3GPP TSG-RAN WG3 #119bis-e R3-231884

Online, Apr 17th – Apr 26th, 2023

**Agenda item: 14.2**

**Source: Huawei (rapporteur)**

**Title: Summary of offline discussion for CB: # MobilityEnh2\_L1L2Mobility**

**Document for: Discussion**

# 1 Introduction

This document contains the summary of offline discussion for the following CB:

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| --- |
| **CB: # MobilityEnh2\_L1L2Mobility****- Summary on pros and cons of candidate cell suggestion using one or multiple messages.****- Discuss on data transmission,** **i.e. introduce new message or reuse legacy message. how to define d new message, and identify which legacy message to be reused.****- How to avoid HO collision between the LTM and the L3 based inter-cell mobility.****- Discuss on subsequent LTM procedure, i.e. subsequent LTM with RACH or without RACH.****- Discuss on releasing of candidate cells, reference configuration, DDDS, releasing of candidate cells,** **TA Acquisition.****- E1 interface issue, i.e. intra-CU-UP LTM and inter-CU-UP LTM?****- Capture all the agreements for above issues and prepared for the draft CRs of TS 38.401(HW), TS 38.473(E///).** (moderator - HW)Summary of offline disc R3-231884 |

**Deadline for second round discussion:** **13:00 UTC April 24, 2023 (Monday)**

**Deadline for TPs checking: 08:00 UTC April 25, 2023 (Tuesday)**

# 2 Proposals for chair notes.

**Second round summary:**

**DDDS：**

**Proposal 3.2-1: For intra-DU LTM, DDDS from gNB-DU to CU-UP is not needed for those DRBs for which RLC is not re-established.**

**FFS on whether or how to capture it in spec.**

**Proposal 3.2-4: For intra-CU inter-DU LTM, target gNB-DU sends initial DDDS using the new UL TEID to CU-UP after target gNB-DU detects the UE access (following legacy). FFS how to capture in spec.**

**FFS: For intra-DU LTM, the gNB-DU sends initial DDDS using the new UL TEID if assigned by the CU to CU-UP after target gNB-DU detects the UE access.**

**Candidate cell modify and release:**

**Proposal 3.4-3a: the (candidate) gNB-DU may use the UE Context Modification Required message to release the candidate cells, and the gNB-CU shall not reject.**

**Proposal 3.4-4: The (candidate) gNB-DU may use the UE Context Modification Required procedure to request to cancel the prepared resources of a subset of candidate cells in it and use the UE Context Release Request procedure to request to release all candidate cells in it.**

**Candidate cells configuration in one message or multiple message:**

**Proposal: To take option 1 as baseline and adding FFS in BLCR for the sake of progress.**

**Next meeting, focus on complexity, singling overhead analysis between option 1 and option 2.**

**To be continued.**

**Data transmission:**

**No consensus. (Will be removed when upload because aleady captured in chair notes in 1st round)**

**E1 Aspects:**

R3-231746 rev in R3-232094, progress and tentative TP for E1, noted.

**To be continued on R3-232094 basis.**

**Reference configuration:**

**Conclusion: Wait for more RAN2 progress.**

**Handover collision avoidance between LTM and L3 handover:**

**Not pursued in 2nd round.**

**TPs to capture the agreement in 1st round:**

R3-231745 rev in R3-23xxxx, TP for 38.401 BLCR, agreed.

[R3-231574](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231574.zip) rev in R3-23xxxx, TP for 38.473 BLCR , agreed.

**First round summary:**

**DDDS:**

propose to agree on the following proposals:

**Proposal 3.2-1: For intra-DU LTM, DDDS from gNB-DU to CU-UP is not needed for those DRBs RLC is not re-established.**

**Proposal 3.2-2: For intra-DU LTM, the gNB-DU sends a DDDS frame about unsuccessfully transmitted downlink data to the gNB-CU after LTM cell switch if RLC reestablishment is configured.**

**Proposal 3.2-3: For inter-DU LTM, the DDDS should be sent from source gNB-DU to CU-UP when the LTM cell switch command is sent. Then the CU-UP can start forwarding the unsuccessfully transmitted data to target gNB-DU.**

**Proposal 3.2-4: For both intra-DU and intra-CU inter-DU LTM, target gNB-DU sends initial DDDS using the new UL TEID to CU-UP after target gNB-DU detects the UE access.**

Clarification from moderator for Proposal 3.2-5: There seems no need that the UL/DL GTP tunnel setup is subject to L2 configuration. Decoupling them will make implementation easier. And may have a unified handling on F1 in subsequent handover if the L2 configuration is changed.

**Proposal 3.2-5: For intra-DU LTM, if RLC is not re-established, the gNB-DU shall continue sending UL PDCP PDUs to the gNB-CU using the previous UL GTP TEID until cell switch command, and after then start sending UL PDCP PDUs using the new UL GTP TEID.**

**Proposal 3.2-6: For intra-DU LTM, if PDCP data recovery is not configured, the gNB-CU shall continue sending DL PDCP PDUs to the gNB-DU using the previous DL GTP TEID until it receives the LTM signalling from DU, and after then start sending UL PDCP PDUs using the new DL GTP TEID.**

E1 Aspects:

**Questions needs to be clarified online:**

1. For intra-DU LTM and intra-UP (i.e. no change of CU-UP), there will be no need to create new TEID, actually no signalling will be exchange with CU-UP?
2. why the CU-UP would be changed, i.e., we wanted to understand the motivation for considering the inter-CU-UP LTM case in the first place, further considering that Rel-18 LTM is for intra-CU.

