3GPP TSG-RAN WG2 #109-e TDoc R2-200xxxx

Electronic meeting, 24th Feb - 6th Mar 2020

Agenda Item: 6.12.4

Source: Ericsson (email discussion rapporteur)

Title: Email discussion report: [AT109e][804][SON/MDT]SON open issues (Ericsson)

Document for: Discussion, Decision

# Introduction

This document captures the important open issues amongst the SON functions’ related reporting that needs to be agreed in the RAN2#109-e meeting.

* [AT109e][804][SON/MDT]SON open issues (Ericsson)

 Intended outcome: email discussion report in R2-2001992

 Deadline: CET 23:00, 2020/02/28

# Discussion

## RLF report

### Inter-RAT RLF reporting

#### Inter-RAT RLF reporting feasibility

In [2] CATT proposes to report LTE RLF to NR and to not report NR RLF to LTE. In [6], ZTE proposes to support NR RLF to be reported to LTE and they propose to have a ‘cross-RAT-RLFReport’ availability indicator in the RRC messages. In [14], Huawei proposes the possibility of reporting the NR RLF report to an ng-eNB. In [15], Samsung proposes to enable reporting of NR RLF report to LTE.

**CATT-Proposal: Confirm the LTE RLF Report to NR could be supported, and the NR RLF report to LTE is not supported.**

**ZTE-Proposal: It is proposed to support NR RLF to be reported to LTE.**

**ZTE-Proposal: For cross RAT RLF reporting, the UE can indicate to the receiving node (via the Complete messages) the availability of cross RAT RLF report by the presence of a new defined IE, e.g. rlf-InfoAvailable-crossRAT.**

**Huawei-proposal: NR RLF can be reported in ng-eNB.**

**Samsung- Proposal: NR RLF can be reported in LTE.**

**Rapporteur input:**

Associated to this, we have the following agreement in RAN2#108.

Agreements

2-7 LTE RLF can be reported in NR. How to support this is FFS.

During the discussion that led to this agreement, RAN2 discussed that not all LTE nodes will have the capability to decode the NR RRC format (legacy nodes that do not support NR RRC) and therefore NR RLF report is not reported to LTE. With the proposal from ZTE, this limitation can be overcome but this introduces additional changes both in the RAN2 and RAN3 specification at this late stage. In the Huawei proposal, it is assumed that all ng-eNBs can decode the NR RRC which need not be the case as a ng-eNB might only support NGC related features but not support (NG) EN-DC.

**Topic-1a: RAN2 to discuss the following options on NR RLF reporting to LTE:**

1. **Reporting of NR RLF report to LTE is not supported.**
2. **The UE shall include nr-RlfInfoAvailable flag (in *RRCConnectionReconfigurationComplete, RRCConnectionReestablishmentComplete, RRCConnectionResumeComplete or RRCConnectionSetupComplete message*) when the UE has NR RLF report and the UE is connected to an LTE node.**
3. **The UE can report NR RLF report related contents to LTE with the existing rlfInfoAvailable flag.**
4. **The UE can report the RLF report associated to an NR cell to only an gNB or ng-eNB, not an eNB.**

Based on the above, we request companies to provide their preferred options. Please note that a company can chose more than one option (when option b or c is chosen, option d can also be an additional preference).

|  |  |  |
| --- | --- | --- |
| **Company name** | **Preferred option(s)** | **Additional comments** |
| Ericsson | Option-a | We believe that this can be discussed in rel-17 work: This will simplify the discussions in this last meeting of rel-16. In rel-17, one can discuss the details of the framework in which we can enable NR RLF reporting to an LTE node.  |
| Huawei, HiSilicon | Option-a | Similar view as Ericsson. |
| QUALCOMM | Option-b’ | As RAN2 already agreed that RLF of LTE/eLTE can be reported to NR(including inter-system-inter-RAT RLF report and intra-system-inter-RAT RLF report), the reverse procedure can also be supported. The report content can be a container with nr-RLFInfoAvailable flag, thus eNB/ng-eNB need not to decode the NR RLF content. |
| Intel | Option a | We also agree that due to lack of time, may be it is simpler not to support reporting NR RLF to LTE. |
| CATT | Option a | The same view with Ericsson |
| OPPO | Option a | Postpone the discussion of reporting NR RLF to LTE node in detail in R-17 |
| Samsung | Option b | It is beneficial for the scenario where both EN-DC and NR SA co-exist.RAN2 has already agreed LTE RLF reporting to NR. Reversely, it seems natural to allow NR RLF reporting to LTE.  |
| ZTE | Option b | It is beneficial for the co-exist case as mentioned by Samsung. And one bit indication is required to inform the eNB/ng-eNB the availability of NR RLF report. |
| Apple | Option b | We are ok to postpone it. |
| Nokia, Nokia Shanghai Bell | Option a | Simplest approach at this stage to finalize Rel.16. Other methods can be discussed as enhancements for Rel-17 |

**Topic-1b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | Yes | The current RLF reporting mechanism works and rel-17 work can address NR RLF reporting to LTE  |
| Huawei, HiSilicon | Yes | Without this, NR networks can still collect RLF reports from Ues staying in NR. |
| QUALCOMM | yes | RLF of NR can only be reported to NR. |
| Intel | Yes |  |
| CATT | Yes |  |
| OPPO  | YES |  |
| Samsung | Yes |  |
| ZTE | Yes, but | sub-optimal as UE might wait until re-access to NR to report RLF.  |
| Apple | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes | The UE will just discard NR RACH reports and not report them to LTE |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

#### RRC format for NR RLF reporting in LTE

This sub-section is applicable only if option b, c or d is selected for the proposal in section 2.1.1.2.

