store all the information in the gNB before merging. |
| NEC | Option-1 | RA-report is only for successful RACH procedure, so we support Option-1. |
| Samsung | Option 1 | It is not suitable to use RA Report for disparate motivations. |
| Qualcomm | Option 1 | Same view as Huawei |
| ZTE | Option 1 |  |
| CMCC | Option 1 |  |
| Nokia | Option 1 | In our view, agreement 1 above already reflects that the SCGFailureInformation is used. In the RA report, indeed, there is no failureType IE.  The agreement 1 was based on the Summary Proposal 1 of the previous meeting:  Put RA information (the 5th parameter) in the existing SCG failure message when some conditions are met. FFS for conditions e.g. the UE would not include RA information to the SCG failure message in case of too late handover failure, and the UE only needs to include RA information in case of RA problem/BFR resulted RLF and HOF.  As we discussed several times, the presumable size increase is only there when the failure is RA related, which is not deteriorating system performance. |

**Rapporteur summary:**

To be added later

Regarding the procedural text associated to failureType, there were some uncertainties regarding what value does the UE include in failureType when the UE RRC has random access problem indications from the lower layers while T304 was running. Associated to this problem, the current procedural text is as follows.

##### 5.3.5.8.3 T304 expiry (Reconfiguration with sync Failure)

The UE shall:

…

1> else if T304 of a secondary cell group expires:

2> if MCG transmission is not suspended:

3> release dedicated preambles provided in *rach-ConfigDedicated,* if configured;

3> initiate the SCG failure information procedure as specified in subclause 5.7.3 to report SCG reconfiguration with sync failure, upon which the RRC reconfiguration procedure ends;

#### 5.3.10.3 Detection of radio link failure

The UE shall:

…

1> upon T310 expiry in PSCell; or

1> upon T312 expiry in PSCell; or

1> upon random access problem indication from SCG MAC; or

1> upon indication from SCG RLC that the maximum number of retransmissions has been reached; or

1> if connected as an IAB-node, upon BH RLF indication received on BAP entity from the SCG; or

1> upon consistent uplink LBT failure indication from SCG MAC:

2> if the indication is from SCG RLC and CA duplication is configured and activated for SCG, and for the corresponding logical channel *allowedServingCells* only includes SCell(s):

3> initiate the failure information procedure as specified in 5.7.5 to report RLC failure.

2> else:

3> consider radio link failure to be detected for the SCG, i.e. SCG RLF;

3> if MCG transmission is not suspended:

4> initiate the SCG failure information procedure as specified in 5.7.3 to report SCG radio link failure.

#### 5.7.3.3 Failure type determination for (NG)EN-DC

The UE shall set the SCG failure type as follows:

1> if the UE initiates transmission of the *SCGFailureInformationNR* message due to T310 expiry:

2> set the *failureType* as t310-Expiry;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message due to T312 expiry:

2> set the *failureType* as any valueand set the *failureType-v1610* as t312-Expiry;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide reconfiguration with sync failure information for an SCG:

2> set the *failureType* as *synchReconfigFailureSCG*;

1> else if the UE initiates transmission of the *SCGFailureInformationNR* message to provide random access problem indication from SCG MAC:

2> if the random access procedure was initiated for beam failure recovery:

3> set the *failureType* as *randomAccessProblem* and set the *failureType-v1610* as *beamFailureRecoveryFailure*;

2> else:

3> set the *failureType* as *randomAccessProblem*;

Based on the above procedural text, there could be two different interpretations of what value does the UE set for *failureType* when the UE experiences random access problem indication from the SCG MAC while T304 is running for the SCG.

Interpretation-1: The UE sets the *failureType* to *synchReconfigFailureSCG* as the UE initiates transmission of the SCGFailureInformationNR message to provide reconfiguration with sync failure information.

Interpretation-2: The UE sets the *failureType* to *randomAccessProblem* as the UE initiates transmission of the SCGFailureInformationNR message to indicate that the reason for decalrign failure is the random access problem indication from the SCG MAC.

The rapporteur would like to request companies on what is their interpretation of the above text.

