**3GPP T****SG-RAN WG2 Meeting #123 R2-2308326**

Toulouse, France, 21- 25August, 2023

Agenda Item: 7.13.8

Source: CMCC (moderator)

Title: Summary of [Post122][584][R18 SON/MDT] Open issues on fast MCG recovery

Document for: Discussion and Decision

# Introduction

This document is the report of the following email discussion,

* **[Post122][584][R18 SON/MDT] Open issues on fast MCG recovery (CMCC)**

Scope: Discussion should focus on the proposals raised and not concluded in R2-2305779.

Intended outcome: Report

 Deadline: Long

Please provide your comments before Aug. 09th, 23:59 UTC

# Contact Information

Participants are encouraged to leave their contact information in the following table.

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# Discussion

In RAN2#122 meeting, companies agreed to introduce the near failure case for fast MCG recovery and initial agreements on fast MCG recovery are concluded as follows:

Agreements:

1 RAN2 confirms scenario of near failure fast MCG recovery.

2 RAN2 confirms scenario f1, i.e., SCG fails or is deactivated before the UE sends the MCGFailureInformation. FFS RAN2 impact.

In this email discussion, the open issues on fast MCG recovery are mainly based on the proposals provided in R2-2305779, including the information for the optimization of near failure of fast MCG recovery reported by UE, T316 related triggering threshold and time information reported by UE for fast MCG link recovery optimization.

## Information reported by UE for the optimization of near failure of fast MCG recovery

Following options are proposed in R2-2305779 for UE to report for the optimization of near failure of fast MCG recovery:

Option 1: Elapsed T316 between the transmission of MCGFailureInformation and receiving RRC reconfiguration or RRC release message;

Option 2: The ratio between the elapsed T316 and the configured value of T316;

**Question 1: Companies are invited to provide the views on which information should be reported by UE for the optimization of near failure of fast MCG recovery.**

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| **Company** | **Comments** |
| CMCC | From our view, both options can help network to detect potential underlying issues and optimize the configuration of T316. Option 1 is preferred, since for option 2 the network needs to remember the configured T316.  |
| CATT | Either is OK to us. |
| Samsung | Option 1 seems to be simpler. |
| Sharp | Option 1 is preferred. |
| Nokia | Option 1 as option 1 is simpler, does not rely on network to remember the configured T316 value or on UE logging it, and helps directly determine how to set T316 value. |
| Huawei, HiSilicon | Option 1 is preferred. For option 2, it depends on the NW to know the configured valued of T316 for further optimization.  |
| Qualcomm  | None of the options are needed. The network knows the configured T316 value. The network further knows the time elapsed since the reception of MCGFailureInformation and sending the RRCReconfiguration or RRC Release. Therefore, nothing is needed from the UE. |
| Ericsson | Option 1 |
| ZTE | Option 1 is preferred, which can provide more detailed information for NW to to fine-tuning of T316 length. Option 2 requires NW to memorize the T316 configuration which may not always be stored in NW when receiving UE reports. |
| Xiaomi | Agree with QC |
| Lenovo | Same view as QC, network can calculate the elapsed T316 value. |

**Summary of Q1:**

8 of 11 companies support option1, since it does not rely on network to remember the configured T316 value and helps directly determine how to set T316 value. Furthermore, MN only knows the time elapsed since the reception of MCGFailureInformation and sending the RRCReconfiguration or RRC Release, but it doesn’t know the time elapsed since the sending of MCGFailureInformation from UE and reception of the RRCReconfiguration or RRC Release at the UE side, which further includes the transmission time between UE and SN, as well as transmission time between SN and MN. So, network cannot calculate the elapsed T316 value. It is proposed that:

**Proposal 1: UE reports the elapsed T316 between the transmission of MCGFailureInformation and receiving RRC reconfiguration or RRC release message*.***

## T316 related triggering threshold

In R2-2305779, it is proposed that UE could only report the information when a triggering threshold is met, e.g., T316 exceeds a configured threshold, to reduce the unnecessary reporting for fast MCG link recovery near failure case, which is similar to SHR.

