**3GPP TSG-RAN WG3 Meeting #119 R3-230850**

**Athens, Greece, 27 February-3 March, 2023**

Agenda Item: 10.2.2

Source: CMCC, Lenovo (moderator)

Title: Summary of Offline Discussion on MRO

Document for: Approval

# Introduction

**CB: # 13\_SONMDT2\_MRO**

**- Discuss the open issues above**

**- For stage2 CR for inter-system HO for voice fallback, take** [**R3-230649**](file:///D:\会议硬盘\TSGR3_119\Docs\R3-230649.zip) **as the starting point**

**- Capture agreements and open issues**

(CMCC, Lenovo - moderator)

Summary of offline disc [R3-230850](file:///D:\SON\标准提案\R3%23119\Inbox\R3-230850.zip)

Officially organized offline discussion

# For the Chairman’s Notes

**For MRO for CPC and CPA, if there are multiple events configured for CPA/CPC, the UE reports the first triggered CPAC event, and the time duration between the two triggered CPAC events.**

**It is beneficial for the UE to report at least PSCell where SCG failure happened, the cause of the fast MCG recovery failure (at least T316 expiry, SCG failure, SCG was deactivated or other cases that SCG is not available), and also if the problem is SCG failure, the SCG failure type (at least t310-Expiry, randomAccessProblem, rlc-MaxNumRetx).**

**LS to RAN2 in R3-230908 (Huawei) – content to be checked**

**Text Proposal for MRO for inter-system handover for voice fallback in R3-230920 (CMCC) – content to be checked**

# Discussion

## MRO for CPAC

**Enhancements on SCGFailureInformation? E.g, the CPAC execution condition(s) fulfilled? Timer between the fulfill of the two events?**

During online discussion, enhancements of SCGFailureInformation message were discussed, but it was hard to be converged. Similar as MRO for CHO, considering at most two CPAC events can be configured for one CPAC candidate target PSCell, two companies raised that for CPAC at least the first fulfilled CPAC event and time duration between two fulfilled CPAC events are beneficial for MRO.

**Moderator proposes:** to make some progresses on the enhancements of SCGFailureInformation, **RAN3 agrees that at least the first fulfilled CPAC event and time duration between two fulfilled CPAC events are useful for MRO for CPAC, other enhancements can be further discussed if any. LS to RAN2 to confirm the two items seems needed**.

**Q1-A: Companies are invited to provide their views on whether agree to support that at least the first fulfilled CPAC event and time duration between two fulfilled CPAC events are useful for MRO for CPAC.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | Yes | To distinguish which (or both) of triggering events needs to be adjusted accordingly. |
| Samsung | Yes with some modification | The first parameter should be “The CPAC execution condition(s) fulfilled” (see chair’s minute). The first fulfilled CPAC event is in the first place if both conditions are fulfilled. So the first fulfilled CPAC event is implicitly indicated to the network. |
| ZTE | Neutral |  |
| Qualcomm | Yes but with some edits | It is possible that there is only 1 event configured in case of CPA/CPC e.g., only Event A4 is configured for MN-initiated inter-SN CPC.  So we propose the following:  **If there are multiple events configured for CPA/CPC, then UE can report the following**  1) The first fulfilled CPAC execution condition  2) Time duration between the two fulfilled CPAC events |
| CATT | Yes | Such IEs have been introduced in R17 CHO. |

**Q1-B: If companies agree with the enhancements in Q1-1, companies are invited to provide their views on whether an LS to RAN2 to confirm the enhancements is needed.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | Yes | To help progress it in RAN2. |
| Samsung | Yes | For MRO, RAN3 normally sends LS to RAN2 on the UE reporting, then RAN2 confirm it and update their spec if needed. So we support to send LS to RAN2. A draft LS is provided in R3-230604. |
| ZTE | Yes | We could send an LS to RAN2 to capture our progress in RAN3 including the MRO for both CPAC and fast MCG recovery, but there seems to be nothing to inform RAN2 on the inter-system handover for voice fallback. |
| Qualcomm | Yes | We should also include the following RAN3 agreement:  **Information available in the network nodes should not be included in the SCGFailureInformation.** |
| CATT | Yes |  |

**Summary to offline discussion in the meeting room:**

## MRO for fast MCG recovery

**Case c/Case d/Case e/Case f would not be considered for MRO for fast MCG recovery failure?**

First, we discuss whether to consider Case c/Case d/Case e/Case f for MRO for fast MCG recovery failure:

* Case c: Fast recovery near failure case, i.e. UE receives the response message from MN via SN while T316 is running which almost expires but not yet.
* Case d: Failure case for CHO based recovery failure after fast MCG recovery failure.
* Case e: Subsequent failure after successful fast MCG recovery.
* Case f: dual failure case, i.e. MCG failure occur while at about the same time SCG is deactivated/suspended/de-configured.