**The following proposals are for agreement if above questions are clarified:**

**Proposal 3.6-1: For intra-CU-UP case, propose to turn the following WF to an agreement:**

**In case of CP UP separation, once CUCP receives LTM cell switch signling from (source)DU , CU CP initiates E1 bearer context modification to the CU UP including DL tunnel ID per DRB** **for target cell, for data transmission.**

**Proposal 3.6-2: For inter-CU-UP LTM, once the CU-CP receives LTM cell switch signaling from (source) DU, the CU-CP initiates E1 bearer context modification to the target CU UP including DL tunnel ID per DRB for target cell for data transmission.**

**Proposal 3.6-3a: Revisit the following proposals after the basic procedure is stable.**

* **One option that can minimize the impact on CU-UP when performing LTM is that the steps 3 and 4 are executed together with steps 9 and 10.**
* **One more option that can minimize the impact on CU-UP when performing LTM is that the CU-UP provides only one UL TNL address which will only be used by the target cell after successful execution of LTM cell switch.**

**To be continued.**

**Proposal 3.6-3: For inter-CU-UP LTM, the CU-CP initiates E1 bearer context modification to the source CU-UP for retrieving the latest PDCP status at the source CU-UP and exchanging the data forwarding information to target CU-UP.**

**Proposal 3.6-4: In case of gNB-CU-UP change, the gNB-CU triggers the source gNB-CU-UP to start data forwarding after receiving LTM cells switch signalling from DU.**

**Proposal 3.6-5: For inter-CU-UP LTM, Path switch procedure is performed towards the core network after detecting the UE has accessed to the target cell.**

**Candidate cell modify and release:**

**Proposal 3.4-1: The gNB-CU may modify or release L1/2 Triggered Mobility (LTM) candidate cells in the gNB-DU.**

**Proposal 3.4-2: The gNB-DU may cancel already configured L1/2 Triggered Mobility (LTM) candidate cells.**

**Proposal 3.4-3: The gNB-CU may use the UE Context Modification procedure to modify or release the prepared resources of candidate cells in the gNB-DU and use the UE Context Release procedure to release the UE context in the gNB-DU.**

**Proposal 3.4-3a: the gNB-DU may use the UE Context Modificaiton Required message to release the candidate cells, and the gNB-CU shall not reject .**

**Proposal 3.4-4: The gNB-DU may use the UE Context Modification Required procedure to request to cancel the prepared resources of a subset of candidate cells in that gNB-DU and use the UE Context Release Request procedure to request to release all candidate cells in that gNB-DU.**

**Subsequent LTM:**

**Proposal 3.5-1: Subsequent LTM is considered feasible for the candidate cells once they are configured to the UE in initial LTM configuration.**

Candidate cells configuration in one message or multiple message:

**Conclusion: no progress. To be continued.**

Data transmission:

Two options are discussed:

* Option 1: New F1 message , class c1 or class 2, like “LTM CELL CHANGE NOTIFICATION”.
* Option 2: Legacy message, i.e., “UE Context Modification Required message”

No consensus. questions needs to be clarified:

* What is the purpose of this message?
	+ Notify CU about the LTM initiation
	+ Modify to the UE context
	+ Negotiate other parameters with CU or target DU in inter-DU LTM?
	+ Any else?

**Conclusion: For intra-DU LTM, a new class 2 message is preferred. For inter-DU LTM, pending to the progress in RAN2 on how to support the RACH-less inter-DU LTM.**

**To be continued on above basis.**

**Handover collision avoidance between LTM and L3 handover:**

The following options are discussed:

* Option 1: OAM configured priority.
* Option 2: Network decides the priority based on scenario (intra-gNB-CU or inter-gNB-CU) and some assistance information (the measurement results, candidate target cells).
* Option 3: Flexible priority. The handover triggered first take the high priority.

For option 3, The detailed description would be:

* Case 1, L3 handover triggered earlier than LTM (the gNB-DU receives the L3 handover command before LTM is triggered), L3 handover has high priority.
* Case 2, LTM triggered earlier than L3 (the gNB-CU receives the LTM notify message from gNB-DU before L3 handover is triggered), LTM has high priority,
* Case 3, LTM and L3 handover are triggered almost simultaneously (cross signallings on F1). The (source) gNB-DU fails the L3 handover by responding with UE Context Modification Failure message with proper cause meaning LTM has high priority. This is to avoid to cancel the LTM command already sent to the UE which seems complex from moderator point of view.

No consensus. **To be continued on above basis.**

Second round plan:

1. Finalize the inter-CU-UP overall LTM procedure
2. Proceed TPs to reflect first round agreements that not covered by 1)
3. issues still open in 1st round, and others like reference configuration, etc.

# 3 Discussion (2nd round)

The 2nd round discussion will discuss the following issues

1. blue bullets that need further check
2. Continue the discussion for not treated topics
3. Other new topics, like reference configuration.
4. **DDDS**

The first issue is to clarify the condition for the following statement.

**Proposal 3.2-1: For intra-DU LTM, DDDS from gNB-DU to CU-UP is not needed for those DRBs RLC is not re-established.**

This proposal comes from R3-231459. And the justification is cited here:

*According to RAN2’s assumption, L2 is continued whenever possible, so the RLC in intra-DU mobility case may not be re-established. The DDDS from source gNB-DU to CU-UP is not needed since no PDCP data will be discarded in RLC during LTM, i.e. retransmission of lost PDCP data to serving DU is not needed.*

Any preferred rewording or clarification please provide here.

|  |  |
| --- | --- |
| Companies | Comments on above proposal |
| Google | OK with the proposal |
| Samsung  | If the understanding is correct, this proposal is trying to clarify that after sending the LTM command to the UE, the DDDS is not needed. This can be reflected in the stage-2 flow chart. To make it clear, the following revision is proposed:**For intra-DU LTM, DDDS from gNB-DU to CU-UP is not needed for those DRBs RLC is not re-established after Step 10 in the stage-2 intra-DU LTM flow chart.** |
| NEC | In intra LTM, no need DDDS as no reestablishment is performed in DU. |
| Huawei | Agree with the proposal. This needs to be clarified. But not sure how to capture this in stage 2. Regarding Samsung’s proposal above, considering we already have “**For intra-DU LTM, the gNB-DU sends a DDDS frame about unsuccessfully transmitted downlink data to the gNB-CU after LTM cell switch if RLC reestablishment is configured.** ” And will be captured in stage 2.And maybe capturing in stage 2 the non-reestablishment case is not needed? |
| Lenovo | Agree with the proposal. |
| CATT | Ok  |
| Nokia | OK |
| Qualcomm | Agree with the proposal. A minor suggested rewording: For intra-DU LTM, DDDS from gNB-DU to CU-UP is not needed for those DRBs for which RLC is not re-established. |
| ZTE | Agree with the proposal. This can be captured as a note for the step sending DDDS for the intra-DU case |
| E/// | The statement is fine, though it seems not necessary to capture in the spec at least for now. |
| CMCC | OK |