* **Q18: Which of the following is your interpretation of the existing procedural text when the UE experiences random access problem indication from the SCG MAC while T304 is running for the SCG?:**
  + **Interpretation-1: The UE sets the failureType to synchReconfigFailureSCG as the UE initiates transmission of the SCGFailureInformationNR message to provide reconfiguration with sync failure information.**
  + **Interpretation -2: The UE sets the failureType to randomAccessProblem as the UE initiates transmission of the SCGFailureInformationNR message to indicate that the reason for declaring failure is the random access problem indication from the SCG MAC**

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| --- | --- | --- |
| **Company** | **Interpretation-1 / Interpretation-2** | **Comments** |
| Ericsson | Interpretation-2 | We believe the UE should set the failureType to synchReconfigFailureSCG only when the UE experiences T304 expiry for the SCG related reconfigurationWithSync. |
| Huawei, HiSilicon | Interpretation-1 | The procudural text is clear at least for the case of setting the failureType to synchReconfigFailureSCG if T304 expires.  If the case for RLF with RA problem is not so clear (as the wording in (NG)EN-DC), the wording may be improved. |
| SHARP | Interpretation -2 | Following the existing procedural text, UE sets the failureType to randomAccessProblem when RA failure during a SCG reconfiguration with sync procedure. |
| CATT | Interpretation-2 | Since in section 5.3.10.3, the SCG RLF can be declared upon random access problem indication from SCG MAC without T304 checking. Therefore when T304 is running, the branch of random access problem should be choosed. |
| NEC | Not sure | For MCG, if random access failure hanppens and T304 is running, the UE will not consider radio link failure for MCG. However, for SCG the text is a bit different. So we are not sure if we need to improve the text for SCG or leave it up to UE implemenation. |
| Samsung | Interpretation 1 | We have assumed that synchReconfigFailureSCG is set in the mobility problem. |
| Qualcomm | Interpretation-1 |  |
| ZTE | Interpretation-2 | This issue has been discussed several meetings ago and RAN2#114-e has reached following consensus:  R2-2105503 Further clarification on random access problem ZTE Corporation, Sanechips discussion Rel-15 NR\_newRAT-Core  **Þ [005] Noted**  **Þ [005] Confirm that UE shall not declare MCG RLF upon MCG RACH/LBT failure detection while MCG T304 is running (no spec change is needed).**  **Þ [005] Confirm that R16 UE shall declare SCG RLF upon SCG RACH/LBT failure detection while SCG T304 is running (no spec change is needed)**  Based on above agreements, there is only one confirmed behavior in R16, i.e., UE declare RLF (i.e., randomAccessProblem) when T304 is running but RA problem indication is received. Therefore UE will set the failureType as randomAccessProblem |
| CMCC | Interpretation-2 | Agree with ZTE. |
| Nokia | Interpretation-2 | Although the UE sets failureType to randomAccessProblem, since the target PSCell ID and sourcePSCell ID are included within the SCGFailureInformation, the network can understand whether it has indeed a PSCell change failure or RLF in a source PSCell.  Thus, we need to agree on the following additional condition to add RA information to the SCGFailureInformation:  If source PSCell CGI and target PSCell CGI are not the same, RA information is included within SCGFailureInformation. |

**Rapporteur summary:**

To be added later

If the answer to the previous question is interpretation-2, then the rapporteur would like to know if companies support the inclusion of 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 from the SCG MAC.

* **Q19: If you answer Interpretation-2 for the previous question, do you agree to the inclusion of 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 from the SCG MAC?:**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes |  |
| SHARP | Yes |  |
| CATT | No | This issue of SCG failure about random access problem and HOF has been discussed before, i.e. in TEI, and nothing is changed to align with MCG RLF which declares random access problem without T304 running. Therefore we think is better not to change the purpose, even in the SCG failure report for MRO. |
| ZTE | Yes | During the TEI discussion, there are sympathies from companies that the behavior is intended to be aligned between SN and MN, but since it is late stage in R16, it is difficult to revert the implementation and there is no clear use case for this information, therefore only a unified behavior as captured in specification is confirmed.  However, RAN3 has introduced a new requirement in MRO, which is to use this information for root cause determination as well as MRO diagnose. Therefore it is important that NW can based on UE reported information to correctly derive the failure type. To modify UE behavior when setting failureType might introduce compatibility issue, therefore, the compromised solution is to have one indication on T304 status can prefectly resolve such issue. |
| CMCC | Yes |  |
| Nokia | No | Although the UE sets failureType to randomAccessProblem, since the target PSCell ID and sourcePSCell ID are included within the SCGFailureInformation, the network can understand whether it has indeed a PSCell change failure or RLF in a source PSCell. |
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**Rapporteur summary:**

To be added later

### 2.4.2 Other open issues on SCG related MRO

In this section, companies are invited to bring up other open issues on SCG related MRO. Note however that according to chairman recommendation, we should avoid discussing new issues unless there is some critical/outstanding problem.

