3GPP TSG-RAN WG2 #114-e Tdoc R2-21xxxxx

Electronic meeting, 19th - 27th May 2021

Agenda Item: 8.13.2.1

Source: Ericsson

Title: [Offline 801][SON/MDT] Handover related SON aspects (Ericsson)

Document for: Discussion, Decision

# Introduction

This contribution summarizes the following discussion.

* [AT114e][801][SON/MDT] Handover related SON aspects (Ericsson)

Collect companies’ views on the cat-a and cat-b proposals in R2-2106637 which not discussed online.

Try to figure out the WFs based on majority views.

Intended outcome: Email discussion report

Deadline:11:00 UTC, Tuesday May 25

Contact person for each participating company:

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
| Ericsson | Marco Belleschi | Marco.belleschi@ericsson.com |
| Qualcomm | Rajeev Kumar | rkum@qti.qualcom.com |
| vivo | Wen-Ming | ming.wen@vivo.com |
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# Handover related SON aspects

## CHO related aspects

### Timers-related info

For convenience, it is copied below the table with the CHO timers from the email discussion [20]:

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| **#** | **Timer** | **Start time (for time related measurements)** | **End time (for time related measurements)** | **Comments** |
| A | Timeline relationship between two consecutive RLF reports for cases of successful or unsuccessful CHO after unsuccessful CHO or handover failure | Time of declaring first RLF / HOF | Time of declaring second RLF/HOF |  |
| B | Time between the UE receiving the CHO command and RLF | Time of received CHO configuration | Time of declaring RLF in the source cell. |  |
| C | Time elapsed between the first CHO execution and the corresponding latest CHO configuration received for the selected target cell | Time of received CHO configuration | Time of CHO execution | [Rapporteur]: Agreed in RAN2#112 |
| D | Time elapsed between CHO execution until the first HOF/RLF | Time of executing the first CHO | Time of first HOF/RLF | [Rapporteur]: Agreed in RAN2#113 |
| E | CHO interruption time | Time of executing the first CHO | Time of HO completion or successful reestablishment |  |
| F | Time elapsed between CHO execution successful until RLF in target | Time of CHO execution successful | Time of RLF in target |  |
| .... |  |  |  |  |

Related to timer, the following agreements were reached during the online session in RAN2#114-e:

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| **From RAN2#114-e**  Agreements:  1 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.  => RAN2 to progress the following method to derive Timer D, i.e. the time elapsed between CHO execution until the first HOF/RLF: The TimeConnFailure is re-used with possible updates to indicate that it is started at CHO execution. Introduce a new timer is not excluded. |

Hence, given the above, Rapporteur considers Cat-a-Proposal 3 and Cat-a-Proposal 4 in the email discussion in [22] resolved for the moment.

Related to timer C, one company (i.e. QC) believe that a previous agreement should be revisited. Rapporteur proposes cat-b for it:

RAN2 to discuss the need to revisit a previous agreement on timer C:

From “Time difference between RRCReconfiguration (containing CHO configuration) reception and execution”

To:“Time difference between RRCReconfiguration (containing CHO configuration) reception and execution or time difference between RRCReconfiguration (containing HO/CHO configuration) reception and RRCReconfiguration (containing CHO configuration) reception”

* **Q1: Do see the need to revisit the definition of Timer C, as proposed in the above proposal?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes | The change in difinition is import if network can send legacy handover command prior to the execution of the conditional handover. However, if this scenario is deprioratized, we can revist the change in difinition later. |
| vivo | Tend to No | The secnario that both CHO and HO command are sent to a UE seems to be a rather rare case.  Further, if this is considered to be a common case that needs to be optimized, then DAPS HO command prior to the execution of the conditional handover seems also need to be taken into account? |
| Ericsson | No | We do not think we need to revisit the wording of this agreement. One concern is that if it is revised, then it will not be clear anymore for the network whether the timer C is the “Time difference between RRCReconfiguration (containing CHO configuration) reception and execution” **or** “the time difference between RRCReconfiguration (containing HO/CHO configuration) reception and RRCReconfiguration (containing CHO configuration) reception”. |
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Rapporteur´s summary: To be added later

Other timers are mentioned in submitted contributions. Since those timers were discussed in previous email discussions, but not agreed, Rapporteur proposes to further discuss them as cat-b proposals:

RAN2 to discuss the need of the following timers:

* 1. Timer A, i.e. to include the timeline relationship between two consecutive RLF reports for cases of successful or unsuccessful CHO after unsuccessful CHO or handover failure
  2. Timer B, i.e. time between the UE receiving the CHO command and RLF in source
  3. Timer F, i.e. time elapsed between successful CHO execution/recovery until RLF in target
  4. In case the UE is configured with both A3 and A5 event for CHO, the UE to report in the RLF report the time elapsed between the fulfilment of the two triggering conditions for the CHO cell
* **Q2: Which (if any) of the four timers (option-a, b, c, d) are acceptable (you can select more than one or none)?**

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| --- | --- | --- |
| Company | Option-a, b,c,d, none | Comments |
| Qualcomm | none | For a, I agree with VIVO contribution that this timer is irrelevant for network optimization. For timer b, the legacy difinition of timeConnFailure should be sufficient, where timeConnFailure captures the time since reception of RRCReconfiguration until RLF or HoF. Time F is captured by timeUntilRecoonection. I believe that the last timer is irrelevant and I am wondering how this can be useful in network optimization. |
| vivo | none | Agree with QC. |
| Ericsson | B, D | A/F: we agree with QC  B: We have agreed that it will be captured the time difference between CHO configuration and CHO failure. Hence, it seems straightforward to assume that if RLF occurs before CHO execution, i.e. RLF in source cell, then this timer is stopped and logged in the RLF-Report  D: the gNB may configure a UE with an A3 and A5 event as CHO execution conditions. Knowing the time elapsing between these two events may be beneficial for the network to determine whether both events should be configured or only one of them. For example, if the time elapsed is too long, there might be the risk that the UE experiences an RLF before triggering the HO, on the other hand it the time elapsed is sufficiently short, two event conditions may make the HO more robust. |
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Rapporteur´s summary: To be added later