Moderator’s summary:

All companies are fine with the proposal. As companies still have different views on how to capture it in the sepc. The rewording from QC is used for agreement:

**Proposal 3.2-1: For intra-DU LTM, DDDS from gNB-DU to CU-UP is not needed for those DRBs for which RLC is not re-established.**

FFS on whether or how to capture it in spec.

The second one to be checked is:

**Proposal 3.2-4: For both intra-DU and intra-CU inter-DU LTM, target gNB-DU sends initial DDDS using the new UL TEID to CU-UP after target gNB-DU detects the UE access.**

The issue needs to be checked is whether this is from legacy handover and whether it is also workable for LTM.

Any comments please provide here.

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| --- | --- |
| Companies | Comments on above proposal |
| Google | OK with the proposal |
| Samsung | OK with the proposal. This is only about stage-2 impact towards the flow chart. |
| NEC | Ok, and limit to inter-DU LTM as we agree proposal 3.2-1 that no DDDS is needed for intra-DU LTM. |
| Huawei | OK for inter-DU case. For intra-DU LTM, whether new TEID on F1U is needed or not needs further discussion and clarification, especially in case of when RLC reestablishment is not configured.First of all , TEID will be transferred from CU to DU by UE Context Modification request message, in intra-DU LTM. Whether the TEID is changed or not for non RLC re-establishment DRBs , in our understanding, it is up to CU implementation.So, we may not mandate the CU not to allocate new TEID in RLF not re-establishment case.The standard needs to clarify the DU behavior in case that new TEID is assigned for RLC not re-establishment DRBs. Meaning when to active the new GTP tunnel.Furthermore, generating L1/L2 RRC configurations and user plane resource handling are usually belonging to different models in implementation. Decoupling them may make the implementation simpler.In summary, maybe the proposal can be reformulated as:**For intra-CU inter-DU LTM, target gNB-DU sends initial DDDS using the new UL TEID to CU-UP after target gNB-DU detects the UE access.****For intra-DU LTM, the gNB-DU sends initial DDDS using the new UL TEID if assigned by the CU to CU-UP after target gNB-DU detects the UE access.** |
| Lenovo | OK for inter-DU case. For the intra-DU case, OK with the proposal provided by Huawei. |
| CATT | we understand this proposal is for the initial DDDS, but intra-DU, whether we need use a new UL TEID? We are not clearly about how and whether need to decouple the UP/DL TEID and the L2 measurements. Prefer to agree inter-DU case at first, and we want to check whether need initial DDDS in intra-DU case.**For intra-CU inter-DU LTM, target Gnb-DU sends initial DDDS using the new UL TEID to CU-UP after target Gnb-DU detects the UE access.** This is the legacy procedure |
| Nokia | OK for inter-DU case. For intra-DU scenario, Huawei rephrasing is agreeable. |
| Qualcomm | Not sure. We still have some questions regarding why this is needed for LTM.We understand and agree that:- this is from the legacy handover procedure,- the initial DDDS is transmitted from the DU or the target DU to the (target) CU-UP, whereas the Access Success message is transmitted from the DU or the target DU to the CU-CP.What is not clear to us is what is the purpose of this message.Upon receiving the LTM cell switch notification from the DU or the source DU, the CU-UP initiates data transmission towards the (target) DU corresponding to the target cell. In the case the CU-UP does not change, the initial DDDS does not seem needed, as it is not clear what action it would trigger at the CU-UP.If there is CU-UP change, then it seems the initial DDDS message should be transmitted to the target CU-UP. In this case, it may be useful, because the target CU-UP can initiate data transmission to the (target) DU once it knows the UE has accessed the target cell.  |
| ZTE | For intra-DU case, we are fine with HW’s rewording. For inter-DU case, it is OK. |
| E/// | Is the intention to have common understanding or further capture something in the spec, i.e., only stage-2? For inter-DU case, it follows the legacy. For intra-DU case, the rewording from Huawei looks better, however it does not clearly address the concerns for RLC not being established. Thus we prefer to leave intra-DU open for now. |
| CMCC | We agree the proposal rewording from Huawei. |

Moderator’s summary:

It seems that all companies agree to the wording of inter-DU case.

For intra-DU case, the rewording from Huawei get some supports. However, few companies would like to keep it open.

And 1 company questioned the DDDs from target DU is needed or not. As clarified by moderator and other companies, the behavior is legacy. The intention of the discussion here is to clarify whether the legacy behavious is applicable for LTM or not.

With above clarification, the moderator would like to propose:

**Proposal 3.2-4: For intra-CU inter-DU LTM, target gNB-DU sends initial DDDS using the new UL TEID to CU-UP after target gNB-DU detects the UE access (following legacy). FFS how to capture in spec.**

**FFS: For intra-DU LTM, the gNB-DU sends initial DDDS using the new UL TEID if assigned by the CU to CU-UP after target gNB-DU detects the UE access.**

1. **Candidate cell modify and release:**

The issue needs further check that the moderator see in the chair notes is:

**Proposal 3.4-3a: the gNB-DU may use the UE Context Modification Required message to release the candidate cells, and the gNB-CU shall not reject.**

**Proposal 3.4-4: The gNB-DU may use the UE Context Modification Required procedure to request to cancel the prepared resources of a subset of candidate cells in that gNB-DU and use the UE Context Release Request procedure to request to release all candidate cells in that gNB-DU.**

Any comments please provide here.

