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

Electronic Meeting, 24th February – 6th March 2020

Agenda: 6.10.5

Source: Ericsson

Title: Fast MCG recovery

Document for: Discussion, Decision

# 1 Introduction

This document is to kick off the phase 2 or the following email discussion:

* [AT109e][048][DCCA] Fast MCG Recovery (Ericsson)

Scope: Treat summary Fast MCG Recovery, remaining aspects

Intended outcome: Report, Agreed Issues resolutions

Deadline: Mar 3 1200 CET

# 2 Summary of remaining issues

## Issue 2.1 Configured guard timer longer than inactivity timer

LG provided a contribution where it is argued that the values part of timer T316 should be larger than the values of the inactivity timer.

* RAN2 needs to specify that configured guard timer value should be longer than configured data inactivity timer value.[9]

According to this, it would be good to clarify that when the UE starts timer T316, it is aware that a failure has happened and that a response by the network to the *MCGFailureInformation* is expected. On top of this, when the *MCGFailureInformation* is sent, the MCG transmissions are suspended and thus the data inactivity timer becomes meaningless. Further, we did not specify this behaviour for the timer T310 and a possible option is have the same solution also for the timer T316. However, we believe this can be further discussed in the online meeting.

According to these, we think two possible options can be pursued:

1. Specify that configured guard timer value should not be longer than configured data inactivity timer value.
2. Do not specify anything as for the timer T310.

Q1: What option should be selected to address the possible issue that the guard timer should not be longer than inactivity timer?

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| Company | Option | Comment |
| Ericsson | Option 2 | We prefer to align the behaviour of T316 to that one of T310 i.e., nothing needs to be specified. |
| LG | Option 1 | We prefer the option 1.  The guard timer value needs to be specified shorter than value of data inactivity timer. During a MCG failure recovery, the UE is waiting reconfiguration message. Meanwhile, during the recovery period, if data inactivity timer is expired, the UE autonomously release RRC connection. So, the UE cannot receive the reconfiguration message. That is an issue. |
| MediaTek | Option 2 | We don’t really understand why guard timer is related to data inactivity timer. To us, they are separate functionality. Thus we would prefer not to specify any relation between the two timers. |
| Qualcomm | Option 2 | We think the intention seems to be reasonable, but don’t think it needs to be specified. It is generally up to NW implementation to avoid misconfiguration, and no UE behavior is specified for misconfiguation. |
| Lenovo&MM | Option 2 | We donot need to specify anything as T310. |
| ZTE | Option 2 | Same view with Ericsson. |
| OPPO | Option 2 | No need to specify anything. It is up to UE implemenatation if any potentional issue exist. |
| Huawei, HiSilicon | Option 2 |  |

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| NEC | Option 2 | Same as Ericsson |
| vivo | Option 2 |  |

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| Nokia | Option 2 | We agree with QC. |
| CATT | Option 2 |  |
| Samsung | Option 2 | Agree with QC |
| Intel | Option 2 | We don’t see a need to specify such restriction and leave it to network implementation to configure reasonable values. |
| Apple | Option 2 |  |

## Issue 2.3 SN change as result of fast MCG recovery procedure

One contribution from Ericsson proposes to discuss the scenario when the fast MCG recovery is triggered and the MN, as a result, decides to trigger an SN change. This means that the MN-initiated SN change (less probable) or the inter-Master Node handover with Secondary Node change (high probable) procedure can be triggered. The following proposals have been made in the contribution:

* During the fast MCG recovery procedure, when the source MN triggers the release of the source SN, the source SN releases the resources associated to the UE only after sending the *RRCReconfiguration* message to the UE (via SCG leg of the split SRB or via SRB3). [4] (Ericsson)
* A note is added in 3GPP TS 37.340 for clarify that, during fast MCG recovery procedure, the source SN releases the resource associated to the UE only after sending the *RRCReconfiguration* message to the UE. [4] (Ericsson)

According to what is described in 37.340 clause 10.5 and 10.7, the release of the SN happens before the sending of the *RRCReconfiguration* message to the UE. Now, even if this is fine for the normal MR-DC operations (i.e., since is the MN that sends the *RRCReconfiguration* to the UE), in case of the fast MCG recovery procedure this represents a problem since is the SN that is responsible to send the reconfiguration, either via the SCG leg of the Split SRB or via the SRB3. According to this, we believe the issue is valid and need to be solved in order to make the fast MCG recovery feature to work properly.