In [14], Huawei proposes to use target RAT RRC to encode the failedPCellID and use the source RAT RRC to encode RLF report. In [15], Samsung proposes to include the last cell that served the UE (in case of RLF) or failed cell of the handover using NR RRC format.

**Huawei-proposal: When the RLF report of one RAT1 (LTE/NR RLF report) is reported in another RAT2 (NR/LTE), the UE reports the RLF report of RAT1 and the failedPCellId in the RRC message of RAT2. RLF report of RAT 1 is carried as one container.**

**Samsung-proposal: Including the CGI of the last cell that served the UE (in case of RLF) or the target of the handover in LTE RRC UE Information Response message (i.e. outside the NR RLF Report container).**

**Rapporteur input:**

No comments.

**Topic-2a: RAN2 to discuss the following options related to RRC format of NR RLF reporting in LTE:**

1. **RAN2 does not support NR RLF reporting to LTE.**
2. **The UE shall include the *failedPCellId* using the LTE RRC format and include the RLF report as an NR RRC encoded OCTET STRING to the LTE node.**

Companies are requested to provide inputs on the above options.

|  |  |  |
| --- | --- | --- |
| **Company name** | **Preferred option(s)** | **Additional comments** |
| Ericsson | Option-a | Same comments as topic-1a |
| Huawei, HiSilicon | Option-a |  |
| QUALCOMM | Option-b |  |
| Intel | Option a |  |
| CATT | Option a |  |
| OPPO | Option-a |  |
| Samsung | Option b |  |
| ZTE | Option b | TAC of failed cell might also needed if the RLF report is forwarded through NG interface. |
| Apple | Option a |  |
| Nokia, Nokia Shanghai Bell | Option-a  | Simplest approach at this stage to finalize Rel. 16. Other methods can be discussed as enhancements for Rel. 17.  |

**Topic-2b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | Yes | Same comments as topic-1b |
| Huawei, HiSilicon | Yes |  |
| QUALCOMM | Yes |  |
| Intel | Yes |  |
| CATT | Yes |  |
| OPPO | Yes |  |
| Samsung | Yes |  |
| ZTE | Yes | Same comments as topic-1b |
| Apple | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

#### RRC format for LTE RLF reporting in NR

In [2], CATT proposes to use the LTE RRC format to encode LTE RLF report that is reported to an NR node. In [14], Huawei proposes to use target RAT RRC to encode the failedPCellID and use the source RAT RRC to encode RLF report. In [15], Samsung proposes to include the last cell that served the UE (in case of RLF) or failed cell of the handover using NR RRC format.

**CATT-Proposal: Use container to carry the LTE RLF content to NR node.**

**Huawei-proposal: When the RLF report of one RAT1 (LTE/NR RLF report) is reported in another RAT2 (NR/LTE), the UE reports the RLF report of RAT1 and the** **failedPCellId in the RRC message of RAT2. RLF report of RAT 1 is carried as one container.**

**Samsung-proposal: Including the CGI of the last cell that served the UE (in case of RLF) or the target of the handover in NR RRC UE Information Response message (i.e. outside the LTE RLF Report container).**

**Rapporteur input:**

The proposal from CATT is the easiest from the UE point of view as the UE can store some of the contents of RLF report soon after the RLF declaration on the LTE cell. This imposes some additional overhead on the network side wherein the NR RAN node should be capable of decoding LTE RRC content. As this has not been discussed before, the rapporteur proposes to discuss this.

**Topic-3a: RAN2 to discuss the following options for encoding the LTE RLF report to be reported to an NR node.**

1. **The UE shall use LTE RRC format and report the contents of RLF report as an LTE RRC encoded OCTET STRING to the NR node.**
2. **The UE shall use NR RRC format.**
3. **The UE shall include the *failedPCellId* using the NR RRC format and include the RLF report as an LTE RRC encoded OCTET STRING to the NR node.**

Companies are requested to provide inputs on the above options.

|  |  |  |
| --- | --- | --- |
| **Company name** | **Preferred option(s)** | **Additional comments** |
| Ericsson | Option-a or option-c | As the NR nodes will be capable of decoding LTE RRC messages, it is okay to include LTE RLF report using LTE RRC format i.e., as an OCTER STRING in the NR specification’s RLF report. To aid the NR node, may be failedPCellId can be encoded using NR RRC so that the NR RRC can send the rest of the content directly to the failed LTE cell without even decoding the message. However, this is an optimization which we think is not a must have.  |
| Huawei, HiSilicon | Option-a | This option is simple. |
| QUALCOMM | Option-a | In LTE, UE set the *failedPCellId* of RLF-Report-r9 when radio link failure of LTE is detected, thus, it is easy for UE to report whole content with LTE RRC format as an OCTER STRING to the NR. |
| Intel | Option a | It seems simpler UE implementation option. |
| CATT | Option a | More simple |
| OPPO | Option a | Entire content should be encoded with the same LTE RRC format for simplicity. |
| Samsung | Option c | If option a is accepted, it should be decodable in NR side because gNB needs the failed cell id for forwarding to LTE. |
| ZTE | Option c | In our understanding, the NR node is not required to decode LTE RRC message or LTE structure. One thing needs to be clarified is what’s the next step when NR node receives LTE RLF report. We think after receives LTE RLF report, NR node need to forward the received LTE RLF to the failed cell via Xn or NG interface, therefore it is more reasonable to adopt option-c. In case LTE RLF report is forward through NG interface, the TAC of failed cell needed to be included as well for routing the RLF report to failed cell. |
| Apple | Option a | Option a is the most straight-forward solution |
| Nokia, Nokia Shanghai Bell | Option a | Simple option |