* **Q20: Is there any further issue on SCG related MRO that you would like to discuss? Please describe it below:**

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| **Company** | **Comments** |
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**Rapporteur summary:**

To be added later

## MHI related

### 2.5.1 Open issues from running CR

The following Editor’s note is captured in the running CR.

Editor´s note: FFS: Whether there should be an explicit capability bit for the PSCell related mobility history information in the *visitedCellInfoList*

This issue arises because there is no explicit capability indicating the UE’s ability to store the PCell related MHI in rel-16 and the indication, *mobilityHistoryAvail*, included in RRCSetupComplete and RRCResumeComplete acts as this indicator implicitly. However, when the PSCell related information is included in the MHI in Rel17, RAN2 has not agreed thus far about how the network gets to know about this capability of the UE. Based on this, rapporteur would like to ask the following.

* **Q21: Which of the following method associated to PSCell MHI related indication is acceptable to you?**
  + **Option-1: Introduce an explicit capability indicator that indicates that the UE is capable of storing the PSCell related MHI.**
  + **Option-2: Introduce an explicit indicator (*mobilityHistoryPSCellAvail*) in RRCSetupComplete and RRCResumeComplete indicating whether the UE has PSCell related information available in its stored *visitedCellInfoList*.**

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| **Company** | **Option-1/Option-2** | **Comments** | |
| Ericsson | Option-1 | We believe, having a new capability bit is most straightforward and avoids the need for introducing new flags in the RRCxxComplete messages. | |
| Huawei, HiSilicon | Option-1 | We think that option-1 is more about UE capability discussion, and it seems not relevant to Q21. In addition, we had MHI capability in TS 38.306, and the new UE capability will be simialr as the existing one.  ***Mobility history information storage***  *It is optional for UE to support the storage of mobility history information and the reporting in UEInformationResponse message as specified in TS 38.331 [9].*  We do not see the benefits of option-2. | |
| SHARP | Option 1 |  | |
| CATT | Other option | The legacy MN MHI is one of the optional features **without** UE radio access capability parameters. To enhanced the support of PSCell record and report, an parallel optional feature could be defined without indicating to the NW.  Since the PSCell MHI is nested in Pcell MHI and should both be reported to the MN, there is no need to indicate to the NW about whether the exectly PSCell MHI is stored in the UE, only a optional feature needs to be defined but not a capability bit. | |
| NEC | Option 1 |  | |
| Samsung | See comments | | Before choosing either option, we would like to first discuss how the MN retrieves PSCell related information (e.g. *visitedPSCellInfoList*) from the UE. According to the running NR CR, it seems that legacy flag *mobilityHistoryReportReq* is used to request both legacy MHI and newly defined PSCell related MHI i.e. **no separate flag in the UEInformationRequest message**. If it is the case, we are not sure whether either option is needed in the sense that R17 UE just reports legacy MHI and new one to the MN (even to the legacy MN R16 gNB) **blindly if supported**. It incurs unnesssary signaling overhead from a UE side.  Having said that, if a separate flag (i.e. *mobilityHistoryReportSCGReq*) is introduced, it is worthy to discuss which option to be chosen.  In our understanding, Option 1 may avoid new flag in the RRCSetup/ResumeComplete message but its main con is that MN has no idea whether the UE has PSCell related information available in its storedvisitedCellInfoList i.e. MN blindly requests the UE to report it. From this perspective, Option 2 is better from a NW side to decide whether to retreive PSCell related MHI if needed and it also follows the same way as in the legacy MHI mechanism. Hence, we have no strong view but we are more inclined to go for Option 2 with the assumption that a separate flag (i.e. *mobilityHistoryReportSCGReq*) is introduced in the UEInformationRequest message.  Side talk: We assume that if we go for Option 2, this implies that PSCell MHI storage feature is optional wihtout the need of reporting this capability as in legacy. |
| Qualcomm | Option-1 | |  |
| ZTE | Further discussed | | First in our understanding, the reason to have on MHI for both MN and SH is to allow NW request both SN and MN MHI within one request, if there is no need for separate request than there is no need for separate availability indication as well.  While for option 1, we are wondering if explicitly signalling of capability is needed since there is no pre-configuration required, also the fetch-report behavior is still the same. |
| CMCC | Option-1 | |  |
| Nokia | See comment | | Neither option 1 nor option 2 is needed. This existing indicator “mobilityHistoryAvail” may be sufficient, since network can realize on its own whether PSCell related information is included, i.e. whether visitedPSCellInfoList is included for each visited PCell (visitedCellId). Furthermore, capability is only a minor aspect, since UE could be capable, but is not operating in DC mode. |

**Rapporteur summary:**

To be added later

Another MHI related Editor’s note is captured in the running CR.