### Radio measurements-related info and candidate cells indication

Related to radio measurements, the following was agreed in RAN2#114-e:

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| **From RAN2#114-e**  Agreements:  2 To represent the measurement results of the candidate target cells:  Reuse the measResultNeighCells in the RLF-Report, and include an indication (depending RAN3 conclusion) on whether a measured neighbour cell was configured as a CHO candidate or not. |

Hence, given the above agreement, Cat-a-Proposal 5 and Cat-a-Proposal 6 in the email discussion [22] are considered resolved.

There are other possible measurement-related info proposed in various contributions. Rapporteur proposes the following:

RAN2 to discuss the need of the following information in the RLF report:

* 1. For successive CHO failure event, it is proposed to include the following information for the first failure case: csi-rsRLMConfigBitmap/ssbRLMConfigBitmap
  2. The first satisfied event or condition (A3 or A5)
  3. The measurements of the second condition when the first condition is fulfilled
* **Q3: Which (if any) of the three options (option-a, b, c) are acceptable (you can select more than one or none)?**

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| --- | --- | --- |
| Company | Option-a, b,c, none | Comments |
| Qualcomm | none | A is already part of RLF report. B and C can be determined by the network from the measurement provided in the RLF report. |
| vivo | none | Agree with QC. |
| Ericsson | B (if D in Q2 is agreed) | B is needed in case the timer D is agreed, i.e. if the UE reports the time elapsed between A3(A5) and A5(A3), then it should log also which was the condition which was first met. |
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Rapporteur´s summary: To be added later

One company (Nokia) believes that one agreement related to the “fulfilled CHO execution conditions” should be clarified:

RAN2 to discuss whether the following agreement should be clarified:

* 1. Include in the RLF-report for CHO the following: “Fulfilled CHO execution condition(s), i.e. whether A3 and/or A5 event was fullfilled, for the cell(s) in which CHO execution was triggered”
* **Q4: Do you see the need to revisit the above agreement? If yes, alternative wording should be given in the reply?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | No | Network can determine this from the measurement provided in the RLF report. |
| vivo | Subjecto RAN3 LS | In case the UE CONTEXT is maintained by NW (that A3/A5 execution conditions are known by NW), NW can be able to derive, for a specific cell, whether CHO execution conditions are fuifilled or not via the measurement recorded in RLF report. |
| Ericsson | Maybe | One thing that could be revised is to clarify that it is applicable only to the first cell in which CHO was executed. In fact, if reestblishment occurs in a second CHO cell, the UE may not evaluate A events, e.g.:  “Include in the RLF-report for CHO the following: “Fulfilled CHO execution condition(s), i.e. whether A3 and/or A5 event was fullfilled, for the first cell in which CHO execution was triggered |
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Rapporteur´s summary: To be added later

### Other info

Related to the IDs to use for the first and second reestablishment attempts, these were the agreements from RAN2#113bis-e:

The following information in the RLF report for CHO are needed:

b. CHOCellId, to indicate the selected CHO cell after the first connection failure and before the reestablishment

c. CellID to indicate the cell in which the UE attempted the second reestablishment after failure of the first reestablishment following an HOF/RLF.

How to provide these information is FFS.

Related the cellID in bullet C from the above agreements, many companies (Huawei, Ericsson, Lenovo, Nokia, ZTE) believe that the reestablishment cell ID can be used. Hence, Rapporteur proposes the following:

1. RAN2 to agree that the reestablishmentCellID is used to represent:
   1. CellID in which the UE attempted the second reestablishment after failure of the first reestablishment following an HOF/RLF

* **Q5: Is the above proposal acceptable?**

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| Company | Yes/No | Comments |
| Qualcomm | Yes | I believe that UE behaviour should be simple. We can simply say that if UE apply CHO configuration after a failure, then the cellID is added on the CHOCellID (irrespective of successful or failed attempt), otherwise it will be included as the reestablishmentCellID. |
| vivo | Yes |  |
| Ericsson | Yes | Agree with QC |
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Rapporteur´s summary: To be added later

One company (Ericsson) believe that the reestablishmentCellID can also be used to indicate the cellID of the first attempted reestablishment, if such cell is an ordinary cell, i.e. non-CHO candidate.

The reestablishmentCellID can also be used to represent the cellID of the cell in which the UE attempted the (first) reestablishment if such cell is a non-CHO candidate cell

* **Q6: Is the above proposal acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes. | I believe that UE behaviour should be simple. We can simply say that if UE apply CHO configuration after a failure, then the cellID is added on the CHOCellID (irrespective of successful or failed attempt), otherwise it will be included as the reestablishmentCellID. |
| vivo | Yes |  |
| Ericsson | Yes | Agree with QC. This is the option that requires less specification changes. |
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Rapporteur´s summary: To be added later

Related to bullet B in the above agreement from RAN2#113bis-e, i.e. CHOCellID, some companies have further provided proposals on it. Most of them believe that a new IE CHOCellID should be used. One company (ZTE) believe that the existing failedPCellID should be used. Since the need of this new IE was already discussed in RAN2#113bis-e, Rapporteur proposes to stick to that agreement:

1. RAN2 to confirm the agreement from RAN2#113bis-e, i.e.
   1. A new CHOCellID is introduced to represent the CHO candidate cell selected after the first connection failure and before the reestablishment

* **Q7: Is the proposal in (a) acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcom | Yes | I believe that UE behaviour should be simple. We can simply say that if UE apply CHO configuration after a failure, then the cellID is added on the CHOCellID (irrespective of successful or failed attempt), otherwise it will be included as the reestablishmentCellID. |
| vivo | Yes |  |
| Ericsson | Yes | Agree with QC |
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Rapporteur´s summary: To be added later

Some companies (ZTE, Huawei) focus on other possible parameters that could be included. Rapporteur proposes to discuss it:

RAN2 to include in the RLF report the following parameters:

* 1. failedPCellId is reused to indicate the cell where the first connection failure is detected in case of CHO
  2. previousPCellId to include the source cell identity if the first failure is a HOF or CHOF
  3. C-RNTI
  4. rlf-cause if the first failure is RLF
  5. noSuitableCellFound
* **Q8: Which of the proposals (a,b,c,d,e), if any, are acceptable (you can select more than one or none)?**

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| --- | --- | --- |
| Company | a,b,c,d,e, none | Comments |
| Qualcomm | Okay | I believe this is about reusing the existing RLF contents for CHO. |
| vivo | All, but.. | We agree the intention of the proposal, but maybe the wording needs to be revised a little bit as now it seems to be a proposal solely about RLF report while actually this is about how to re-use the legacy parameters in RLF report to represent the CHO failure cases:  RAN2 to include in the RLF report the following parameters for CHO failure cases: |
| Ericsson | OK | Agree with QC, and with Vivo proposed rewording. We also believe that the intention of this proposal is to reuse the above existing parameters already present in the RLF report. |
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Rapporteur´s summary: To be added later

Related to the need of an explicit CHO flag, some companies (Nokia, ZTE, Lenovo) believe that this is needed:

RAN2 to discuss the need of an explicit CHO indication as HO type in the RLF-Report

* **Q9: Is the above explicit CHO indication needed?**

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| Company | Yes/No | Comments |
| Qualocmm | No | Considering fields considered, it should be clear from the report implicitly. |
| vivo | No |  |
| Ericsson | Maybe | Considering that the UE may execute an ordinary HO while configured with CHO, it might be needed to have such an indication because the ordinary HO may fail and still the UE may include in the RLF report CHO-related paramters (since it was configured with CHO). Hence, it will be unclear whether the ordinary HO or the CHO failed.  We can maybe discuss the need of this parameter, once we have a first structure of the signalling needed, i.e. during stage-3. |
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Rapporteur´s summary: To be added later

Rapporteurs proposes to further discuss these proposals:

For scenarios that two connection failures happened, it should be clarified that whether the connection failure means the first failure or the second failure.

* **Q10: For CHO scenarios in which a first failure occurs in a first CHO cell and then a second failure occurs in a second CHO cell, which event is considered as “connection failure”?** 
  1. **The first failure**
  2. **The second failure**

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| --- | --- | --- |
| Company | Option (a,b) | Comments |
| Qualcomm | A |  |
| vivo | a |  |
| Ericsson | A |  |
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Rapporteur´s summary: To be added later

Introduce a single flag indicating whether all CHO conditions were met. Do not introduce a seperage flag indicating whether UE attempted recovery (given large overlap)

* **Q11: Is the above proposal acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | No | No need for a flag. It should be determined by the network from measurement in RLF report. |
| vivo | Subject to RAN3 LS | Similar reasons as commented in Q4. |
| Ericsson | No | We already have the agreement “Include in the RLF-report for CHO the following: “Fulfilled CHO execution condition(s), i.e. whether A3 and/or A5 event was fullfilled, for the cell(s) in which CHO execution was triggered”.  It is seems that the intention of this proposal is already covered. |
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Rapporteur´s summary: To be added later

The network need to confirm whether attemptCondReconfig-r16 is configured or not to help deducing the optimization direction. Whether an explicit indication is needed in RLF report depends on RAN3’s response to LS R2-2102149.

* **Q12: As per the above proposal, do you see the need to include in the RLF-Report indication of whether “attemptCondReconfig” was configured to the UE?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | No | This should be handled by the network. |
| vivo | Subject to RAN3 LS | Similar reasons as commented in Q4. In case UE context is maintained by the NW, this information is not needed to be included in the RLF report at all. |
| Ericsson | No | This information can be beneficial, but maybe it can be alredy inferred from the reestablishment cell ID and from the information on measured CHO cells, i.e. if the reestablishment cell ID is a cell flagged as CHO cell in the measResultNeighCells, then the NW can figure out that attemptCondReconfig was not configured. |
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Rapporteur´s summary: To be added later

### Signalling model

Related to the signalling model to adopt for the multiple failures the UE may experience during CHO, these are the options:

* + 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 (Lenovo, Huawei, Nokia, Ericsson, China Telecommunication, ZTE)
  + In case UE experiences multiple report triggers/ events, the UE stores multiple reports that network can retrieve (Samsung)

Given the above, Rapporteur proposes the following:

1. 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.