During online discussion, CMCC and HW suggested Case c needs to be considered with description update. From moderator point of view, Case c is the case that the UE can receive the response message (e.g. RRC reconfiguration message for MCG change/modification) for MCG failure recovery while T316 is running, but the elapsed time of the T316 is near to be expired. If companies think the description is not clear enough, the updates are welcome. **Case c is open to be discussed in offline meeting.**

For Case d, moderator think it is a complex case with two successive failures, it is better to de-prioritize it.

For Case e, moderator think it is a legacy MRO case where failure happens after successful fast MCG recovery, there seems no spec impact.

For Case f, since the UE can not transmit the MCGFailureInformation message for recovery due to SCG failure/deactivation upon MCG failure, which needs to be avoided, majority proposes to consider it.

**Moderator proposes:** since we have discussed these cases for several meetings, we should try to de-prioritize some cases, it is suggested that **Case d/e would not be considered, and case f would be considered**.

**Q2-A: Companies are invited to provide their views on whether agree that case d/e would not be considered for MRO for fast MCG recovery failure.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | No | D+E is beneficial for the MRO algorithm. The resulting report from the failure event happens after a recovery situation so it should be possible for the MRO algorithm to distinguish this type of event from “normal” event when collecting statistics. |
| Samsung | No | At RAN3#117-e meeting, there is agreement “*other problems are not precluded if legacy MRO mechanism cannot cope with it.”*  Therefore, we prefer to keep it open. Then companies can check whether legacy MRO mechanism cannot cope with it until the end of Rel-18. |
| ZTE | Yes | For Case d, the failure case for CHO based recovery failure should be out of the scope. For Case e, it should be regarded as a normal failure. |
| Qualcomm | Yes | Case d): Same view as moderator, not critical to consider this successive failure case. Also not clear what is the optimization goal here  Case e): Legacy MRO can handle this |
| CATT | No | MRO enhancement for fast MCG recovery should end at the failed sending MCG failure information to network. |

**Q2-B: Companies are invited to provide their views on whether agree that case f would be considered for MRO for fast MCG recovery failure.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | Yes |  |
| Samsung |  | Case f can be covered by case a. |
| ZTE | Yes | There is difference between Case a and Case f about the timing, and it is better to has a individual case. |
| Qualcomm | Only case f1 below | Case f as it is described is not clear e.g., what is “suspended” or “deconfigured”  Split case f as follows:  Case f1: SCG failure occurs before UE sends MCGFailureInformation for fast MCG recovery  Case f2: MCG failure occurs before UE sends SCGFailureInformation  Case f1 is already agreed. No need to capture this again.  We don’t think case f2 is needed as this is not related to fast MCG recovery but just a dual failure scenario and this is not in the objective of the WID. |
| CATT | Yes |  |

**Summary to offline discussion in the meeting room:**

**Additional information to be reported by UE?**

Then, we discuss whether/what we can agree about the information for fast MCG recovery. Based on companies’ documents, the information to be reported by UE can be summarized as following:

1. the failure type i.e. SCG failure/deactivation upon MCG failure
2. PSCell where SCG failure happened
3. an indication concerning that SCG was deactivated during fast MCG recovery resulting in T316 expiry
4. T316 elapsed time
5. SCG status while T316 is running, e.g. SCG deactivation/suspended/de-configured
6. SCG status e.g. PSCell change/PSCell addition/SCG deactivation/SCG RLF upon initiation failure of MCG recovery
7. SCG status at the time of Fast MCG Recovery attempt
8. SCG RLF failure type, e.g. synchReconfigFailureSCG, scg-ReconfigFailure, srb3-IntegrityFailure
9. RRM measurement results
10. time between MCG failure and SCG failure/deactivation
11. MCGFailureInformation