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| --- | --- |
| Companies | Comments on above proposal |
| Google | OK with the proposal |
| Samsung  | OK |
| NEC | Both proposal 3.4-3a and 3.4-4are OK. |
| Huawei | Both are fine for us. |
| Lenovo | Agree with the proposals. |
| CATT | Also need add (candidate) before DU. |
| Nokia | OK with both proposals 3.4-3a and 3.4-4. Addition of (Candidate) before gNB-DU is also clearer. |
| Qualcomm | Agree with the proposals and the suggestion by Nokia. |
| ZTE | Agree |
| E/// | In principle ok. Add (candidate) to differentiate intra and inter-DU cases. |
| CMCC | Agree |

Moderator’s summary:

All companies agree to the proposal with a rewording comment,

The moderator propose:

**Proposal 3.4-3a: the (candidate) gNB-DU may use the UE Context Modification Required message to release the candidate cells, and the gNB-CU shall not reject.**

**Proposal 3.4-4: The (candidate) gNB-DU may use the UE Context Modification Required procedure to request to cancel the prepared resources of a subset of candidate cells in it and use the UE Context Release Request procedure to request to release all candidate cells in it.**

1. **Candidate cells configuration in one message or multiple message:**

**The suggestion from Vice chair is:**

**Working on one single solution for candidate cells configuration.**

Here is the latest status from moderator’s summary on this issue.

* **Option 1: One message: HW, E///, ZTE, LENOVO, CMCC, QC, LG, CT**
* **Option 2: multiple messages: INTEL, NOKIA, CATT, SAMSUNG, NEC, GOOGLE**
* **Option 3: Both options are supported. In case that a list of candidate cells is included, the DU responds to the CU with the accepted candidate cells which have the same admitted result for DRBs.**

Companies positions summary in 1st round:

Option 1: Ericsson, China Telecom, Huawei, NTT DOCOMO, Lenovo, ZTE, Charter Comm, QC, CMCC

Option 2: Google, NEC, CATT, Nokia, Samsung, NTT DOCOMO, CMCC, Intel

Option 3: Samsung, NTT DOCOMO, China Telecom

Any further comments or suggestions to move forward please provide here.

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| Companies | Comments |
| Samsung  | Prefer to Option 2. Can accept Option 3.  |
| Huawei | Option 1 as baseline and adding FFS in BLCR for the sake of progress. |
| Lenovo | Prefer to use Option 1 as baseline. |
| CATT | Prefer option2 |
| ZTE | Agree HW’s proposal |
| E/// | Option 1 as baseline. Further check IEs design in F1AP. Option 3 should be opted out, which will cause complexity by implementing two ways.  |
| CMCC | Prefer to use Option 1 as baseline. |

Moderator’s summary:

Inovlved companies propose to take option 1 as baseline and leave FFS in BLCR to move forward.

Therefore, the moderator propose:**Proposal: To take option 1 as baseline and adding FFS in BLCR for the sake of progress.**

**Next meeting, focus on complexity, signlaing overhead analysis between option 1 and option 2.**

**To be continued.**

1. **Data transmission:**

This topic was not treated online. And below is the moderator’s summary for the 1st round discussion.

*Two options are discussed:*

* *Option 1: New F1 message , class c1 or class 2, like “LTM CELL CHANGE NOTIFICATION”.*
* *Option 2: Legacy message, i.e., “UE Context Modification Required message”*

*Companies views summary in first round:*

* *Option 1:China Telecom (class 2), Samsung (class 1), Lenovo, Nokia, CMCC*
* *Option 2: Google, NEC, Ericsson, ZTE ,Charter Comm ,LGE ,Qualcomm, Intel, CATT*
* *Either option 1 or option 2: NTT DOCOMO, Huawei*

*No consensus. questions needs to be clarified:*

* *What is the purpose of this message?*
	+ *Notify CU about the LTM initiation*
	+ *Modify to the UE context*
	+ *Negotiate other parameters with CU or target DU in inter-DU LTM?*
	+ *Any else?*

***Conclusion: For intra-DU LTM, a new class 2 message is preferred. For inter-DU LTM, pending to the progress in RAN2 on how to support the RACH-less inter-DU LTM.***

Let’s continue the discussion with above summary as a basis.

Any further comments or suggestions to move forward please provide here.

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| Companies | Comments |
| Google | It seems that Option 2 had more support in the first round? (then not sure how the conclusion is made.) |
| Samsung  | No decision for this meeting.Suggest to make decision between Option1 and Option 2 after the purpose or content of this message is clear. As mentioned by moderator, the content of this message needs further progress from RAN2. we can discuss the purpose and the content of this message in the next meeting based on RAN2 progress.  |
| NEC | Indeed, how the proposed conclusion is made based on option 1 that has less support?the UE Context Modification Required message will be extended to also handling the modification of UE context related with LTM (if any), so we prefer to extend the existing UE Context Modification Required message, also to be used from source DU is to tell CU that the LTM command has been sent or about to send to the UE, |
| Huawei | Propose to continue in next meeting on above as a basis.  |
| Lenovo | Agree to continue in next meeting. |
| CATT | In our understanding, the two options do not have much difference. A basic purpose is to inform CU that LTM is happened. Whether it can be called as a kind of UE context modification is a bit tricky. But in some degree, a release can also be seen as a modification Required. Also, this required can not be refused by the CU.To put the discussion forward, we can accept the option 2, and indicate this require can not be refused. For the third impact *Negotiate other parameters with CU or target DU in inter-DU LTM,* we think it is no matter with use a new message or a legacy one. |
| Nokia | Agree with moderator’s proposal ***Conclusion: For intra-DU LTM, a new class 2 message is preferred. For inter-DU LTM, pending to the progress in RAN2 on how to support the RACH-less inter-DU LTM.***Also, as discussed several times, reuse of gNB-DU initiated UE Context Modification procedure is not appropriate. When a gNB-DU informs that LTM has been triggered, it is NOT modifying the actual UE Context nor modifying its prior configuration via this signaling. Further, in regard to CATT comment. This is clearly different also from a DU initiated request to deconfigure LTM cells. In this latter case, there is an action taken by CU to modify the UE context at DU. |
| LGE | This message may be to negotiate other parameters with CU or the target DU in inter-DU LTM and notify CU about the LTM initiation. Suppose the gNB-CU receives some parameters from the target DU due to the negotiation. In that case, it can send the received ones to the source gNB-DU as a response, e.g., using the UE CONTEXT MODIFICATION CONFIRM message.  |
| ZTE | *Companies views summary in first round:** *Option 1:China Telecom (class 2), Samsung (class 1), Lenovo, Nokia, CMCC*
* *Option 2: Google, NEC, Ericsson, ZTE ,Charter Comm ,LGE ,Qualcomm, Intel, CATT*
* *Either option 1 or option 2: NTT DOCOMO, Huawei*