* **Q13: Is the above proposal acceptable?**

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| Company | Yes/No | Comments |
| Qualcomm | Yes. |  |
| vivo | Yes |  |
| Ericsson | Yes |  |
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Rapporteur´s summary: To be added later

### Scenarios

Related to the merging of scenarios 1b/1c, 3 companies (China Telecommunication, LG) believe that they should not be merged. One company (Huawei) believe that they should be merged. Given the above, Rapporteur suggests the following

1. No need to merge scenarios 1b/1c

* **Q14: Is the above proposal acceptable?**

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| Company | Yes/No | Comments |
| Ericsson | Yes |  |
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Rapporteur´s summary: To be added later

Related to the merging of scenarios 2a/2b, 2 companies (China Telecommunication, Oppo, LG) believe that they should not be merged. One company (Oppo) believe that they should be merged. Rapporteur believe that in can be discussed in stage-3 whether the same set of IEs or different should be used to represent the scenarios 2a/2b. Hence, given the above, Rapporteur suggests to agree on the following for the time being:

1. No need to merge scenarios 2a/2b

* **Q15: Is the above proposal acceptable?**

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| Company | Yes/No | Comments |
| Ericsson | Yes |  |
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Rapporteur´s summary: To be added later

For the other proposals on this topic, Rapporteur suggests to further discuss it, since there are no sufficient views available in submitted contributions.

RAN2 to discuss the need to Deprioritize case 3c and 3f for MRO of mixed ordinary HO and CHO

* **Q16: As per the above proposal, do you see the need to Deprioritize case 3c and 3f for MRO of mixed ordinary HO and CHO?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | May be | Can be deprioratized or wait for RAN3 for this |
| Ericsson | No | It is a possible scenario, and considering that it can be covered with no major standardization efforts it can be kept on the table from the time being |
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Rapporteur´s summary: To be added later

RAN2 to discuss the following “Case 2b is the CHO to wrong cell not too early CHO according to the definition in stage 2”

* **Q17: Do you see the need to move CHO scenario 2b from “To early CHO” to “CHO to wrong cell”?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | No strong view |  |
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Rapporteur´s summary: To be added later

RAN2 to discuss the need to use more exact wording in the description of MRO scenarios and actions in order to differentiate between CHO recovery and re-establishment procedure

* **Q18: Do you see the need to use more accurate wording to differentiate between CHO recovery and re-establishment procedure? If yes, please provide your definition.**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | No | Don’t see the need. |
| Ericsson | No | Agree with QC. Do not think RAN2 should spend time on this. |
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Rapporteur´s summary: To be added later

## DAPS related aspects

### Timers-related info

Related to the use of timeConnFailure, these are the views:

* timeConnFailure is to indicate the time elapsed since the last HO initialization, including DAPS HO, until first connection failure (Huawei)
* timeConnFailure represents “The elapsed time between the execution of DAPS and HOF or RLF in target cell” (Ericsson, CATT, China Telecommunications)
* timeConnFailure represents “Time elapsed since reception of RRCReconfiguration containing DAPS HO until UE leaves CONNECTED state, i.e., UE doesn’t have an active cell connection.” (Qualcomm)

Further one company (Oppo) believe that a new IE timeConnFailureTarget might need to be introduced in the RLF report to indicate the time elapsed since the DAPS HO execution until RLF occurs in the target cell. Rapporteur proposes to discuss the following.

1. RAN2 to discuss what timeConnFailure should represent among the following options
   1. “The elapsed time between the execution of DAPS and HOF or RLF in target cell”
   2. “The time elapsed since the last HO initialization, including DAPS HO, until first connection failure”
   3. “Time elapsed since reception of RRCReconfiguration containing DAPS HO until UE leaves CONNECTED state, i.e., UE doesn’t have an active cell connection.”
   4. A new IE timeConnFailureTarget is introduced in the RLF report to indicate the time elapsed since the DAPS HO execution until RLF occurs in the target cell.

* **Q19: Which of the above proposals (a,b,c,d) are acceptable (you can select more than one)?**

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| --- | --- | --- |
| Company | A,b,c,d,none | Comments |
| Qualcomm | Fine with B or C |  |
| vivo | B |  |
| Ericsson | A | The timeConnFailure is used in legacy to represent the time between HO initialization and HOF or RLF in target. Hence, A seems simpler and more aligned with the legacy intention of timeConnFailure.  B: If the first failure is the failure in source, then the timeConnFailure would be stopped. So it will remain unclear which timer to use in case the UE gets an HOF or an RLF in the target. We would need to introduce a new timer which somehow changes the legacy behaviour.  C: This modifies the legacy intention of timeConnFailure, so we should not pursue it  D: It seems strange to introduce a new timer for a functionality that can be already covered by a legacy timer. |
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Rapporteur´s summary: To be added later

Related to the “The time elapsed since DAPS HO execution until RLF occurs in source cell before fallback”, some companies (Ericsson, CATT, China Telecommunication, Oppo) believe that a new IE should be used. One company (Huawei) believe that timeConnFailure can be reused

1. RAN2 to discuss how to represent the “The time elapsed since DAPS HO execution until RLF occurs in source cell before fallback”, among the following options
   1. A new timeConnSourceFailure IE is introduced
   2. timeConnFailure is reused

* **Q20: Which of the above proposals (a,b) are acceptable (you can select more than one)?**

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| Company | A,b | Comments |
| Qualcomm | B | timeConnFailure should be reused. |
| vivo | b | We should try to reuse the legacy timers as much as possible. |
| Ericsson | A | The failure in source while doing HO is a new scenario not existing in legacy. Hence, it makes sense for this new scenario to introduce a new timer. |
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Rapporteur´s summary: To be added later

Related to the “The time elapsed since DAPS HO execution until RLF occurs in source cell after fallback”, two companies (CATT, China Telecommunication) believe that a new IE should be introduced. One company (Ericsson) believe that the timeConnFailure can be reused together with a “DAPS fallback” indication. Hence, Rapporteur proposes to discuss the following:

1. RAN2 to discuss how to represent the “The time elapsed since DAPS HO execution until RLF occurs in source cell after fallback”, among the following options:
   1. A new timer IE is introduced
   2. timeConnFailure is reused and a “DAPS fallback” indication is introduced

* **Q21: Which of the above proposals (a,b) are acceptable (you can select more than one)?**

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| --- | --- | --- |
| Company | A,b | Comments |
| Qualcomm | B |  |
| vivo | b |  |
| Ericsson | B | B seems simpler since it allows the UE and the network to reuse a legacy timer. |
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Rapporteur´s summary: To be added later

Further, two companies (Huawei, Qualcomm) proposes to introduce a timer to indicate the time elapsed betwen the first connection failure until the second one. Since this was discussed in the past in [20] but not agreed, Rapporteur proposes cat-b.