Editor’s Note: The value of maxPSCellHistory is FFS.

The current size of the PCell information in MHI is 16. It has already been agreed that PSCell information is stored within the corresponding PCell related information. Some companies had concerns on the size of MHI in Rel17 if each PCell can include upto 16 PSCell information thus leading to upto 256 (PSCell) + 16 (PCell) cell related information to be stored in the MHI. One could impose a restriction of up to 16 PSCells (independent of whether this is only in the last PCell or across multiple PCells).

As nothing has been agreed on this aspect in RAN2, rapporteur would like to ask the following.

* **Q22: What is the total number of PSCell (across all PCells) related information that should be stored by the UE in the MHI?**
  + **Option-1: 16**
  + **Option-2: 256**
  + **Option-3: ??**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Option-1/2/3** | **Comments** | |
| Ericsson | Option-1 | We believe providing up to 16 latest PSCell related information in the MHI is sufficient. These 16 cells could be belonging to the same PCell or could be distributed across multiple PCells. | |
| Huawei, HiSilicon | Option-3 | Option-2 may have a large number of Pscells, and option-1 may be too limited on the number of Pscells. We suggest to consider the following alternatives:  For each Pcell, there could be at most 2 or 4 Pscell. Or the total number of Pscells could be 32 or 64. | |
| CATT | Option-1 | Total number same as Pcell could be accepted. | |
| NEC | Option-3 | Option-1 is too small and Option-2 is too large. Suggestion from Huawei seems reasonable. | |
| Samsung | Option-1 or Option-3 | We prefer Option-1 but can accept 34 or 65 as Qualcomm indicated. | |
| Qualcomm | Option-1 | | Same UE memory should be allocated for PSCell information as PCell in MHI |
| Nokia | Option 3 | | MHI is used to detect issues like ping pong handovers or short stays (unwanted mobility cases w/o failure), and/or trajectory prediction.  It also questionable if 16 visited PCells are needed at all. For the mentioned use cases, looking back to lower number of visited PCells might be sufficient.  We think some share of the total number accross of PCells should be set in consideration of the use case (shorted stay or longer stay). |
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**Rapporteur summary:**

To be added later

### 2.5.2 Other open issues related to MHI

In this section, companies are invited to bring up other open issues related to MHI. Note however that according to chairman recommendation, we should avoid discussing new issues unless there is some critical/outstanding problem.

* **Q23: Is there any further issue related to MHI that you would like to discuss? Please describe it below:**

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| --- | --- |
| **Company** | **Comments** |
| **Huawei, HiSilicon** | In previous RAN2 meetings, the following issues were discussed but there were no conclusions:  (1) How to deal with the PSCell MHI if the SN is released  (2) How to deal with the PSCell MHI if the SN is added  (3) How to deal with the PSCell MHI if the MN is changed but PSCell is not changed  For (1) and (2), we think they are valid cases, and the UE could try to log something in order to help network undrstand more details, e.g. addition of new timeSpent (the time duration when there is only Pcell, and the time duration when there are both Pcell and PScell).  For (3), we would like RAN2 to confirm the use case. If Yes, perhaps the procedural text may need some updates (no extra impacts to ASN.1 part). |
| Samsung | As expressed in Q21, we would like to discuss whether a separate flag (i.e. mobilityHistoryReportSCGReq) in the UEInformationRequest message is needed or not. Besides, it would be good to discuss/conclude above three issues raised by Huawei. |
| Nokia | With current 1D-MHI method, the UE stores the visited cell information when the cell has been left, i.e. the PCell entry belongs to previously visited PCell, and the current one will be entered to visitedCellsList with change to new one.  Timing setup needs to be more precisely described in the specification to keep the concurrently visited PCell and PSCell(s) synced within nested 2D-MHI. |
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**Rapporteur summary:**

To be added later

# Conclusion

**To be added later.**