According to the above summary, 9 companies support option 2 and 5 companies support option 1, then why the conclusion is “For intra-DU LTM, a new class 2 message is preferred”?Prefer to reuse the existing message. |
| E/// | Share similar views as Google and NEC. The conclusion does not reflect first round discussion.Either we make Option 2 as WA, or continue talking F2F. |
| CMCC | Agree with introducing a new F1 message, but it seems that people in this meeting do not reach an agreement. Prefer discuss in next meeting based on the current analysis. |

Moerator’s summary:

The discussion is still diverging. Option 2 gets more support. And moderator’s conclusion gets 1 support and some challenges.

Therefore, it is concluded:

No consensous.

**To be continued.**

1. **E1 Aspects:**

This topic was not treated online either. And below is the moderator’s summary for the 1st round discussion.

***Questions needs to be clarified online:***

1. *For intra-DU LTM and intra-UP (i.e. no change of CU-UP), there will be no need to create new TEID, actually no signalling will be exchange with CU-UP?*
2. *whether can realize CU UP change without security key update? This case is very limited and we prefer to consider it later.*
3. *why the CU-UP would be changed, i.e., we wanted to understand the motivation for considering the inter-CU-UP LTM case in the first place, further considering that Rel-18 LTM is for intra-CU.*

Any comments or answers to above questions please provide here.

|  |  |
| --- | --- |
| Companies | Comments |
| Samsung  | 1. This depends on whether there is PDCP recovery/RLC reestablishment.
2. Agree to discuss this later if it is a valid case.
3. RAN2 already agreed

No security update support in Rel-18 with L1/L2 based mobility.So, the CU-UP change may not be applicable.  |
| NEC | 1. For intra-DU LTM and intra-UP, there will be no need to create new TEID so no signalling will be exchanged with CU-UP.2. RAN2 agreed that LTM does not need to have security update, so for now understand no need to have security update.3. indeed why the CU-UP would be changed for intra-DU LTM? |
| Huawei | Q1: We think that it is up to CU/DU implementation. See detailed comments below which is also mentioned above.TEID will be transferred from CU to DU by UE Context Modification request message, in intra-DU LTM. Whether the TEID is changed or not for non RLC re-establishment DRBs , in our understanding, it is up to CU implementation.So, we may not mandate the CU not to allocate new TEID in RLF not re-establishment case in standard.Furthermore, generating L1/L2 RRC configurations and user plane resource handling are usually belonging to different models in implementation. Decoupling them may make the implementation simpler.Standard should leave this flexibility to implementation. Once new TEIDs are assigned, there will be impact on E1. Q2 may relates to Q3: Regarding the feasibility of no security update in inter-UP LTM, we have no clear view, but can provide the following prior arts:In TS 33.501, it says:*6.9.2.3.1 Intra-gNB-CU handover and intra-ng-eNB handover**The gNB shall have a policy deciding at which intra-gNB -CU handovers the KgNB can be retained and at which a new KgNB needs to be derived. At an intra-gNB-CU handover, the gNB shall indicate to the UE whether to change or retain the current KgNB in the HO Command message. Retaining the current KgNB shall only be done during intra-gNB-CU handover.* If UP change is occurred in intra-CU, it seems clear that the security key can be retained in this case.And the following agreement made in RAN2 does not restrict it only applicable to intra-CU-UP. RAN3 should assume that this agreement is applicable for both intra-UP and inter-UP cases.No security update support in Rel-18 with L1/L2 based mobility.And there is no any excuse to exclude the inter-UP LTM for the time being which may negatively impact on the commercial scenarios for LTM.Furthermore, in TS38.401 section 8.9.5, change of CU-UP is supported. It implies that UP change can likely happen even in intra-DU LTM.We think that above evidences justify the motivate of support of inter-UP LTM regardless of the security key is retained or not. |
| Lenovo | Prefer to discuss them in next meeting with more consideration. |
| CATT | First force on the without CU-CP change in intra-DU case. |
| Nokia | 1. Whether the TEID changes or not may depend on implementation. Hence, this scenario should not be excluded.2. In our understanding, the CU-UP may change even if the security is not updated.3. Different cells that support LTM can have different CU-UP serving them. Hence, the inter CU-UP change scenario should be considered and NOT excluded. |
| Qualcomm | 1. It seems we should follow the legacy intra-DU handover case, in which there are new TEIDs created at handover.2. Agree with NEC on this.3. If there is a specific reason for why the CU-UP may be changed, e.g., load balancing, preferred deployment, it would be good to know and understand. This question arises for both the inter-DU, intra-CU, and the intra-DU cases.  |
| LGE | Same view as Lenovo. |
| ZTE | Same view as Lenovo. Need more time to check. |
| E/// | We focus on intra-UP case first. No security update is considered, which adheres to the agreements established by RAN2. |
| CMCC | Same view as Lenovo. |

Moderator’s summary:

Huawei is trying to provide some answers to the questions to be clarified. However, this is no time for companies to check the details.