RAN2 to discuss the need to include in the RLF report the “The elapsed time between first failure in source (or target) and second failure in target (or source) while performing the DAPS HO”.

* **Q22: As per the above proposal, do you see the need to include in the RLF report the “The elapsed time between first failure in source (or target) and second failure in target (or source) while performing the DAPS HO”?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| vivo | No |  |
| Ericsson | No | It does not seem to be essential to explicitly know the time elapsed between the two failures. |
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Rapporteur´s summary: To be added later

One company (Huawei) further suggests introducing a new timer. Since that was not discussed in the past, Rapporteur proposes cat-b.

RAN2 to discuss the need to introduce the following timer:

* 1. new time IE, e.g., timeFailureDAPSHO, to indicate the time elapsed since the first connection failure until the successful RACH with the target DAPS HO cell
* **Q23: Do you see the need to introduce the timer in the above proposal?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | No | I believe timeUntilReconnection is the same as proposed timer. |
| vivo | No | Agree with QC that *timeUntilReconnection* can be reused, the definition of the legacy timer is given below:  This field is used to indicate the time that elapsed between the connection (radio link or handover) failure and the next time the UE comes to RRC CONNECTED in an NR or EUTRA cell. |
| Ericsson | No | Agree with QC/Vivo |
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Rapporteur´s summary: To be added later

One company (Huawei) suggests that the “timeSinceFailure” is defined to indicate the time elapsed since the last connection failure”. Since this was not discussed before, Rapporteur suggests discussing it. Rapporteur also would like to note that according to TS38.331 the timeSinceFailure in the RLF-Report is “the time that elapsed since the last radio link failure or handover failure”.

RAN2 to discuss what “timeSinceFailure” represents in case of DAPS HO, e.g.

* 1. The time elapsed since the connection failure in the target
  2. The time elapsed since the last connection failure (irrespective of whether that is in source or target)
* **Q24: Which of the above option (a,b) is acceptable for the definition of timeSinceFailure in DAPS HO scenarios?**

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| --- | --- | --- |
| Company | A/B | Comments |
| Qualcomm | B |  |
| vivo | B | B seems to be more aligned with the legacy definition of *timeSinceFailure*. |
| Ericsson | B | Agree with QC/Vivo. B is more aligned to the legacy definition. |
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Rapporteur´s summary: To be added later

### Other info

Different new indicators are proposed by various companies. Some of them were discussed in [20], but not agreed. Hence, Rapporteur proposes to further discuss the need of them:

RAN2 to discuss the need of:

* 1. DAPS handover type indication in RLF-report in case that DAPS HO is successfully performed but subsequent RLF occurs in target
  2. failure order indicator, e.g., consecutivetwofailuresoder, to indicate whether the failure between the UE and the source cell occurs before the one between the UE and the target cell
  3. Indicator to determine whether the HoF happened before or after the RLF at the source
  4. The state of source link after successful RACH should be included in the RLF-Report.
* **Q25: Which of the above options (a,b,c,d) is acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | A,B,C,D | Comments |
| Qualcomm | C |  |
| vivo | D, but… | We notice the D is beneficial to NW as this indicates that the DAPS HO is actually failed even though a successful RACH is performed at the target cell.  As the UE stops sending and receiving any RRC control plane signalling toward the source cell once it receives the DAPS handover message, the radio link failure detection mechanism for the source cell is suspended likewise. It is true that there is still a possbility the UE can be aware of the the source link quality via HARQ/ARQ retransmission and ROHC feedback transmissions to the source gNB, but it may not be always the case.  So the inclusion of D is not always feasible, we wonder how to ensure that the UE is able to find out the source connection problems every time? |
| Ericsson | C | C is needed for the case of “failure in source after fallback”. D seems to be more a SHR case |
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Rapporteur´s summary: To be added later

One company (Huawei) seems to propose some different interpretations of failedPCell and reestablishmentCellID. Rapporteur is unsure on whether any change is needed compared with legacy.

1. In case of DAPS HO, the failedPCell and reestablishmentCellID in the RLF-report are reused as in legacy.

* **Q26: Is the above proposal acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Ericsson | Yes |  |
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Rapporteur´s summary: To be added later

### Signalling model

Related to the signalling model, two options are possible:

* DAPS handover failure information could be included in FailureInformation message for handover optimization (CATT, Sharp)
* The existing FailureInformation message associated to DAPS failure is not enhanced for SON purposes (Ericsson, ZTE, Lenovo, Vivo, Huawei, CMCC)

Rapporteur proposes the following:

1. The existing FailureInformation message associated to DAPS failure is not enhanced for SON purposes.

* **Q27: Is the above proposal acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | No | I believe that it needs to be enahced. In the case the fallback happens, early information to network can help network in providing the second reconfiguration to avoid RLF at source after failure. |
| vivo | Yes | The legacy FailureInformation already functions as a means to help NW in providing the second reconfiguration as it explicitly delivers the message that DAPS failure occurred. This is not the same to MCG/SCGFailureInformation which requires a timely notification, instead, the reconfiguration/optimization on DAPS parameters rely on the collective data reported from a significant number of UEs. |
| Ericsson | Yes | Agree with Vivo. Additionally, we should avoid adding overhead to the FailureInformation message that is likely sent by the UE when it is already in bad coverage. Since the SON information are not time critical, they should be reported using the classical RLF-report framework. |
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Rapporteur´s summary: To be added later

### Scenarios

Related to the merging of scenarios 2b/2c, and 3b/3c in [20], these are the views:

* Merge scenarios 2b/2c and 3b/3c (China Telecommunication, Oppo, ZTE, Huawei)
* Not merge 2b/2c and 3b/3c (LG)

Given the above, Rapporteur proposes the following:

1. Scenarios 2b/2c and 3b/3c are merged

* **Q28: Is the above proposal acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | No strong view |  |
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Rapporteur´s summary: To be added later

One company (Huawei) has further proposals on scenarios that Rapporteur suggests to further discuss.

RAN2 to further discuss the following:

* 1. Move scenario 1b into the too early DAPS HO
  2. Introduce new scenario 3d and merge scenarios 3a and 3d
* **Q29: Is the above proposal acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | No | We believe that at this stage of the WI, RAN2 should not spend time complicating scenarios’ discussion. |
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Rapporteur´s summary: To be added later

## Successful Handover Report

### SHR triggering conditions

The following triggering conditions were agreed in RAN2#113bis-e:

At least the following triggering conditions are applied for generating an HO Success Report in the case that the HO succeeds:

a. The UE logs the HO success report if, while doing HO, T310 value exceeds a threshold

b. The UE logs the HO success report if, while doing HO, T312 value exceeds a threshold

c. The UE logs the HO success report if, while doing HO, T304 exceeds a threshold

d. In case of DAPS, if the UE gets an RLF in the source while doing DAPS.

One company (Huawei) provides proposals on how to configure the T310/T312/T304 thresholds for SHR reporting.

1. There are separate thresholds for T310/T312/T304 for SHR triggering conditions, and the values should be within the existing values.

* **Q30: Is the above proposal acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Seems okay. However, this is not whthin the scope of this meeting |  |
| vivo | Not sure | It not so clear to us that what’s the meaning of ‘the values should be within the exisiting values’.  Take T312 as an example:  T312-r16 ::= ENUMERATED { ms0, ms50, ms100, ms200, ms300, ms400, ms500, ms1000}  Assume NW configures T312 = 50ms to a UE, does the proposal mean that the threshold to generate the SHR can only be set to 0ms? If so, this seems not be desriable as it would always trigger the SHR… |
| Ericsson | To be postponed | We understand the intention of “separate thresholds”, but we also share Vivo´s concern.  We can discuss such details later on. |
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Rapporteur´s summary: To be added later

1. The UE does not log SHR if not triggering conditions are configured.

* **Q31: Is the above proposal acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Ericsson | Yes |  |
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Rapporteur´s summary: To be added later

Two companies (Nokia, Lenovo) believe that exceeding the thresholds for T310, T312, T304 should be used as SHR triggering conditions also for CHO. This seems to be in line with the above agreements.

1. RAN2 to confirm that the UE generates Successful HO report upon exceed thresholds on T310, T312 and T304 exceed also for CHO case (in addition to regular HO)

* **Q32: Is the above proposal acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Ericsson | Yes |  |
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Rapporteur´s summary: To be added later

A number of companies proposes additional triggering conditions on top of what already agreed in RAN2#113bis-e.

RAN2 to discuss the need of the following additional SHR triggering conditions:

* 1. The UE logs the Successful HO report if the time between receiving the RRCReconfiguration command with sync and the CHO execution exceed a certain threshold
  2. In case of CHO, if the UE gets an RLF in the source while doing CHO/normal HO;
  3. For UE configured with CHO, when RLF does not happen in target cell but T310 in target cell is started within a period after successful handover
  4. For UE configured with CHO, when RLF does not happen in target cell but T312 in target cell is started within a period after successful handover
  5. For UE configured with CHO, when RLF does not happen in target cell but the number of consecutive "out-of-sync" indications from target cell is greater than one threshold
  6. The UE logs the HO success report if, while doing HO, the number of out-of-sync indications exceeds a threshold
  7. The UE logs the HO success report if the beam(s) configured with CFRA for the RACH to the target, are not the best beams at the time of HO
  8. the ratio of CFRA attempt among the total attempts is less than a configured threshold
  9. if T310 value for source cell exceeds a threshold at the time of RA completion in case of DAPS HO
  10. The UE to include in the HO Success Report for CHO and ordinary HO, the HO interruption time, i.e. time elapsed between last received packet in the DL (last transmitted packet in the UL) in source cell, and first received packet in the DL (transmitted packet in the UL) in the target cell
* **Q33: Which of the above options (a,b,c,d,e,f,g,h,i), if any, are acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | a,b,c,d,e,f,g,h,i, none | Comments |
| Qualcomm | None |  |
| vivo | None |  |
| Ericsson | E/F, G, J | E/F can be beneficial because even if T310 is not started, still the overall amount of out-of-sync indications can be high which may make the HO not very robust.  G: That is needed because the CFRA configuration at HO may be based on certain measurements that are not actually reflecting the “best” beams at HO for the UE.  J is needed because if the HO interruption time is high, then the network can for example use this information to enable a DAPS HO to minimize the interruption time. |
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Rapporteur´s summary: To be added later

### Timers-related info

In RAN2#113bis-e the following FFS were left:

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| Proposal 6 RAN2 to further discuss the need of the following time-related measurements as part of the successful HO report:  a. Elapsed time for T310 timer for normal HO  b. Elapsed time for T310 timer for Conditional HO |

Given the above FFS and the submitted proposals on this topic, Rapporteur proposes to first discuss whether explicit values of RLM timers should be included or if instead it should be just included an indicator indicating which triggering conditions for SHR was fulfilled by the UE.