**Question 2: Companies are invited to provide the views on whether to introduce the T316 related triggering threshold.**

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| **Company** | **Comments** |
| CMCC | We support to introduce the T316 related triggering threshold. Only if the triggering threshold is met, UE generates and reports the information, which will reduce the reporting overhead for UE. |
| CATT | Agree with CMCC, and maybe the similar thresholds configuration of SHR T310 can be reused: ENUMERATED {p40, p60, p80, spare5, spare4, spare3, spare2, spare1}. |
| Samsung | We do not support introducing the T316 related trigger. We think that the overhead for reporting the information is not very high irrespective of the option 1/ option 2 chosen in 3.1. It is 6 bits/ 11 bits of information and the UE can easily include this information in the existing RLF report. On the other hand, if we keep adding new thresholds for each information, the UE and network implementation will become much complex.  |
| Sharp | We understand the purpose of this T316 triggering threshold can reduce the SHR reporting overhead, and implicitly inform the network about the elapsed value of T316. However, as the handover triggered by fast MCG recovery anyway is not a perfect handover, another option is to always allow UE to send SHR-like report to the network in case of HO for fast MCG recovery.Having said that, we do not have strong view, and ok to go for the T316 related triggering threshold, if this is majority view. |
| Nokia | Our view is that **no** T316 related triggering threshold should be introduced. We think it is beneficial to report all different values of elapsed T316 so that the network can determine the correct distribution. This also provides more data for statistics. |
| Huawei, HiSilicon | Yes, agree with CMCC and CATTWith the T316 related triggering threshold, the NW can identify the near failure case from all cases. It is also beneficial to reduce the unnecessary reporting for fast MCG link recovery. Regarding how the UE sends the information to the network, we think a new report can be considered and it would be similar as SHR. The detailed comments can refer to the reply to Q4.In R18, we prefer to address the sub-optimal fast MCG recovery case. For the case raised by Sharp, we need first discuss whether to enhance this new case, in near-failure fast MCG recovery case or near-failure HO case. It is a little bit complex to mix fast MCG recovery with HO case.  |
| Qualcomm | We share Samsung and Nokia view, no T316 related triggers. No SHR for fast MCG Recovery. During the fast MCG recovery, no lower layer issue is detected. Furthermore, there is no configuration optimization associated with the T316. Therefore, just to optimize T316 timer, introducing trigger condition is waste of UE resources.  |
| Ericsson | For the following reasons, we don’t think a triggering condition is needed.1. RLF by itself is not a very frequent event and hence we assume successful MCG recovery is not very frequent as well, so no need to limit to specific cases
2. The RLF report is already generated and stored at the UE, so there is no need to have a triggering threshold to trigger logging the elapsed time information in that existing report.
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| ZTE | Yes. Agree with Rapporteur’s analysis that it would be beneficial to reduce report overhead and it is common for all cases, including HO triggered to recover from MCG failure.  |
| Xiaomi | Agree with Samsung and Nokia that no need for trigger conditions. |
| Lenovo | As commented in Q1, since network can calculate the elapsed T316 value, we are not clear about the motivation or benefit to introduce T316 related SHR triggering threshold. It seems SHR is not needed for fast MCG recovery. |

**Summary of Q2:**

Half companies support to introduce the T316 related triggering threshold to reduce the reporting overhead of UE. While the other half companies do not support it since they think successful MCG recovery is not very frequent, and it is beneficial to report all different values of elapsed T316 so that the network can determine the correct distribution. Therefore, the threshold will not be introduced due to the support is insufficient.

**Proposal 2: No T316 related triggering threshold is introduced.**

## Time information reported by UE for fast MCG link recovery optimization

Until now, following cases for fast MCG link recovery have been agreed to be addressed in both RAN2 and RAN3:

* Case a: SCG fails when the UE is undergoing fast MCG recovery (i.e. SCG failure happens while T316 is running)
* Case f1: SCG fails or is deactivated yet before the UE sends the MCGFailureInformation
* Case b: the signalling delay is longer than the time the UE waits for the response (T316 expired)

Regard to fast MCG link recovery optimization, some time-related information is also beneficial for network to understand the situation of SCG and do further optimization of fast MCG recovery, e.g., the time between MCG failure (or transmitting MCGFailureInformation) and SCG failure or SCG deactivation.

Therefore, for case a, UE reports the time between MCG failure (or transmitting MCGFailureInformation) and SCG failure. For case f1, UE reports the time between MCG failure (or transmitting MCGFailureInformation) and SCG failure or SCG deactivation.