**To be continued.**

***The following proposals are for agreement if above questions are clarified:***

***Proposal 3.6-1: For intra-CU-UP case, propose to turn the following WF to an agreement:***

***In case of CP UP separation, once CUCP receives LTM cell switch signling from (source)DU , CU CP initiates E1 bearer context modification to the CU UP including DL tunnel ID per DRB for target cell, for data transmission.***

***Proposal 3.6-2: For inter-CU-UP LTM, once the CU-CP receives LTM cell switch signaling from (source) DU, the CU-CP initiates E1 bearer context modification to the target CU UP including DL tunnel ID per DRB for target cell for data transmission.***

***Proposal 3.6-3a: Revisit the following proposals after the basic procedure is stable.***

* ***One option that can minimize the impact on CU-UP when performing LTM is that the steps 3 and 4 are executed together with steps 9 and 10.***
* ***One more option that can minimize the impact on CU-UP when performing LTM is that the CU-UP provides only one UL TNL address which will only be used by the target cell after successful execution of LTM cell switch.***

***To be continued.***

***Proposal 3.6-3: For inter-CU-UP LTM, the CU-CP initiates E1 bearer context modification to the source CU-UP for retrieving the latest PDCP status at the source CU-UP and exchanging the data forwarding information to target CU-UP.***

***Proposal 3.6-4: In case of gNB-CU-UP change, the gNB-CU triggers the source gNB-CU-UP to start data forwarding after receiving LTM cells switch signalling from DU.***

***Proposal 3.6-5: For inter-CU-UP LTM, Path switch procedure is performed towards the core network after detecting the UE has accessed to the target cell.***

Any comments to the first round proposals for agreement and WF please provide here.

|  |  |
| --- | --- |
| Companies | Comments |
| Google | Generally ok with the proposals (if the inter-CU-UP LTM use case is clarified) |
| Samsung  | The above proposals can be discussed after the above questions are clarified.  |
| NEC | Can be discussed after. |
| Lenovo | Related to the above question. Prefer to discuss them in next meeting with more consideration. |
| CATT | Agree with lenovo |
| Nokia | Agree in general with Proposals 3.6-1 and 3.6-2. The wording can also be improved by replacing “once” to “after”.NOK for Proposal 3.6-3a. These proposals also break the basic framework already existing for establishing UE/Bearer contexts in disaggregated architecture.OK for proposals 3.6-3, 3.6-4, 3.6-5. |
| Qualcomm | The proposals look fine. But we prefer the previous basic questions to be answered first. Also, prefer that proposal P3.6-3a is kept as an FFS item. |
| LGE | Same view as Lenovo. |
| ZTE | Same view as Lenovo. |
| E/// | Prefer to consider in a full package.  |
| CMCC | Same view as Lenovo. |

Moderator’s summary:

**To be continued,**

**Stage 2 TP for Inter-DU LTM with gNB-CU-UP change checking:**

The following shows the tentative overall message flow for inter-CU-UP LTM. For intra-CU-UP LTM message flow, the moderator thinks that it is simple and could be treated part of the inter-CU-UP case. The only difference is in step 2 and 3, in which Bearer Context Modification will be used in case of intra-CU-UP LTM.

****

**Figure : Inter-DU LTM with gNB-CU-UP change**

*0. The source gNB-DU forwards the Measurement Report to the gNB-CU-CP.*

*1. The gNB-CU-CP decides to initiate LTM configuration.*

*2. The gNB-CU-CP sends a BEARER CONTEXT SETUP REQUEST message containing UL TNL address information for NG-U to setup the bearer context in the gNB-CU-UP.*

*3. The gNB-CU-UP responds with a BEARER CONTEXT SETUP RESPONSE message containing the UL TNL address information for F1-U, and DL TNL address information for NG-U.*

*4 - 5. F1 UE context setup procedure is performed to setup one or more bearers in the gNB-DU.*

*6. The gNB-CU-CP notifies the source gNB-DU and sends the RRC Reconfiguration message to the UE.*

*7. The source gNB-DU makes the LTM decision.*

*8. The source gNB-DU sends the LTM cell switch notify message to the gNB-CU-CP with the selected target cell ID.*

*9-10. The gNB-CU-CP performs the Bearer Context Modification procedure to retrieve the PDCP UL/DL status and to exchange data forwarding information for the bearer.*

*11-12. The gNB-CU-CP performs the Bearer Context Modification procedure to send the DL TNL address information for F1-U and data forwarding between source gNB-CU-UP and target gNB-CU-UP, and PDCP status.*

*13. The target gNB-DU detects the UE in the target cell.*

*14. The target gNB-DU sends an Access Success message to the gNB-CU-CP.*

*15. Data Forwarding may be performed from the source gNB-CU-UP to the target gNB-CU-UP.*

*16 - 18. Path Switch procedure is performed to update the DL TNL address information for the NG-U towards the core network.*

*19-20. Bearer Context Release procedure may be performed to release the UE context in the source gNB-DU. This step may be skipped in case that subsequent LTM is supported.*

**Q3.6-6: Any comments on above tentative message flow for inter-CU-UP LTM?**

Comments on the tentative inter-CU-UP LTM message flow, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | Generally ok with the tentative message flow (if the inter-CU-UP LTM use case is clarified) | Additional question: “The only difference is in step 2 and 3, in which Bearer Context Modification will be used in case of intra-CU-UP LTM.” Are steps 2 and 3 needed for intra-CU-UP LTM? |
| Samsung  | Not ready for the flow chart |  |
| NEC | Generally ok. | Understand this figure for Inter-DU LTM with gNB-CU-UP change.(By the way, does the wording “inter-DU LTM” mean inter-DU LTM with gNB-CU-UP change?) |
| Huawei |  | Reply to Google:See clarifications on above questions.Reply to NEC: yes |
| Lenovo | Related to the above question. Prefer to discuss them in next meeting with more consideration. |  |
| CATT | Generally agree |  |
| Nokia | Needs updates | Step 6 should be DL RRC MESSAGE TRANSFER, up to now RAN3 has also not agreed on “notifying” anything to DU regarding other neighbours during LTM configuration stage. Likewise, an UL RRC MESSAGE TRANSFER message should also take place after the RRC Reconfiguration to the UE.After Step 12. Data forwarding can already take place given that the corresponding tunnels have been set via E1 signaling. There is no need to wait until CU-CP receives ACCESS SUCCESS message from DU.  |
| Qualcomm | Generally fine, but prefer that the proposals are agreed first before proceeding with the overall signalling flow |  |
| ZTE | Prefer to wait for the progress of the above proposals.We are also wondering why a separate signalling is needed for the E1 procedure. Can it be merged with the existing intra-DU and inter-DU procedures? |  |
| E/// | Not for now |  |
| CMCC | Prefer to wait |  |