To solve this issue, two options have been discussed during the email discussion:

1. The SN should release the resource associated to the UE only after successfully sending the *RRCReconfiguration* message to the UE. For this, the MN should set a flag in the X2: SgNB/SeNB RELEASE REQUEST message to inform the SN.
2. The source MN sends the SN release to the source SN only after getting a confirmation (i.e., via X2/Xn) from the target MN that the procedure is completed.
3. Others (i.e., please add in the comment tab)

Q2: What option should be selected to address the issue that, during fast MCG recovery, the source SN is released before sending the *RRCReconfiguration* message to the UE?

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| Company | Option | Comment |
| Ericsson | Option1 or Option2 | Both Option 1 and Option 2 may work. We are fine to go with the majority. |
| LG | Option 3 | There is no issue when resource with SN associated with released by SN node. If the UE does not receive reconfiguration message, the UE will perform the re-establishment procedure after guard timer is expired |
| MediaTek | See comments | First we would like to clarify whether there is UE behaviour impact or stage 3 SPEC changes based on the proposals. In our understanding, there is not.  If the above understanding is correct, it seems the issue could be solved by NW implementation. We do not have strong view on whether change on stage 2 SPEC is required. |
| Qualcomm | Option 1 or Option 2 can work, although it seems to be a corner case | In our understanding, it seems to be this is a corner-case optimization.  However, we assume there is no UE impact. Thus, we don’t have strong opinion since there is no UE impact. But both option 1 and option 2 need some change on NW procedure in 37.340. Thus, we hope infra-vendors can provide more analysis on its impact and whether it is worth. We can follow the majority view, but we think at most a note is enough, i.e. no need of text procedure change. |
| Lenovo&MM | See comments | If MN wants to release the SN, that means the channel of SN link is not good. Then, UE can perform re-establishment upon T316 expiry. So, we dont see the need to solve it. |
| ZTE | See comments | We try to understand the issue.  In section 10.5/10.7, we have following procedure description:  16. Upon reception of the *UE Context Release* message, the source SN can release radio and C-plane related resource associated to the UE context. Any ongoing data forwarding may continue.  So source SN only release resource after receiving the final notification (e.g. UE context release) from source MN. Before that, if SN receives RRC Transfer or packets from source MN, we think source SN can still forward it to UE, this can be handled by NW implementation. |

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| OPPO | No strong opinion | No strong opinion if there is no impact on UE side. |

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| Huawei, HiSilicon | See comments | About LG, QC and Lenovo&MM comments: in case of MN handover, the target MN may be a legacy eNB which does not support EN-DC, this has nothing to do with the SN link not being good and this is certainly not a corner case.  About MediaTek‘s comments: indeed, there is no UE impact, it is a pure network question.  About the „option 1“: can‘t fast MCG link recovery via split SRB1 work with a Rel-15 SN? If so, „option 2“ is much better because it preserves this possibility, unlike „option 1“.  About ZTE‘s comment: we agree that some more checking is needed. |

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| NEC | Option 1 or 2 | We prefer to specify this network behviour in Stage 2 so that the whole picture of the fast MCG recovery procedure is clarified.  On the Stage 3 impact, RAN3 X2/Xn specs includes some interaction between procedures or X2/Xn messages. The LS to RAN3 may be good for confirmation. |
| vivo | Option 3: leave to NW implementation | We not see any issue here. If SN releases UE associated resource before sending the RRC release message before sending RRC reconfiguration, UE would not receive the RRC reconfiguration and T316 will expire. UE performs RRC reestablishment |