**Topic-3b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

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| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | Yes | Though the existing RLF reporting works without supporting ‘cross-RAT’ RLF reporting, we have made an agreement in the previous meeting to support LTE RLF reporting to NR and the topic of 3a addresses that issue.  |
| Huawei, HiSilicon | Yes |  |
| QUALCOMM | Yes |  |
| Intel | Yes | Only RLF of cross RAT will not work if no conclusion is made.  |
| CATT | Yes |  |
| OPPO | Yes |  |
| Samsung | Yes |  |
| ZTE |  | We already agreed to report the LTE RLF to NR, and it is better to have a solution to this issue. |
| Apple | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes | nothing is broken |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

#### UE capabilities related to LTE RLF reporting to an NR node

In [2], CATT proposes to introduce a new capability to support LTE RLF reporting to an NR node.

**CATT-proposal: Add the capability bits of LTE RLF Report in NR in TS 38.306.**

**Rapporteur input:**

As this has not been discussed before, the rapporteur proposes to discuss this.

**Topic-4a: RAN2 to the following options related to UE capabilities for cross-RAT RLF report delivery.**

1. **Introduce a capability in 38.306 for cross-RAT RLF report delivery.**
2. **No new capability is introduced in 38.306 for cross-RAT RLF report delivery.**

Companies are requested to provide inputs on the above options.

|  |  |  |
| --- | --- | --- |
| **Company name** | **Preferred option(s)** | **Additional comments** |
| Ericsson | No strong opinion | As we have indicated in topic-3a, since the LTE RLF report to be reported to an NR node uses the LTE RRC format, we do not see why we need a new capability to support this as there additional UE processing overhead. However, if the chip set vendors think that this feature has larger impact on the UE side (e.g., information transfer between LTE and NR dedicated hardware), we are fine with having dedicated capability indication |
| Huawei, HiSilicon | Option b |  |
| QUALCOMM | Option a | Chipset may have different hardware implementation to support cross-RAT RLF report. However, intra-RAT RLF report is a mandaoty feature w/o capability, it is necessary to introduce a new UE capability to support Cross-RAT RLF report. |
| Intel | Option a |  |
| CATT | Option b | If we choose option a in topic-3a, this capability is not needed at all as the LTE RLF report is a container when reporting to NR, which is the same way we do for intra-RAT RLF reporting. |
| OPPO | Option a |  |
| Samsung | Option b | Not sure if a capability is required. It is assumed that UE will transmit an availability indicator during setup, which represents the UE capability. If NW is also supportive on reporting, it would request RLF report retrieval. If the UE does not support, no availability indicator to the NW. there is no confusion from the network side |
| ZTE | Option b |  |
| Apple | Option a | Agree with QC and Intel |
| Nokia, Nokia Shanghai Bell | Option b |  |

**Topic-4b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | May be | Chipset vendors might have a stronger opinion here. |
| Huawei, HiSilicon | Yes |  |
| QUALCOMM | No | Some UE can not support Cross-RAT RLF report as mandatory w/o capability |
| Intel | No | If no conclusion is made, capability is unclear and feature will not be able to implement.  |
| CATT | Yes |  |
| OPPO | No |  |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Apple | NO |  |
| Nokia, Nokia Shanghai Bell | Yes |  |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

### RLF report contents

#### TAC of the source cell

In [2], CATT discusses the inclusion of TAC of source cell in the RLF report and proposes not to include TAC of the source cell and instead include a 1-bit indication to differentiate intra-system and inter-system HO. In [6], ZTE proposes to include the TAC of the source cell in the RLF report. In [14], Huawei proposes to include TAC information in the RLF report associated to source cell and failed cell in the RLF report.

**CATT-Proposal: No need to add the TA info of source cell but introduce 1 bit to differentiate between intra-system HO and inter-system HO instead in the RLF report.**

**ZTE-Proposal: To include the TAI of source cell in the RLF report as asked by RAN3.**

**Huawei-Proposal: Add the TAC in the IE CGI-INFO-LOGGING-r16.**

**Rapporteur input:**

The CATT proposal is not in line with the LS request from RAN3.

After further discussion, RAN3 reached agreement on other information which is necessary for MRO in UE RLF Report as below:

1. TAI of the failed cell and source cell: These two IEs could be used by the network node for routing of MRO signaling messages as well as to differentiate between intra-system HO and inter-system HO.

As listed by RAN3, there are two reasons to include TAC of the source cell.

* To route the HANDOVER REPORT message if the message is sent via NG interface;
* To differentiate between intra-system HO and inter-system HO together with the TAC of failed cell.

In the contribution, CATT mentions that the source cell can be identified by the existing neighbor cell relation at the failed cell. This assumes that the handover that resulted in the failure is a X2/Xn based handover. However, many a times X2/Xn based handover is not supported and if the handovers are S1/NG based handovers and if the handover fails, then the failed cell needs to know the TAC of the source cell to route the HANDOVER REPORT message to the source cell. By including TAC, intra-system HO or inter-system HO identification come implicitly.

Based on this, the rapporteur proposes to include the TAC of the source cell in the RLF report.

**Topic-5a: RAN2 to discuss the following options for the inclusion of TAC of *previousPCellIID* in the RLF report:**

1. **The UE shall include the TAC of the source cell (*previousPCellId-r16*) in the RLF report.**
2. **The UE shall not include the TAC of the source cell (*previousPCellId-r16*) in the RLF report. Instead introduce 1 bit to differentiate between intra-system HO and inter-system HO instead in the RLF report.**

Companies are requested to provide inputs on the above options.