**Question 3:** **Companies are invited to provide the views on whether to agree to report the time information for fast MCG link recovery optimization in the proposal listed below.**

**Proposal: UE reports following time information for fast MCG link recovery optimization:**

* **Time between MCG failure (or transmitting MCGFailureInformation, only for case a) and SCG failure for case a and f1**
* **Time between MCG failure and SCG deactivation for case f1**

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| **Company** | **Comments** |
| CMCC | We support to report the above time information for fast MCG link recovery optimization. For the scenario that both MCG failure and SCG failure happen in a short time, it means there is a coverage issue, since the UE cannot connect to the network at all, the coverage enhancement is necessary. For the scenario that both MCG failure and SCG deactivation happen in a short time, it means the decision of SCG deactivation is not appropriate, so the principle to deactivate SCG needs further optimization. |
| CATT | Agree with CMCC, at least the time between MCG failure and SCG failure should be introduced since the time can be used to indicate whether the coverage problem of the MN an SN maybe occurred in a nearby location. Then some optimization can be performed.For the MCG failure and SCG deactivation scenario, the NW could consider reducing the possibility of initiating SCG deactivation near the location of MCG failure, so that MCG link can be recovery as much as possible. |
| Samsung | Until now, following cases for fast MCG link recovery have been agreed to be addressed in both RAN2 and RAN3:* Case a: SCG fails when the UE is undergoing fast MCG recovery (i.e. SCG failure happens while T316 is running)
* Case f1: SCG fails or is deactivated yet before the UE sends the MCGFailureInformation
* Case b: the signalling delay is longer than the time the UE waits for the response (T316 expired)

For simplicity, we suggest to include the indications to identify why MCG failure information procedure was not initiated, rather than the time information. * Indication to indicate if T316 is configured
* Indication to indicate if SCG transmission is not suspended
* Indication to indicate if the SCG is not deactivated
* Indication to indicate if neither PSCell change nor PSCell addition is ongoing
* Indication to indicate whether SRB2 and at least one DRB or multicast MRB setup.

This is aligned with the agreements from RAN2/RAN3 (such as RAN3 agreement “log SCG was deactivated or other cases that SCG is not available” and RAN2 agreement “Fast MCG recovery failure cause shall be included for fast MCG recovery optimization”).If the UE is not able to initiate MCG Failure Information procedure due to SCG failure (case f1), the SCG failure would have occurred in a very less time before the MCG failure as otherwise MN would have restored SCG. This means that network can identify there is a SCG coverage issue before a very short period (usually in the order of milliseconds) before MCG failure, and this is enough for the optimization. Benefits of reporting actual time is questionable.Similarly SCG deactivation and MCG failure occurring together (case f1) is also a corner case. SCG deactivation is based normally on the amount of data in SCG bearers, and not coverage. Hence the indication is enough and time is not much helpful.For case a, if the UE stores the elapsed timer for T316 as in 3.1 and the SCG failure type as already agreed in RAN3, time information is not needed. Elapsed timer of T316 gives the time between initiating the fast MCG link recovery and the SCG Failure. |
| Sharp | For SCG failure, agree with CMCC.For SCG deactivation, we wonder how can the NW improve the strategy of SCG deactivation based on the time between MCG failure and SCG deactivation. Does it mean the NW may not deactivate the SCG if the MCG link is getting worse? If so, maybe some other information, e.g. the measurement results of MCG link upon SCG deactivation, should be known by the NW. |
| Nokia | OK only with Time between MCG failure (or transmitting MCGFailureInformation) and SCG failure for case a. For case f1, network has information and no point in knowing the time. |
| Huawei, HiSilicon | Agree on the time between MCG failure (or transmitting MCGFailureInformation) and SCG failure for case a and f1. This kind of time info can also assist NW to derive the corresponding mobility info and check whether to optimize it.For the second one, we believe it may be beneficial for the deactivation strategy optimization, so we can agree on it as well.  |
| Qualcomm | There is no correlation between MCG RLF and SCG RLF or SCG deactivation. Therefore, there is no need for a timer. The only thing matters is whether the SCG was available (i.e., UE could not send MCG RLF report because SCG not available either due to being deactivated or suspended) when PCell RLF was detected. Or, whether the SCG RLF happened after MCG was transmitted. Therefore, we can introduce indicators to indicate* If SCG was available upon MCG RLF detection
* If SCG RLF happened after MCGFailureInformation transmission.
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| Ericsson | Agree with CMCC |
| ZTE | For case a, this information can be indicated by elapse time of T316 upon SCG failure, which can also be used as an implicit indication to differentiate whether SCG failure happens before or during fast MCG recovery. For case f1 since UE will not generate or transmit MCGFailureInformation based on current specs, only time between MCG failure and SCG failure or deactivation can be stored. For case b, if new cause i.e., T316 expiry is introduced, there is no strong need to add more time information. |
| Lenovo | Agree with the time between MCG failure (or transmitting MCGFailureInformation, only for case a) and SCG failure for case a and f1. For the time between MCG failure and SCG deactivation for case f1, there is no need to be reported by the UE, since network can calculate it. |