1. RAN2 to discuss how to represent time-related information in the SHR:
   1. The UE reports in SHR explicit values of RLM timers or other timers/indicators from the list proposed in Cat-b-Proposal 20
   2. The UE indicates which triggering conditions for generating the SHR were fulfilled, e.g. flag for T310, T304, T312 indications, or for other possible information agreed in Q33

* **Q34: Which of the above options (a,b) are acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | A,B | Comments |
| Qualcomm | B |  |
| vivo | B | Don’t see the need to indicate the value, as what really matters to SHR is the failure events occurred previously, instead of when it succeeds. |
| Ericsson | B | B sounds a good compromise between SHR information accuracy and overhead/complexity. |
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Rapporteur´s summary: To be added later

If Option A in the above question is agreed, RAN2 should discuss including the following explicit information proposed in various contributions.

RAN2 to discuss the need of the following timers to be included in the SHR:

* 1. Elapsed time for T310 timer for normal HO
  2. T304 elapsed time
  3. For UEs configured with CHO, T310 value in target cell
  4. For UEs configured with CHO, T312 value in target cell
  5. For UEs configured with CHO, The number of consecutive "out-of-sync" indications from target cell.
  6. For UEs performing DAPS HO, T310 value in target cell
  7. For UEs performing DAPS HO, T312 value in target cell
  8. For UEs performing DAPS HO, The number of consecutive "out-of-sync" indications from target cell
  9. In case the UE is configured with both A3 and A5 event for CHO, the UE to report in the HO Success Report the time elapsed between the fulfilment of the two triggering conditions for the CHO cell
  10. Include the RLM related timers and RLC retransmission counter in the Successful Handover Report.
  11. UE includes the time elapsed from the DAPS HO command reception to RLF in source cell in successful HO report for DAPS HO.
  12. The UE to include in the HO Success Report for CHO and ordinary HO, the HO interruption time, i.e. time elapsed between last received packet in the DL (last transmitted packet in the UL) in source cell, and first received packet in the DL (transmitted packet in the UL) in the target cell
  13. time between the RLF occurrence at the source cell and the success RACH to the target, in order to identify the service interruption during DAPS HO
* **Q35: Which of the above options (a,b,c,d,e,f,g,h,I,j,k,l,m) are acceptable?**

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| --- | --- | --- |
| Company | A,b,c,d,e,f,g,h,i,j,k,l,m | Comments |
| Qualcomm | None |  |
| Ericsson | None if B in Q34 is agreed |  |
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Rapporteur´s summary: To be added later

### Radio measurements-related info

In RAN2#113bis-e the following was left as FFS:

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| Proposal 4 RAN2 to further discuss the need of the following parameters as part of the successful HO report:  a. Latest radio link quality of neighbour cells before HO command was received for all HO types.  b. Configured CHO execution condition(s), e.g. A3 and/or A5 event configuration, of the candidate target cells. The inclusion of this parameter depends on the RAN3 reply to the RAN2 LS R2-2102149.  c. The radio quality of source cell when ConditionalReconfiguration is received before conditional handover execution condition is satisfied  d. Latest radio link quality of source cell before HO command was received in the case of DAPS. |

Given the above FFS and submitted proposals, Rapporteur proposes to continue the discussion on the need of any radio measurements in the SHR.

1. RAN2 to discuss the need of any of the following radio-related measurements to be included in the SHR
   1. Latest radio link quality of neighbour cells before HO command was received for all HO types
   2. Configured CHO execution condition(s), e.g. A3 and/or A5 event configuration, of the candidate target cells. The inclusion of this parameter depends on the RAN3 reply to the RAN2 LS R2-2102149
   3. The radio quality of source cell when ConditionalReconfiguration is received before conditional handover execution condition is satisfied
   4. Latest radio link quality of source cell before HO command was received in the case of DAPS
   5. Latest radio measurement results of source and target cells
   6. Fulfilled CHO execution condition(s), i.e. whether A3 and/or A5 event was fullfilled, for the cell in which CHO execution was triggered
   7. Indication that none of beams in *candidateBeamRSList* could meet the measurement requirement
   8. ID and measurements of beams whose measurement higher than the threshod *rsrp-ThresholdSSB* but not within the configured list *candidateBeamRSList*
   9. Measurements of reference signals that within the configured list *candidateBeamRSList*

* **Q36: Which of the above options (a,b,c,d,e,f,g,h,i) are acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | A,b,c,d,e,f,g,h,i | Comments |
| Qualcomm | A (with the modification for CHO prior to execution) |  |
| vivo | A |  |
| Ericsson | A,B,E,F | That is aligned with what agreed for the RLF-Report, so it can be included in the SHR as well. |
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Rapporteur´s summary: To be added later

### Other info

For the above proposals, Rapporteur proposes to discuss them since in [20] only the location information were agreed as “other info”.