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| --- | --- | --- |
| **Company name** | **Preferred option(s)** | **Additional comments** |
| Ericsson | Option-a | Based on the learnings from LTE, some handovers are always performed over S1 due to X2/Xn establishment limitations. In such scenarios, if the S1 based handover results in an RLF, then the failed cell needs to identify the source cell based on the RLF report content. One such content of the RLF report is the TAC of the source cell. Also, specification wise this is much cleaner as we can reuse the same IE (some equivalent of currently defined CGI-Info-Logging) for source cell, failed cell and re-establishment cell of the RLF report.Therefore, we believe that option-a is the simplest and the most comprehensive solution that provides solutions to all network scenarios.  |
| Huawei, HiSilicon | Option-a | Similar view as Ericsson. |
| QUALCOMM | Option-a | Same as E/// |
| Intel | Option b | 1 bit seems simpler and more efficient  |
| CATT | Option b | Even for NG handover, the source cell should also provide the TAC of the target cell to the AMF, in other words, one cell will maintain a neighbor cell relationship info list, for each neighbor cell, the mapping rule between NCGI and TAC info is visible to the source cell. So when the UE reports the RLF report to the target cell, the target cell will decode the RLF report first to get the NCGI of the source cell from the RLF report, upon which the UE can know the TAC info of the source cell based on the mapping relationship between NCGI and TAC of the source cell according to the stored neighbor cell relationship info list. More addition, The TAC info of source cell is not included in LTE RLF report, so what’s the motivation to include this info for NRSo one bit to indicate intra-system HO or inter-system HO is sufficient. |
| OPPO | Option a |  |
| Samsung | Option a |  |
| ZTE | Option a | As discussed in RAN3, same comment as Ericsssion. Also according to discussion in RAN3, the neighboring cell relation might not exist between source and target cell, therefore targetcell cannot know the TAC of source cell based on the NCGI. |
| Apple | Option b | 1-bit indicator is sufficient |
| Nokia, Nokia Shanghai Bell | Option-a  | Including the TAC of the source cell is a simple way of addressing the problem of failed handovers by routing the Handover Report to the TAC of the source cell where the handover failed.  |

**Topic-5b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

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| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | No | This is needed to route the Handover Report message from the failed cell to the source cell if the failure was deemed to be due to ‘too early handover’ |
| Huawei, HiSilicon | No |  |
| QULACOMM | No |  |
| Intel | No |  |
| CATT | Maybe | Not sure, because even without TAC info of the source cell, the SON feature is still workable for LTE RLF report based optimization. Why the situation is different if we don’t introduce TAC info of the source cell for NR RLF report? |
| OPPO | No |  |
| Samsung | No |  |
| ZTE | No |  |
| Apple | No |  |
| Nokia, Nokia Shanghai Bell | No |  |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

#### Re-connection attempt cell

In [2], CATT discusses the inclusion of re-connection attempt cell ID in the RLF report. CATT has two proposals in this regard wherein they want to restrict the re-connection attempt cell ID to only LTE cell id and not include the NR cell re-connection attempts. In [6], ZTE proposes to include the CGI of the re-connection attempt cell in the RLF report. In [14], Huawei raises the concern that the changes associated to re-connection cell requires changes in the VarRLF-Report of one RAT in the specification of the other RAT.

**CATT-Proposal: Add “Re-connection attempt cell CGI” of LTE cell to the NR RLF Report.**

**CATT-Proposal: Postpone the optimization of reporting the “Re-connection attempt cell CGI” of NR cell to R17.**

**ZTE-Proposal: The CGI of the cell towards which the UE wants to initiate re-connection attempt is included in the RLF report.**

**Huawei- Proposal: If RAN2 agrees to add the CGI of the re-connection attempt cell in the UE RLF report, RAN2 need to modify the *VarRLF-Report* of one RAT in the specification of another RAT.**

**Rapporteur input:**

The scenario mentioned by RAN3 is a valid one and there is no difference between an inter-RAT RRC Setup vs the intra-RAT RRC set up. When the UE goes to idle upon unavailability of re-establishment cell, the UE can come back to connected on another frequency of the intra-RAT at a later point in time or it can come back to connected on another RAT immediately or at a later point in time. This is based on whether there is any pending data at the UE. Therefore, the rapporteur proposes not to distinguish between ‘re-connection cell’ being an LTE cell or an NR cell. However, this needs to be discussed in RAN2.

**Topic-6a: RAN2 to discuss on the following aspects related to the inclusion of re-connection attempt cell in the RLF report.**

1. **The UE shall include the re-connection attempt cell CGI when the re-connection attempt cell is a EUTRA cell.**
2. **The UE shall include the re-connection attempt cell CGI when the re-connection attempt cell is a NR cell.**
3. **The UE shall include the re-connection attempt cell CGI when the re-connection attempt cell is either a EUTRA cell or a NR cell.**
4. **Do not include re-connection attempt cell in the RLF report.**

Companies are requested to provide inputs on the above options.