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| Nokia | Option 3 | In our understanding:   * no stage-3 impact is needed; * when SRB3 is used, the problem is avoided by sensible SN implementation;   the only restriction needed is that when split SRB1 is used, MN should not inititate the MCG-recovery-related RRC Transfer in parallel with SN Release. (The trigger for initiating SN Release can be as in Option 2 above, or RRC Transfer from the SN confirming the delivery of the recovery-related RRC message to the UE.) If so desired, this restriction can be captured as a stage-2 note. |
| CATT | See comment | Agree with ZTE, further check is needed to clarify whether this issue is existed.  If this issue is existed, option 1 and option 2 both works, but we prefer to option 2. |
| Samsung | Option 3 | Agree with Nokia |
| Intel | See comments | From checking through stage 2 and RAN3 stage 3, it is not entirely clear whether the SN actually releases the radio resources on receipt of the UE context release. If it does, then there would a problem also in Rel-15 if network side releases the radio before UE receives the Reconfiguration message. In any case, we think this topic should be discussed further and solved on the network side. |
| Apple | Option 1 or Option 2 | We are fine with either way. It’s better to clarify NW behavior in stage-2 spec. |

## Issue 2.3 Supported handover scenario for fast MCG recovery

In another contribution, CATT is questioning whether the inter-RAT handover is supported for the fast MCG recovery and whether the E-UTRA measurements are needed to be forwarded by the UE to the MN. According to this, the following proposals are made:

* RAN2 should discuss whether inter-RAT handover can be supported for MCG fast recovery.[7] (CATT)
* If the inter-RAT handover is not supported for MCG fast recovery, the UE shouldn’t include the EUTRAN measurement results in the *MCGFailureInformation* if NR-DC is configured.[7] (CATT)

In our opinion, we did not agree on any restriction regarding the supported MR-DC handover scenarios that are supported during the fast MCG recovery procedure. For this reason, we think that all the MR-DC handover scenario illustrated in table B-1 of 37.340 should be supported (i.e., with no standardization impact). On the other side, it is worth highlighting that not supporting the MR-DC scenario in Table B-1 of 37.340 will require a standardization impact that is not desirable at this stage. During the online discussion, the following FFS has been agreed to be discussed offline:

* FFS if The MR-DC scenarios illustrated in Table B-1 of TS 37.340 are supported for the fast MCG recovery procedure (i.e., the intention is to not support additional cases than the one illustrated in Table B-1 of TS 37.340).

Q3: Do companies think that the Table B-1 of TS 37.340 applies also to fast MCG recovery (i.e., only handover scenario marked with “YES” in Table B-1 of TS 37.340 are supported)?

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| Company | Yes/no | Comment |
| Ericsson | Yes | Our understaning is that all the scenario ticked with “YES” in Table B-1 of TS 37.340 are supported during fast MCG recovery. |
| LG | Yes |  |
| MediaTek | No | First we think that proposal itself is confusing. Why we have to mention Table B-1 in 37.340. I think the CATT proposal is only talking about inter-RAT handover.  Back to inter-RAT handover. Although we tend to agree that it is doable to trigger inter-RAT handover, additional change in current running CR is needed.  For SRB3 case, we used *DLInformationTransferMRDC* to transfer the message after MCG failure. For EN-DC case, it is specified that (in *dl-DCCH-MessageEUTRA*)  “Includes the DL-DCCH-Message. In this version of the specification, the field is only used to transfer the E-UTRA *RRCConnectionReconfiguration* and *RRCConnectionRelease* messages as specified in TS 36.331 [10].”  The key change here is that “*MobilityFromEUTRACommand*” may also be included here.  And some companies mention that there may be RAN3 impact during the online discussion. Thus we prefer not to support inter-RAT case in this release for simplicity. |
| Qualcomm | FFS (see comments) | This issue has been discussed online, and has been labelled as FFS. Then, we are not sure why we need to address this issue in phase 2 email discussion?  We think since it has been list as FFS, then it is low priorty and can be discussed in next meeting based on contributions (if any companies had interest to bring paper). But for now, we don’t need to discuss it again. |
| Lenovo&MM |  | Before decision, we need to evaluate how much impact on the current running CR and RAN3. It is better to discussion it next meeting. |
| ZTE | Yes | We don’t see big problem of supportig inter-RAT handover in this case. The 331 CR and RAN3 CR may need update, but seems only field descriptions are involved. |