**Q2-C: Companies are invited to provide their views on which information above is needed from the UE?**

|  |  |
| --- | --- |
| Company | Comment |
| Huawei | a), b), c), f), g), h), j)  a), f), g) are all intended to indicate the SCG status which makes UE fail to initiate MCG recovery attempt. |
| Samsung | b) e)/g) j)  e) and g) can be combined. SCG status which leads to MCG recovery failure is enough. We don’t need to differentiate “when”.  a) and c) can be covered by e)/g) |
| ZTE | We are ok with b) and i).  In addition, k) is needed.  Normally, the UE should report the MCGFailureInformation to the MN via SN after the MCG failure happens. However, if the SCG failure occurs before the UE sends the MCGFailureInformation to the MN, the MCGFailureInformation cannot be send to MN or SN directly, and it should be send to a new NG-RAN node via the RLF report, then, the new NG-RAN node is able to send the MCGFailureInformation to the MN for root cause analysis. Otherwise, the MN will never receive the MCGFailureInformation.  While, whether to enhance the RLF report with MCGFailureInformation is still under discussion in RAN2. If RAN3 decides to add the MCGFailureInformation in the UE reported information, RAN2 should be informed of this decision. |
| Qualcomm | a) after rewording, b), c) after rewording, h)  Detailed comments below:  a) Reword to “Indication that SCG failure happened during fast MCG recovery”. Consider deactivation separately in c)  b) - OK  c) – Reword to “Indication that SCG got deactivated during fast MCG recovery”  d) – No need of sending detailed timer value  e) – Duplicate with a) and c)  f) - No need to consider PSCell change/PSCell addition. Others are duplicate with a) and c)  g) – Duplicate with f)  h) – OK  i) – Not clear. RRM measurements are already there in RLF report. Are we specifically talking about PSCell measurements?  j) – No. This is not very useful in our opinion as MCG RLF and SCG RLF are independent events. gNB can’t optimize much knowing this exact timer value. A good MN implementation should send RRCReconfig/RRCRelease immediately upon receiving the MCGFailureInformation. |
| CATT | b) f) h) i) j)  a,c,e,f are all related to the SCG status. f) is more complete.  d) It seems to be an optimization for T316. But if the T316 is too short, it can be optimized by the cause of T316 expires. And for the too long T316, how to network identify it. |

If we can have conclusion on Q3-1, RAN3 should inform RAN2 about the information to be reported by the UE.

**Q2-D: Companies are invited to provide their views on whether an LS to inform RAN2 about the information to be reported by the UE is needed.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | Yes | Since RAN3 has analyzed, it is beneficial for RAN2 to take into account. |
| Samsung |  | The same reason as for Q1-B. We support to send LS to RAN2. A draft LS is provided in R3-230604. |
| ZTE | Yes | Same as Q1-B |
| Qualcomm | Yes | We should also send the list of scenarios agreed so that RAN2 doesn’t have duplicate discussions. |
| CATT | Yes |  |

**Summary to offline discussion in the meeting room:**

## MRO for inter-system handover for voice fallback

During the meeting, the following open issue in MRO for inter-system handover for voice fallback is identified for further discussion offline.

**Work on stage2 CR for inter-system handover for voice fallback with agreed cases.**

Regard to the MRO for inter-system handover for voice fallback cases already agreed in previous RAN3 meetings:

“*Consider Case 1-2 for MRO enhancements for inter-system inter-RAT handover for voice fallback:*

*- Case 1: after failure (HOF/RLF) of inter-system inter-RAT handover from NR to E-UTRAN for voice fallback, a suitable E-UTRA cell is selected, and the UE tries RRC connection setup procedure for the voice service in the E-UTRA cell.*

*- Case 2: after failure (HOF) of inter-system inter-RAT handover from NR to E-UTRAN for voice fallback, none suitable E-UTRAN cell can be selected, the UE reverts back to the configuration of the source PCell and initiates RRC re-establishment procedure in NR.*”

Based on the online discussion, we agreed to capture the agreed cases in stage2 TP in TS 38.300.

From the TPs provided by companies, there are two options to draft a TP including case 1 and case 2.

* Option 1: adding the description of inter-system handover for voice fallback within the section 15.5.2.2.3 connection failure due to inter-system mobility in stage 2 in TS38.300.
* Option 2: adding the description of inter-system handover for voice fallback in a new section in stage 2 in TS 38.300

**Q3-A: Companies are invited to provide their views on which option to be selected.**

|  |  |
| --- | --- |
| Company | Comments for Option 1 or Option 2 |
| Huawei | Option 1 is supported. |
| Samsung | Option 1.  15.5.2.2.3 Connection failure due to inter-system mobility, the title is appropriate for this topic.  Option 1 can also avoid many duplicated description as Option 2. |
| ZTE | Option 1 is preferred. |
| Qualcomm | Option 1 seems sufficient. |
| catt | Option 1.  We would like to note that option 1 includes both HOF and RLF, it already agreed in previous meeting (green text). RLF is not a corner case, it may occur usually. We acknowledge that the LTE specification should be updated (i.e., introduce voice fallback indication), but it aims to optimize NR cell. It would be benefit for source gNB to choose a suitable LTE cell for voice fallback. In R17, inter-system too early aims to optimize LTE cell. |