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| --- | --- | --- |
| **Company name** | **Preferred option(s)** | **Additional comments** |
| Ericsson | Option-d | In our understanding, the inclusion of re-connection attempt cell was requested by RAN3 so that the source cell of the handover can use this information also into account in the handover parameter tuning based on the RLF report.However, just including the re-connection attempt cell identity is not sufficient. Consider the following example wherein the UE is in cell-A and is being handed over from cell-A to cell-B and the UE declares RLF. The UE goes to an out-of-coverage region and fails to perform re-establishment or find a suitable cell to camp on. Later, the UE finds a suitable cell, cell-C, in another RAT and comes to connected. However, the serving cell do not fetch the RLF report immediately (i.e., the *timeSinceFailure* is running). After another successful handover, the new source cell, cell-D, fetches the RLF report from the UE and sends it to cell-B. Now, although the RLF report includes re-connection cell, it does not mention when the re-connection was performed in comparison with declaring the RLF i.e., the UE might have re-connected to cell-C after a long duration and this duration is invisible to the network.Based on the above analysis, we agree that there is benefit in having re-connection attempt cell in the RLF report but with the time limitation, we propose to postpone it to rel-17 wherein we can standardize the solution of including the re-connection cell along with some timer to indicate when this re-connection was performed.  |
| Huawei, HiSilicon | Option-d | Do not see strong need for the information. |
| QUALCOMM | Option-a | We think it needs to distinguish between inter-RAT RRC setup and intra-RAT RRC setup, for inter-RAT RRC setup, RLF of NR can be extended to include re-connection attempt cell CGI of when the re-connection attempt cell is a EUTRA cell, just follow LTE RLF report to include selectedUTRA-CellId of 3G; for the case intra-RAT RRC setup, the re-established cell id of NR is reported in RLF, for the case identified by Ericsson that pending UL data triggered RRC setup, that re-connection attempt information will be reported as RACH Report/CEF report. it is complicated for UE to link the RLF procedure with new RRC setup procedure, thus it is unnecessary for UE to report intra-RAT RRC setup re-connection attempt cell ID. |
| Intel | Option d | We think that due to lack of time, the re-connection attempt reporting can be postponed to Rel17. |
| CATT | Option d | This is a new feature, due to the limited time, better to postpone. |
| OPPO | Option d | Due to the lack of time, postpone the discussion to R-17 |
| Samsung | Option c | for commonality |
| ZTE | Option d | Since the usage is for optimize HO decision, I tend to agree with Ericsson that simply include re-connection cell id can not provide much information. And we can discuss further in R17. |
| Apple | Option d | Too late to discuss this |
| Nokia, Nokia Shanghai Bell | Option-d  | Even though including the reconnection attempt cell CGI in the RLF report can help the network determine the cell where UE attempted to re-connect we believe that this aspect is not critical for Release 16 and should be handled later.  |

**Topic-6b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

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| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | Yes | This is an optimization and in our understanding can be postponed to rel-17. |
| Huawei, HiSilicon | Yes |  |
| QUALCOMM | Yes |  |
| Intel | Yes |  |
| CATT | Yes |  |
| OPPO | Yes |  |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Apple | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

#### Frequency location of RA resources in RLF report

In [11], Ericsson propose to include frequency related information of the RA resources used to perform the RA procedure that led to RLF.

**Ericsson proposal: The UE shall include absoluteFrequencyPointA-r16, locationAndBandwidth, subcarrierSpacing, msg1-FrequencyStart, msg1-FDMInfo and msg1-SubcarrierSpacing when the *rlf-Cause* is set to *beamFailureRecoveryFailure* or *randomAccessProblem.***

**Rapporteur input:**

Without this information, the cell in which the RA procedure failed cannot identify which RA resources were used by the UE that led to RLF and therefore, this information is needed. However, since this was not discussed before, we propose to discuss this in RAN2.

**Topic-7a: RAN2 to discuss on whether the UE shall include absoluteFrequencyPointA-r16, locationAndBandwidth, subcarrierSpacing, msg1-FrequencyStart, msg1-FDMInfo and msg1-SubcarrierSpacing in the RLF report when the rlf-Cause is set to beamFailureRecoveryFailure or randomAccessProblem.**

Companies are requested to provide inputs on the above options.

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No** | **Additional comments** |
| Ericsson | Yes | If the RLF was declared due to RA issues, then it is good to indicate which RA resources were used by the UE that resulted in the RLF. To indicate the frequency resources associated to the RA procedure, the UE needs to include the above listed parameters. |
| Huawei, HiSilicon | Yes | Similar view as Ericsson. |
| QUALCOMM | No | For RLF led by RACH failure, the associated RACH resource can be known by the NW with the UE report tried SSB/CSI-RS index. We should keep the UE report information as simple as possible. |
| Intel  | No | Since this is a new topic and this is the last meeting, more analysis and study should be done before we agree on adding failure information to report. |
| CATT | Yes | No strong view, but think it’s still useful. |
| OPPO | No | The usage of msg1-FrequencyStart, msg1-FDMInfo seems overlaps with the usage of SSB/CSI-RS index.The usefulness of reporting at least these two IEs should be leaved to R17 |
| Samsung | No | Same opinion with Qualcomm and Intel. |
| ZTE | Yes  | There could be multiple RA resource pool within a cell and NW cannot deduce the RA resource UE utilized solely based on SSB/CSI-RS index. |
| Apple | No | Agree with Qualcomm |
| Nokia, Nokia Shanghai Bell | Yes  | We would need all those parameters to be indicated in a RLF Report so that the network can identify the RACH Resources used by the UE during a RACH Procedure given that the UE can store up to 8 RACH procedures.  |

**Topic-7b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | No | Without the inclusion of above listed parameters, the network is unaware of the RA resources used by the UE that led to RLF. |
| Huawei, HiSilicon | No |  |
| QUALCOMM | Yes | With the tried SSB index/CSI-RS index in the RLF report, NW can know the associated RACH resource. |
| Intel | Yes | Network may not know which resources the UE failed in case of RA failure. But other SON/MDF will still work. |
| CATT | Maybe |  |
| Samsung | Yes | Just additional info to be collected |
| ZTE | No |  |
| Apple | Yes |  |
| Nokia, Nokia Shanghai Bell | No |  |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

## RA related information

### RA report contents

#### Frequency location associated to RA resource

In [4], CATT proposes to include detailed information related to frequency location of the RA resources in the RA report.