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| OPPO | Yes | We cannot see any issue to block st o-RAT hanover due to fast MCG failure recovery. |

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| Huawei, HiSilicon | FFS | We have interest in all these scenarios but we need to further check how it works. |

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| NEC | FFS | we also prefer to have more time to check, although it seems no additional specification impact to our current understanding which may be not 100% correct..  On the other hand, we are wondering if inter-system HO (e.g. EN-DC to EUTRA/5GC) is really „fast“ recovery compared to legacy re-establishment as RLF has already declared anyway (apart from ist feasibility)? |
| vivo |  | Agree with Huawei |

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| Nokia | Not supported currently | The current running CRs do not support inter-RAT HO (e.g. NR RRC section “5.7.2y.3 Actions related to reception of DLInformationTransferMRDC message” only handles RRC reconfiguration and release).  In this meeting, RAN2 could agree that inter-RAT HO to the extent of Table B-1 should be supported. |
| CATT | Yes | We support the proposal. Table B-1 of TS 37.340 applies also to fast MCG recovery |
| Samsung | Yes | No differentiation for fast MCG recovery is needed. |
| Intel | FFS | Needs further investigation and scenarios that do not involve additional effort should be considered. |
| Apple | FFS |  |

## Issues 2.4 PrimaryPath during MN handover

In [10], Google made the following proposal:

* After the MCG resume, the UE switch the primary path from SCG to MCG.

According to the proposal made in Google’s paper [10], in the RAN2#107 meeting the following agreement was made:

If PDCP duplication is not activated, upon detection of MCG failure the primaryPath for split SRB1 is implicitly reconfigured to the SCG. The UE expects the network to explicitly reconfigure the primaryPath back to MCG in the MCG recovery or in a Re-establishment

Therefore, no further agreements are expected on this issue since is already clear that is the network that needs to explicitly reconfigure the *primaryPath* to MCG (in the RRCReconfiguration or the RRCReestablishment). Nevertheless, there were concerns expressed on how the target MN understand that the *primaryPath* should be again switch to SCG during MN handover or MCG resume. For this reason, we would like to ask the following question.

Q4: Do companies think that the UE should switch the primary path from SCG to MCG upon MN handover and MCG resume?

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| Company | Yes/no | Comment |
| Ericsson | No | According to the agreement taken in RAN2#107, we think that the UE should not take any further autonomous actions for switching back the *primaryPath* from SCG to MCG. Nevertheless, we acknowledge that current RRC running CR may not be clear enough regarding this aspect. Our proposal is to address this in the email discussion [AT109e][042][DCCA] CR RRC 38331 36331 (Ericsson). |
| LG | No |  |
| MediaTek | No | For handover (reconfiguration with sync), it has been agreed that NW should use explicit signalling.  For Resume, we don’t understand why it is related. We do not expect the following scenario:  UE in CONNECTED mode 🡪 MCG Failure and fast recovery is triggered 🡪 NW send UE to INACTIVE mode??? 🡪 UE trigger Resume Request. |
| Qualcomm | No | We don’t fully understand this question. Isn’t agreement in RAN2#107 clear enough that UE will rely on NW to explictly reconfigure it back to MCG?  If PDCP duplication is not activated, upon detection of MCG failure the primaryPath for split SRB1 is implicitly reconfigured to the SCG. The UE expects the network to explicitly reconfigure the primaryPath back to MCG in the MCG recovery or in a Re-establishment  Then nothing needs to be captured in spec.  Back to the question, I think it is not clear whether it means general HO and resume procedure, or the related procedure (e.g. HO) during MCG recovery. If it is former understanding, we should stop the discussion because it is out of scoping of Rel-16 DCCA. If it is later understanding, we think HO procedure (as response to reception of MCG failure indication) has been well addressed by RAN2#107 agreement. And for resume procedure, we have the same understanding as MediaTek it isn’t related to MCG recovery. Thus, we don’t need further discussion.  All in all, we don’t think nothing further should be captured in spec. |
| Lenovo&MM | No | The UE autonomous switching is not needed since we have agreed with the explicit signalling for switching. |
| ZTE | No | The source MN knows the UE triggers MCG failure recovery, and it knows the UE has switched the primary path to SCG, so is it simpler for source MN to set “primaryPath“ field to “SCG“ in AS-Config in HandoverPreparationInfo? Then target MN can decide whether to switch it back to MCG path.  We think this can be left to NW implementation, thus autonomous switch back is not needed. |