Moderator’s summary:

Some companies think that the procedure is ok in general, but is subject to the questions above.

Some companies prefer to treat it next meeting.

Since we have had some discussion and progress in the 1st round discussion, in order not to start from 0 at next meeting, the moderator would like to cpture the E1 aspect stuff in a WF document, and we continue in next meeting based the WF.

The moderator proposes:

R3-231746 rev in R3-23xxxx, progress and tentative TP for E1, noted.

To be continued on R3-23xxxx basis.

1. **Reference configuration**

This is a new topic which was not discussed in the first round. Some companies think that this needs to be discussed in this meeting in RAN3.

R3-231315, R3-231678 think that reference configuration transmission should be support in F1, details are pending on RAN2. While R3-231388 provide few dedicated proposals which have RAN3 impact.

***Proposal 1: A gNB-DU generates the reference configuration for initial LTM configuration.***

Intra-gNB DU LTM:

***Proposal 2: The gNB-DU takes the reference configuration into account when generating the lower layer RRC configurations.***

Inter-gNB DU LTM:

***Proposal 3: The gNB-CU may provide a reference configuration to the gNB-DU in the UE Context Setup Request message to the gNB-DU.***

***Proposal 4: The candidate gNB-DU may generate the reference configuration for LTM configuration if not received from the gNB-CU.***

***Proposal 5: The candidate gNB-DU is not allowed to update the reference configuration if received from the gNB-CU.***

Any comments on above proposals please provide here.

|  |  |
| --- | --- |
| Companies | Comments |
| Google | Support the proposals (as the proponent) and think that these points should be discussed considering the RAN2 progress (stage 2 and 3 running CR had captured the reference configuration). The stage 2 TP to 38.401 to reflect the above proposals can also be considered if the proposals are agreeable.  |
| Samsung  | Suggest to delay this discussion since this is a new topic.  |
| NEC | Can wait for RAN2 to have more concrete conclusion. |
| Huawei | Similar view as NEC. |
| Lenovo | Same view with NEC. |
| CATT | Agree to wait more details from RAN2 |
| Nokia | Too soon for any conclusion. This discussion to take place based on RAN2 progress at next meeting. |
| Qualcomm | Can wait for RAN2 progress on this. |
| LGE | Wait for RAN2 progress. |
| ZTE | Wait for RAN2 progress. |
| E/// | Prefer to wait |
| CMCC | Wait for RAN2 progress. |

Conclusion: Wait for more RAN2 progress.

1. **Handover collision avoidance between LTM and L3 handover:**

This issue was not treated online either. The moderator thinks that there are already quite lots of topics in 2nd round. And propose not to open the discussion in 2nd round for this topic.

1. **TPs to capture the agreements**

The moderator forgot that we still have 1 task in this CB:

**-Capture all the agreements for above issues and prepared for the draft CRs of TS 38.401(HW), TS 38.473(E///).**

And commented are received asking to trigger this earlier so that we have more time to check the TPs.

**Agreements in 1st round discussion:**

**1. DDDS:**

**For intra-DU LTM, the gNB-DU sends a DDDS frame about unsuccessfully transmitted downlink data to the gNB-CU after LTM cell switch if RLC reestablishment is configured.**

**For inter-DU LTM, the DDDS should be sent from source gNB-DU to CU-UP when the LTM cell switch command is sent. Then the CU-UP can start forwarding the unsuccessfully transmitted data to target gNB-DU.**

**2. Candidate cell modify and release:**

**The gNB-CU may modify or release L1/2 Triggered Mobility (LTM) candidate cells in the gNB-DU.**

**The (candidate) gNB-DU may cancel already configured L1/2 Triggered Mobility (LTM) candidate cells and notify to the CU.**

**The gNB-CU may use the UE Context Modification procedure to modify or release the prepared resources of candidate cells in the (candidate) gNB-DU and use the UE Context Release procedure to release the UE context in the (candidate) gNB-DU.**

**Agreements in 2nd round discussion:**

TBD.

TPs:

R3-231745 rev in R3-23xxxx, TP for 38.401 BLCR (Huawei).

[R3-231574](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231574.zip) rev in R3-23xxxx, TP for 38.473 BLCR (Ericsson).

**Deadline for second round discussion: 13:00 UTC April 24, 2023 (Monday)**

**Deadline for TPs checking: 08:00 UTC April 25, 2023 (Tuesday)**

# 4 Discussion (1st round)

Here is the list of topics summarized by chair to be discussed in this CB:

* Summary on pros and cons of candidate cell suggestion using one or multiple messages.
* Discuss on data transmission, i.e. introduce new message or reuse legacy message. how to define d new message, and identify which legacy message to be reused.
* How to avoid HO collision between the LTM and the L3 based inter-cell mobility.
* Discuss on subsequent LTM procedure, i.e. subsequent LTM with RACH or without RACH.
* Discuss on releasing of candidate cells, reference configuration, DDDS, releasing of candidate cells, TA Acquisition.
* E1 interface issue, i.e. intra-CU-UP LTM and inter-CU-UP LTM?
* Capture all the agreements for above issues and prepared for the draft CRs of TS 38.401(HW), TS 38.473(E///).