**CATT - Proposal: Include the following parameters in the RACH report to address the RACH resources UEs use for random access:**

* + - ***absoluteFrequencyPointA* (e.g., in *FrequencyInfoUL*)**
		- ***msg1-FDM* (e.g., in *RACH-ConfigGeneric*)**
		- ***msg1-FrequencyStart* (e.g., in *RACH-ConfigGeneric*)**
		- ***msg1-SubcarrierSpacing* (e.g., in *RACH-ConfigCommon*)**
		- ***locationAndBandwidth* (e.g., in UL BWP),**
		- ***subcarrierSpacing* (e.g., in UL BWP),**

**Rapporteur input:**

Most part of the proposal is already captured in the running CR. The only open issue is to include msg1-FDM in the RA report. They are used to indicated which exact RA resources were used by the UE in the frequency domain.

**Topic-8a: Whether to include the following parameters in the RAReport or not.**

* + - ***absoluteFrequencyPointA* (e.g., in *FrequencyInfoUL*)**
		- ***msg1-FDM* (e.g., in *RACH-ConfigGeneric*)**
		- ***msg1-FrequencyStart* (e.g., in *RACH-ConfigGeneric*)**
		- ***msg1-SubcarrierSpacing* (e.g., in *RACH-ConfigCommon*)**
		- ***locationAndBandwidth* (e.g., in UL BWP),**
		- ***subcarrierSpacing* (e.g., in UL BWP),**

Companies are requested to provide inputs on the above parameters.

|  |  |  |
| --- | --- | --- |
| **Company name** | **Which parameters from the above to be included in RAReport (all/none/only some)?**  | **Additional comments** |
| Ericsson | All | As the UE can store up to 8 RA procedure related information in the RAReport with different RA procedures being potentially performed towards different cells, when the RAReport is fetched by the RAN node, it might belong to one of the previous serving cell (<48 hours old though). The previous serving cell would have released the UE contexed by then and have no knowledge about the RA resources that this UE had used. Therefore, we need the UE to store the frequency information of the RA resources.  |
| Huawei, HiSilicon | All |  |
| QUALCOMM | Only some | UE only report locationAndBandwidth, subcarrierSpacing and absoluteFrequencyPointA, same as last RAN2 agreement |
| Intel | All | Same view as E/// |
| CATT | All |  |
| OPPO | Only some | The reason of reporting exact position of msg1 is not sufficiently justified. So at least msg1-FDM and msg1-FrequencyStart should be excluded. |
| Samsung | all |  |
| ZTE | All |  |
| Apple | Only some | We need to stick to prior agreement to report only " locationAndBandwidth, subcarrierSpacing and absoluteFrequencyPointA” |
| Nokia, Nokia Shanghai Bell | All  | We think that all those parameters are needed to be indicated in the RA Report so that the network can identify the RACH Resources used by the UE during a RACH Procedure given that the UE can store up to 8 RACH procedures.  |

**Topic-8b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | No | Without the above information, the network cannot identify which RA resources were used by the UE. |
| Huawei, HiSilicon | No |  |
| QUALCOMM | Maybe |  |
| CATT | No | BWP is a mandatory feature for NR, and RACH resources are configured per BWP, if we don’t introduce these parameters, the NR network will not know how to configure the per BWP RACH resources in a efficient way. |
| OPPO | YES |  |
| Samsung | No |  |
| ZTE | No |  |
| Apple | Yes |  |
| Nokia, Nokia Shanghai Bell | No |  |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

### Resetting of the RAReport after 48 hours

In [9], ZTE proposes the method as to how the UE shall replace the existing RA entries with new ones. This has been brought up in the email discussion 108#42 and some proposals were captured in the email discussion report [18]. In [11] Ericsson proposes that the current method of resetting the RA report in the RRC specification is confirmed. In [19], Nokia proposes to keep it simple by adopting option-a in the 108#42 email discussion.

**ZTE-Proposal: When all RACH entries are filled, UE continues to log RACH report, and replace the oldest RACH entry with the new RACH entry before the RACH report is fetched by network.**

**ZTE-Proposed note: “ The oldest RACH entry will be replaced by new RACH entry if the corresponding RACH report is full (i.e., all entries are filled) and has not been fetched. A RACH entry within a RACH report will be deleted if it is already been stored for 48 hours.”**

**108#42 Rapporteur Proposal (Based on comments from ZTE in this email discussion) – (specification clarification related) - RAN2 to discuss which of the following option is to be adopted for RAReport retaining at the UE:**

1. **UE will stop logging RA info if all 8 entries is filled in RA report, and starts to count the duration. If not fetched within 48 hours, then the whole RA report will be deleted.**
2. **(Related to the phrasing used in the current running RRC spec) The oldest RA entry will be continuously replaced by new RA entry if the RA report is not fetched and if the UE already has 8 entries in its RA report. If the RA report has not been fetched and if the UE has not executed a new successful RA procedure in the last 48 hours, then the RA report will be deleted.**
3. **The oldest RA entry will be continuously replaced by new RA entry if the RA report is not fetched and if the UE already has 8 entries in its RA report. If the RA report has not been fetched and if the UE has not executed a new successful RA procedure in the last 48 hours, then the RA report will be deleted.**

**Ericsson-Proposal: The resetting of RA Report after 48 hours as captured in the running RRC CR is confirmed.**

**Nokia Proposal: In Rel-16, the UE supports RA-report retaining according to Option a):****UE will stop logging RA info if all 8 entries is filled in RA report, and starts to count the duration. If not fetched within 48 hours, then the whole RA report will be deleted.**

**Rapporteur input:**

In the 108#42 email discussion, the option-c is wrongly captured. It should have reflected ZTE’s proposal.