**Summary of Q3:**

7 companies support UE to report the Time between MCG failure (or transmitting MCGFailureInformation, only for case a) and SCG failure for case a and f1, and 3 companies do not support. As for the Time between MCG failure and SCG deactivation for case f1, majority companies do not support it. So:

**Proposal 3: RAN2 discuss whether UE reports following time information for fast MCG link recovery optimization:**

* **Time between MCG failure (or transmitting MCGFailureInformation, only for case a) and SCG failure for case a and f1**

## In which report to capture fast MCG recovery related information

As for in which report to capture fast MCG recovery related information, we would like to ask the following question.

**Question 4: Companies are invited to provide their view on which report to be used for supporting data collection for above information.**

1. **Existing RLF report**
2. **SHR**
3. **New report**

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| **Company** | **(A/B/C)** | **Comments** |
| CMCC | A | Since the UE will generate an RLF report when MCG failure occurs, it is straightforward to reuse it to collect fast MCG recovery related information. |
| CATT | A for failure;B for near failure | RLF report is appropriate to include all the real failure scenario(s), but we think the near failure case (case c) can reuse the SHR mechanism since the triggering threshold should be configured by the NW. |
| Samsung | A | Agree with CMCC. We already agreed that RLF report is enhanced to support fast MCG recovery MRO in RAN2#120.  |
| Sharp  | A and B | For failure case, RLF report can be used.For near failure case, SHR-like is more suitable, especially if a T316 threshold is agreed to be defined. |
| Nokia | A and B | As scenarios cover both cases where fast MCG recovery fails and nearly fails, information can be captured in both reports (RLF report for failures and SHR for near failure cases). |
| Huawei, HiSilicon | A for failureC for near failure | For B, it is introduced only for HO procedure, and source cell info and target cell info are mandatory. For near-failure fast MCG recovery case, there is no target PCell info involved. Instead, there may be new PSCell info. With the above in mind, we believe it is not reasonable to reuse B.Thus, we prefer C for near failure. |
| Qualcomm | A | No SHR or No new report for near-failure scenario. RLF report can be enhanced for both failure and near-failure scenarios, if required.  |
| Ericsson | A | UE already generated MCG RLF report, so the timing information for fast MCG recovery optimization can be simply added to the existing RLF report (this only requires UE to not delete the existing RLF report in case of successful MCG recovery).  |
| ZTE | A | UE can already stores in fast MCG recovery information in RLF report when fast MCG recovery is triggered, and the T316 threshold configuration can help UE to decide whether to keep the stored information.  |
| Xiaomi | A |  |
| Lenovo | A |  |

**Summary of Q4:**

For failure case, all companies support to reuse the existing RLF report to capture fast MCG recovery related information. For near failure case, 7 companies support to use RLF report, 3 companies support to use SHR and 1 company suggests to introduce new report.

In moderator’s view, UE already generated MCG RLF report when fast MCG recovery is triggered, so it is straightforward to add the timing information for fast MCG recovery optimization to the existing RLF report.

**Proposal 4: Reuse existing RLF report to capture fast MCG recovery related information.**

# Conclusion

Following proposals are made:

**Proposal 1: UE reports the elapsed T316 between the transmission of MCGFailureInformation and receiving RRC reconfiguration or RRC release message.**

**Proposal 2: No T316 related triggering threshold is introduced.**

**Proposal 3: RAN2 discuss whether UE reports following time information for fast MCG link recovery optimization:**

* **Time between MCG failure (or transmitting MCGFailureInformation, only for case a) and SCG failure for case a and f1**

**Proposal 4: Reuse existing RLF report to capture fast MCG recovery related information.**

# Reference

1. R2-2305779, Further considerations on fast MCG recovery, CMCC