Moderator gives an example if Option 1 is selected as below:

15.5.2.2.3 Connection failure due to inter-system mobility

One of the functions of Mobility Robustness Optimization is to detect connection failures that occurred due to Too Early or Too Late inter-system handovers or inter-system handover for voice fallback. These problems are defined as follows:

- Inter-system/ Too Late Handover: an RLF occurs after the UE has stayed in a cell belonging to an NG-RAN node for a long period of time; the UE attempts to re-connect to a cell belonging to an E-UTRAN node.

- Inter-system/ Too Early Handover: an RLF occurs shortly after a successful handover from a cell belonging to an E-UTRAN node to a target cell belonging to an NG-RAN node; the UE attempts to re-connect to the source cell or to another cell belonging to an E-UTRAN node.

- Inter-system handover for voice fallback: A failure (HOF/RLF) occurs during the handover procedure from a cell belonging to an NG-RAN node to a cell belonging to an E-UTRAN node for voice fallback purpose, the UE attempts to re-connect to a cell belonging to an E-UTRAN node for the voice service; or a failure (HOF) occurs during the handover procedure from a cell belonging to an NG-RAN node to a cell belonging to an E-UTRAN node for voice fallback purpose, the UE reverts back to the configuration of the source PCell and attempts to re-connect to a cell belonging to a NG-RAN node.

**Summary to offline discussion in the meeting room:**

Regard to case 4 that after a successful inter-system inter-RAT handover from a first NG-RAN node to an E-UTRA node for voice fallback, the UE is handed over back to a second NG-RAN node from the E-UTRA node, the moderator thinks that case 4 should be considered for MRO for inter-system handover for voice fallback without stage3 impact. It is proposed that introducing a clear description in TS38.300 to indicate the inter-system handover for voice fallback cannot be counted in the statistics of inter-system ping-pong.

**Q3-B: Companies are invited to provide their views on whether agree to introduce a clear description in TS38.300 to indicate the inter-system handover for voice fallback cannot be counted in the statistics of inter-system ping-pong.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comment |
| Huawei | Yes | A clarification of this MRO case is needed in order to avoid being misunderstood as ping-pong. |
| Samsung |  | So far, we failed to understand why this is needed. |
| ZTE | Yes |  |
| Qualcomm | Yes | But the above text needs to be reworded more clearly:  1) Do we need to capture RLF and HOF in case 1 separately as they are different? We think it’s good to separate  2) Do we need to also capture case 2? |
| CATT | Yes | There is no stage3 impact, but the clarification in stage2 is useful. Without this clarification, network may think the voice fallback is ping-pong |

Moderator gives an example as below:

15.5.2.4 Inter-system Ping-pong

One of the functions of Mobility Robustness Optimization is to detect ping-pongs that occur in inter-system environment. The problem is defined as follows:

- A UE is handed over from a cell in a source system (e.g. 5GS) to a cell in a target system different from the source system (e.g. EPS), then within a predefined limited time the UE is handed over back to a cell in the source system, while the coverage of the source system was sufficient for the service used by the UE. The event may occur more than once.

The solution for the problem may consist of the following steps:

1) Statistics regarding inter-system ping-pong occurrences are collected by the responsible node;

2) Coverage verification is performed to check if the mobility to other system was inevitable.

The statistics regarding ping-pong occurrence may be based on evaluation of the *UE History Information* IE in the HANDOVER REQUIRED message. Inter-system handover triggered by voice fallback is not counted in the statistics of inter-system ping-pong. If the evaluation indicates a potential ping-pong case and the source NG\_RAN node of the 1st inter-system handover is different than the target NG-RAN node of the 2nd inter-system handover, the target NG-RAN node may use the HANDOVER REPORT message or the UPLINK RAN CONFIGURATION TRANSFER message to indicate the occurrence of potential ping-pong cases to the source NG-RAN node.

If NG-RAN coverage during the potential ping-pong event needs to be verified for the purpose of determining corrective measures, the Unnecessary HO to another system procedure may be used.

**Summary to offline discussion in the meeting room:**

# Conclusion, Recommendations [if needed]

If needed

# References