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| OPPO | No | Follow the agreemest oade.  If the SRB is configured as split SRB, it is ususally configedd as PDCP duplication, so there is not primary leg switch issue.  I still think it is werid case to configddured the split SRB without PDCP duplication. The only requirement to confiured split SRB is for reliability. |

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| Huawei, HiSilicon | No if we can find a solution that always works in case of handover | We are glad that at least one company (ZTE) did not ignore the question we raised on how, in case of handover, the target MN needs to switch the primaryPath to MCG.  The solution mentioned by ZTE certainly can work if the target MN is a Rel-16 node and the Rel-16 specification is updated to allow this value of primaryPath in the HandoverPreparationInformation message.  Nevertheless, what happens with a legacy node which receives this? Will it reject the handover? Or will it accept it and do full configuration? |

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| NEC | No |  |
| vivo | No |  |

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| Nokia | Yes | We have a slight preference for UE-autonomous switch-back to avoid unnecessary full-config handovers triggered by target MN in cases where AS-config indicates primaryPath as SCG. (Current spec says „In this versist othe specification, only cell group ID corresponding to MCG is supported for SRBs.“) |
| CATT | No | ZTE soultion can work, or the spec can make the primaryPath mandatory present upon handover and reestablishment. |
| Samsung | No | RAN2 already agreed explicit reconfiguration. |
| Intel | No | We think ZTE comments should be able to address the issue raised as Huawei also acknowledge. We can consider this issue agast o it remains unresolved.  Regarding the HO to legacy node, we don’t think we need to consider this as there are many aspects that will not work. The behaviour we have agreed to day for thst o to use Full configuration. |
| Apple | No | RAN2 has agreed the explicit reconfiguration. |

# 3 Conclusion

According to the discussion in section 2, the following proposals are made:

# 4 References

1. [R2-2000301](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000301.zip), Fast recovery failure indication, vivo, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000541](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000541.zip), Discussion on RRC reestablishment initiated by failure of MCG failure recovery, sharp, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000677](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000677.zip), Remaining details of MCG failure recovery, Nokia, Nokia Shanghai Bell, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000873](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000873.zip), SN change during fast MCG recovery procedure, Ericsson, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000874](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2000874.zip), Value range for T316, Ericsson, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2001266](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2001266.zip), Further issues on MCG fast recovery, ZTE Corporation, Sanechips, RAN2#109-e, Electronic Meeting, February 2020
2. [R2-2001454](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2001454.zip), Discussion on MCG Failure Information Report, CATT, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2001618](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2001618.zip), Remaining issue on guard timer setup, LG Electronics Inc., RAN2#109-e, Electronic Meeting, February 2020
2. [R2-2001620](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2001620.zip), Remaining issue on guard timer setup, LG Electronics Inc., RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2001655](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs//R2-2001655.zip), Further Correction on fast MCG link recovery, Google Inc., RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2000541](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2000541.zip), Discussion on RRC reestablishment initiated by failure of MCG failure recovery, sharp, RAN2#109-e, Electronic Meeting, February 2020

1. [R2-2001162](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2001162.zip), Remaining eDCCA issues (early measurements, fast MCG recovery), Samsung Telecommunications, RAN2#109-e, Electronic Meeting, February 2020