Based on the above, it is proposed to discuss further on this topic.

**Topic-9a: RAN2 to discuss which of the following option is to be adopted for RAReport retaining at the UE:**

1. **UE will stop logging RA info if all 8 entries is filled in RA report, and starts to count the duration. If not fetched within 48 hours, then the whole RA report will be deleted.**
2. **(Related to the phrasing used in the current running RRC spec) The oldest RA entry will be continuously replaced by new RA entry if the RA report is not fetched and if the UE already has 8 entries in its RA report. If the RA report has not been fetched and if the UE has not executed a new successful RA procedure in the last 48 hours, then the RA report will be deleted.**
3. **The oldest RA entry will be replaced by new RA entry if the corresponding RA report is full (i.e., all entries are filled) and has not been fetched. A RA entry within a RA report will be deleted if it is already been stored for 48 hours.**

Companies are requested to provide inputs on the above options.

|  |  |  |
| --- | --- | --- |
| **Company name** | **Preferred option(s)** | **Additional comments** |
| Ericsson | Option-b | In our understanding the option-B follows the RLF report principle wherein if the previous RLF report was not fetched by the network and if the UE declares one more RLF, then the UE shall store the latest RLF report. The same is applied here for RAReport wherein after filling the buffer of 8 RA procedures in the RAReport, the UE replaces the oldest entry with the newest entry. Only when no new RA procedure is performed for 48 hours, the RAReport is discarded.Option-c would require the UE to maintain the timestamp of each of the RA entry within the RAReport which is more complex.Option-A could result in a situation wherein the fetched RAReport might belong to only old cells that had served the UE and might not contain any RA entry associated to the current serving cell of the UE itself.   |
| Huawei, HiSilicon | Option-b | Option-b follows the RLF report principle so it is preferred. |
| QUALCOMM | Option-a or option-b | Option-a is preferred as It is simple to implementation and can reduce UE effort |
| Intel | Option C | All 3 options somewhat require the UE to check for the 48 hours. How to delete per entry of record is up to the UE implementation. But it makes more sense for the UE to report old record more than 48 hours. But no strong view. Option B is also acceptable. |
| CATT | Option b |  |
| OPPO | Option a | Keep the operation simple is necessary to reduce UE effort and power consumption. For the operation b and c, the UE will always logging new RACH information. |
| Samsung | Option b |  |
| ZTE | Option b or Option c | Both option b and option c can both provide NW the latest RA information. Option b means the validity time always re-counted once a new RA entry is created, and RA info stored more than 48 hours could be provided to NW in this case, which we think might not be so useful. But we are fine to go for option-b if it is majorities view. |
| Apple | Option a | Agree with OPPO |
| Nokia, Nokia Shanghai Bell | Option-a  | Option-a is preferred due to its simplicity. Even though some RACH procedures could be logged for more than 48 hours, in practice the network when it detects a fault that it needs to monitor it will retrieve the RACH Reports from the UEs frequently and well ahead of the 48-hour timer expiration.      |

**Topic-9b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | No | If this is not agreed, the UE might have to store RAReport indefinitely. |
| Huawei, HiSilicon | No |  |
| QUALCOMM | NO | UE behavior is not clear |
| CATT | No |  |
| Samsung | No |  |
| ZTE | No |  |
| Apple | No |  |
| Nokia, Nokia Shanghai Bell | No  | Unspecified how long UE should store RACH report entries and to update those |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

### Handling of the RAReport at inter PLMN cell reselection

In [11], Ericsson proposes different options on how to handle the RAReport at the inter-PLMN cell reselection situation and proposes the following.

**Ericsson Proposal: The UE shall reset the entire RA Report when the UE performs cell reselection to a cell belonging to a new PLMN which is not part of the current RPLMN list.**

**Rapporteur input:**

Although this has not been discussed before, this topic needs to be addressed. There are some options in which this could be handled.

1. The UE shall reset the entire RA Report when the UE performs a successful random access procedure to a cell belonging to a new PLMN which is not part of the current RPLMN list.
2. The UE continues to store the RA related information associated to the new cell belonging to a different PLMN than the one stored in the stored PLMN list (as part of VarRAReport). The UE maintains multiple sets of PLMN lists, each one belonging to the respective entry of RAReport contents. When the network requests for the RA Report, then the UE shall include only those RA Report entries that belong to the current RPLMN.