RAN2 to discuss the following information to be included in the SHR

* 1. The state of source link can be reported in the successful handover report.
  2. in case successful HO is stored when RA configuration is sub-optimal, UE includes the the same amount of RA information as in ra-InformationCommon of RA report in successful HO report
  3. For location config/reports for SHR, location info for RLF report can be reused
  4. UE includes the source RLF cause or the T310 value of source cell at RA completion in successful HO report for DAPS HO
* **Q37: Which of the above options (a,b,c,d) are acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | A,b,c,d | Comments |
| Qualcomm | B and C | A can be determined from the report. We are gerenrating the SHR report based on T310 timer condition. UE don’t need to include the T310 timer. UE can include the RLF cause if we envision there can be more than one RLF cause. |
| vivo | C |  |
| Ericsson | B,C | Agree with QC. RA information can be included as for the RLF report. The same holds for the location information. |
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Rapporteur´s summary: To be added later

### Configuration aspects

Two companies (ZTE, NEC, Samsung) propose to configure the UE for the logging of SHR. Rapporteur proposes to discuss it.

UE logs successful HO report in case prior configuration is received for successful HO report (interested trigger and corresponding configuration), otherwise UE doesn’t store successful HO report

* **Q38: Is the above proposal acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes |  |
| vivo | Yes, but… | This seems to overlap with the questions in 2.3.1, should we have redundant proposals for the same issue? |
| Ericsson | Yes | As baseline, we can assume that the UE reports the SHR if it is configured to do so. |
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Rapporteur´s summary: To be added later

### Signalling and procedures

Related proposals on signalling and procedure, Rapporteur suggests to first agree on the following principles which should be in line with the current RLF report:

1. The *varSuccHOReport* is introduced to store the parameters for successful HO report.

* **Q39: Is the above proposal acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes | A UE variable would be needed to store the information. |
| vivo | Yes |  |
| Ericsson | Yes |  |
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Rapporteur´s summary: To be added later

1. The UE includes the availability of successful HO report to NW in each completed message send in RRC procedure, i.e., RRCReconfigurationComplete, RRCReestablishmentComplete, RRCSetupComplete, RRCResumeComplete message if it has available successful HO report to be reported.

* **Q40: Is the above proposal acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes (but we are fine with any two options here) | I believe that there can be two options:   1. Similar behavious as RLF report: UE indicates the availability in RRCReconfigurationComplete,RRCReestablishmentComplete,RRCSetupComplete, RRCResumeComplete messages and network can extract the report desired. In this case, UE can keep the report for maximum 48 hours. 2. UE reports the availability in RRCReconfigurationComplete only, if not requested by the network immediately, UE clears the SHO report |
| vivo | Yes |  |
| Ericsson | Yes | That is aligned to RLF-Report. We can discuss such details also later on during stage-3 discussion. |
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Rapporteur´s summary: To be added later

1. UEInformationRequest/UEInformationResponse message is used for successful HO report request and report.

* **Q41: Is the above proposal acceptable?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes |  |
| vivo | Yes |  |
| Ericsson | Yes |  |
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Rapporteur´s summary: To be added later

Related to how many entries related to SHR shall be stored by the UE, one company (Huawei) believes that only one entry should be stored, while another company (ZTE) proposes have multiple SHR entries. Hence, Rapporteur proposes to discuss the following:

1. RAN2 to discuss the following:
   1. The UE only stores the latest SHR entry
   2. The UE may store multiple SHR entries

* **Q42: Which of the above option(a,b) are acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | A,B | Comments |
| Qualcomm | A | Similar behavious as RLF report |
| vivo | A | The latest SHR may be enough, we don’t want to burden UE in terms of such NW optimization. It is our understanding that SHR is not as significant as the other reports, for example, RLF/CEF/RACH report, since in this case the UE anyway succeeds in the end. |
| Ericsson | A | A can be assumed as baseline for the time being, since that is like for RLF-report. |
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Rapporteur´s summary: To be added later

### Scenarios

Related to scenarios 2c and 3b, these are the views:

* Scenario 2c should be considered as part of RLF-report (Oppo, Ericsson)
* Scenario 2c should be considered as part of SHR (ZTE)
* Scenario 3b should be considered as part of SHR (Oppo, Ericsson, ZTE)
* Scenario 3b should be considered as part of RLF-report (Huawei: covered by 1a)

Hence Rapporteur proposes the following:

1. RAN2 to discuss if scenario 3b i.e. “Successful HO completion, but RLF in source during DAPS HO” is part of:
   1. RLF-Report
   2. SHR

* **Q43: Is the above proposal acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | a/b | Comments |
| Qualcomm | B | As HoF has not happended this should be considered in SHR. |
| vivo | B | At last meeting，we already agreed that the one of the triggering conditions for SHR is:  **In case of DAPS, if the UE gets an RLF in the source while doing DAPS.**  So I guess this scenario should be considered in SHR. |
| Ericsson | B | Agree with QC and Vivo. In this scenario, the UE completed successfully HO, so it would be weird to capture this case as RLF. |
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Rapporteur´s summary: To be added later

1. RAN2 to discuss if scenario 2c, i.e. “Successful CHO recovery while initial failure” is part of:
   1. RLF-Report
   2. SHR

* **Q44: Is the above proposal acceptable?**

|  |  |  |
| --- | --- | --- |
| Company | a/b | Comments |
| Qualcomm | B | In our understanding, during the recovery pocedure, the trigger condition can meet for the SHR, therefore, the scenario should be consider in the SHR and information regrading first failure should be reported in SHR report. |
| vivo | B |  |
| Ericsson | A | The fact that the UE successfully reestablished its connection in a CHO cell after the CHO failure is not a wanted outcome from the network perspective. The HO failed, and this means that the CHO configuration was not good, no matter if reestablishment in CHO cell succeeded.  Hence this case should be treated as RLF. |
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Rapporteur´s summary: To be added later

# Conclusion

To be added later.

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