**Topic-10a: RAN2 to discuss which of the following option is to be adopted for RAReport handling at the UE upon performing a successful RA procedure towards a cell belonging to a different PLMN than the ones included in the plmn-Identity-r16 of** **VarRAReport:**

1. **The UE shall reset the entire RA Report when the UE performs a successful random access procedure to a cell belonging to a new PLMN which is not part of the current RPLMN list.**
2. **The UE shall continue to store the RA related information associated to the new cell belonging to a different PLMN than the one stored in the stored PLMN list (as part of VarRAReport). The UE maintains multiple sets of PLMN lists, each one belonging to the respective entry of RAReport contents. When the network requests for the RA Report, then the UE shall include only those RA Report entries that belong to the current RPLMN.**

Companies are requested to provide inputs on the above options.

|  |  |  |
| --- | --- | --- |
| **Company name** | **Preferred option(s)** | **Additional comments** |
| Ericsson | Option-a | Option-a is simpler and requires the UE to maintain a single plmn-Identity-r16 in the VarRAReport. |
| Huawei, HiSilicon | Option-a |  |
| QUALCOMM | Option-a |  |
| Intel | Option a | Agree with E///. It is simpler. |
| CATT | Option a |  |
| OPPO | Option a |  |
| Samsung | Option a |  |
| ZTE | Option a | Option-a is sufficient for this release. Enhancement maybe considered for R17. |
| Apple | Option a |  |
| Nokia, Nokia Shanghai Bell  | Option-a  | Option-a is simple. Option-b or other enhancements can be considered for Release 17.  |

**Topic-10b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | No | If this is not agreed, the specification will be unclear as to what happens when the UE performs a successful RA procedure in a different PLMN than the one in the plmn-Identity-r16 of VarRAReport. |
| Huawei, HiSilicon | No |  |
| QUALCOMM | No |  |
| Intel | No |  |
| CATT | No |  |
| OPPO | No |  |
| Samsung | No  |  |
| ZTE | No |  |
| Apple | No |  |
| Nokia, Nokia Shanghai Bell | No |  |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

## SCG failure related information

### UE capabilities associated to *locationInformation* in *SCGFailureInformation*

In [14], Huawei proposes not to introduce new capabilities associated to whether the UE is capable of reporting *locationInformation* in the *SCGFailureInformationNR* message. In [17], Docomo proposes to make it mandatory for the UE to support location information reporting in the SCG failure message without extra capability signalling.

**Huawei-proposal:** **No need to introduce the new capability for the location information in SCG failure. The location information is encoded in MN RRC format. MN sends the SCG failure information to the TCE.**

**Docomo-proposal: For rel-16 MR-DC, NR standalone support UE, mandatory support of location reporting function in SCG failure report without UE capability signaling.**

**Rapporteur input:**

As the *locationInformation* is encoded using the LTE RRC format in the *SCGFailureInformationNR* message, rapporteur agrees that no need to introduce new capabilities (and the same is applicable for *SCGFailureInformation* in NR-DC case).

**Topic-11a: RAN2 to discuss whether to add a new UE capability indication or not regarding the ability to include the *locationInformation* in *SCGFailureInformationNR and SCGFailureInformation* messages.**

Companies are requested to provide inputs on the above options.

|  |  |  |
| --- | --- | --- |
| **Company name** | **Preferred option** | **Additional comments** |
| Ericsson | No new capability | In our understanding, the existing locationInfo related capability should be applicable for RLF report, MDT report and also for SCG failure information. |
| Huawei, HiSilicon | No new capability | In running 38.306 CR, the location related capabilities have been defined, and we think the capabilities can be appliable for SCG failure information case. |
| QUALCOMM | New UE capability | For immediate MDT with DC cases, as both MN and SN can configure separate list of WLAN APs and Bluetooth beacons for measurement to obtain location information independently, it brings additional functionality and memory requirement for UE, what’s more, to include the location information in SCGFailureInformationNR/ SCGFailureInformationEUTRA, UE needs to convert SN configured WLAN/Bluetooth measurement result to the MN via the MN RRC format, which requires UE to have across-RAT measurement result report capability. It is necessary to introduce new UE capability to support immMeasBT for DC and immMeasWLAN for DC and immMeasSensor for DC. |
| Intel | No new UE capability | However, the UE can report base on location availability |
| CATT | No new UE capability |  |
| OPPO | New UE capability |  |
| Samsung | No new capability | Same view with Huawei |
| ZTE | No new capability |  |
| Apple | New UE capability |  |
| Nokia, Nokia Shanghai Bell | No new UE capability  | We agree the location related capabilities should be DC configuration agnostic |

**Topic-11b: If no conclusion is achieved for this issue, what is the consequence? Does SON/MDT still work without this?**

|  |  |  |
| --- | --- | --- |
| **Company name** | **Yes/No/May be** | **Additional comments on consequences** |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes |  |
| QUALCOMM | No |  |
| CATT | Yes |  |
| OPPO | No |  |
| Samsung | Yes |  |
| ZTE | Yes |  |
| Apple | No |  |
| Nokia, Nokia Shanghai Bell | Yes |  |

Summary of the companies’ views:

Placeholder

1. Placeholder for proposal.

# Conclusion

Based on the discussion in section 2 the following proposals are captured:

[Proposal 1 Placeholder for proposal.](#_Toc33473214)

[Proposal 2 Placeholder for proposal.](#_Toc33473215)

[Proposal 3 Placeholder for proposal.](#_Toc33473216)

[Proposal 4 Placeholder for proposal.](#_Toc33473217)

[Proposal 5 Placeholder for proposal.](#_Toc33473218)

[Proposal 6 Placeholder for proposal.](#_Toc33473219)

[Proposal 7 Placeholder for proposal.](#_Toc33473220)

[Proposal 8 Placeholder for proposal.](#_Toc33473221)

[Proposal 9 Placeholder for proposal.](#_Toc33473222)

[Proposal 10 Placeholder for proposal.](#_Toc33473223)

[Proposal 11 Placeholder for proposal.](#_Toc33473224)

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17. R2-2001479, Discussion on UE capability for location reporting in SCG failure, NTT DOCOMO INC., RAN2#109e, Online meeting, February 2020
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19. R2-2001146, Principle on Rareport entry logging, Nokia, RAN2#109e, Online meeting, February 2020.