Note that TA acquisition is related to the RAN1 LS, and it will be discussed in the other CB in this AI.

And reference configuration issue is more related to RAN2 and moderator proposes to wait for more RAN2 progress before discussing it in RAN3. Hope the authors of those proposals to understand.

#### 3.1 Issue 1: Candidate cells configuration in one message or multiple message

Below are the companies views on this issue at last meeting,

* **Option 1: One message: HW, E///, ZTE, LENOVO, CMCC, QC, LG, CT**
* **Option 2: multiple messages: INTEL, NOKIA, CATT, SAMSUNG, NEC, GOOGLE**

Papers in R3-231315, R3-231447, R3-231459, R3-231510, R3-231573, and R3-231848 express support to option 1. While paper in R3-231751, think that option 2 should be adopted to minimize the spec impact. R3-231807 thinks that either option is fine. R3-231747 proposes a compromised solution as following.

* **Option 3: Both options are supported. In case that a list of candidate cells is included, the DU responds to the CU with the accepted candidate cells which have the same admitted result for DRBs.**

After read all papers related to this issue, the moderator thinks that there are no any new arguments brought up which can be used to make a final decision. And it seems that companies still keep their positions no change as last meeting.

Keeping it in mind that much more F1AP signalling requirements will be needed for L1 measurement configuration and early TA acquisition according to the LS in R3-231107 (discussed in another CB), let’s check companies views once again to see if we can converge.

**Q 3.1-1: Which option do you prefer among option 1, 2 and 3?**

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any |
| Google | Option 2 is preferred | There is no actual problem to adopt Option 2 as it already works for R-17;As for skipping the reference configuration issue, there had been sufficient RAN2 progress in this topic (i.e., agreements and running CRs) and as RAN2 does not handle the F1 interface, we should have some discussion as well.  |
| NEC | Option 2 |  |
| E/// | Option 1 | The principle between R17 CHO for example is fundamentally different with R18 LTM. For Xn interface the UE-associated logical connection may not be maintained for all the time UE is in connected mode, so the parallel HO request procedures were introduced. However, for F1AP, CU can be always connected to DU, so there is no need to re-initiate the UE associated logical connection at certain time intervals. To avoid overhead signaling, Option 1 would be the best way for network implementation. |
| China Telecom | Option 1 or Option3 | We still prefer1 as it can reduce the signalling load over F1 interface. LTM is more suitable for FR2 scenario, which means there are more candidate cells, if we only allowed to configure the candidate cell in parallel way, the signalling load will be heavy. For option 2, it can also be supported if option 1 is adopted, by carrying only one candidate cell in each request message.As moderator proposed, we can also adopt option 3 as a compromise way.  |
| CATT  | Still prefer option 2 | Signalling load may not very critical in F1AP |
| NTT DOCOMO | Option 1, 2, and 3 | We are open for these options. However, option 3 seems good compromised solution. |
| Huawei | Option 1  | If option 2 is adopted, it means that there will be much more F1 signalling between source DU and CU, and between target DU and CU for support of L1 measurmemnt configuration and early TA acquisition. |
| Samsung | If we want to progress, Option 3 is a middle ground. | The key difference between two methods is how to deal with the case that different candidate cells have different admission results. To support this case, the single message method will result in large specification impact since different admission results should be reflected w.r.t. different candidate cells. This is what we want to avoid. Option 3 is a middle ground between Opt 1 and Opt 2. If multiple candidate cells can have the same admission results, the impact to the signal can be small. |
| Lenovo | Option 1 | The reason why parallel configuration is adopted for CHO is to align with the Xn interface design, where the target node can choose only one cell and send the respective RRC HandoverCommand message in the Handover Request Acknowledge message.For LTM, there is only impact on F1 interface. We don’t need to follow the CHO principle, and we propose to contain multiple candidate cells in one message to reduce the signalling overhead. |
| ZTE | Option 1 | Since we are stuck in this issue for several meetings, option 3 may be the way forward. |
| Charter Comm | Option 1 |  |
| Qualcomm | Option 1 | We think Option 1 is preferable from a latency point of view, and also taking into account the fact that subsequent configuration modifications may be needed after the initial preparation (using multiple messages results in delays in such modification procedures also). We can try and make Option 1 work even though there are changes required to the signalling messages. |
| Nokia | Option 2 | Single procedure incurs unnecessary complexity. Similarly, the signaling overhead over F1 is likely not overly critical. This given that we do not assume that LTM configurations would change too frequently over short periods of time. Hence, there is a benefit in terms of IE structure and F1AP spec reuse from utilizing multiple messages, each conveying configuration of each target candidate cell. |
| CMCC | Either option | In the online meeting, hope people in RAN could evaluate the complexity of spec design on candidate cell suggestion during this meeting. |
| Intel | Option 2 | As we discussed in our paper, there’s no issue for using option 2, as it follows the same approach that was previously established for CHO/CPAC |

**Moderator’s summary:**

Option 1: Ericsson, China Telecom, Huawei, NTT DOCOMO, Lenovo, ZTE, Charter Comm, QC, CMCC

Option 2: Google, NEC, CATT, Nokia, Samsung, NTT DOCOMO, CMCC, Intel

Option 3: Samsung, NTT DOCOMO, China Telecom

Companies views are still diverged. However, the moderator would like to encourage companies to think of the signalling requirements for support of L1 measurement configuration, early TA acquisition, and subsequent LTM. If one LTM configuration message only contains 1 single cell, the additional F1AP signalling for support of those functions will increase with the number of prepared candidae cells.

**Conclusion: no progress. To be continued.**

#### 3.2 Data transmission

In this section, we will discuss, i.e. introduce new message or reuse legacy message, how to defined new message, and identify which legacy message to be reused, probably also the DDDS handling as this relates to the data transmission.

RAN3 has agreed that the gNB-DU will notify the gNB-CU about the LTM initiation with a F1AP message. And it is still FFS on whether to use a new message or legacy message.

To summarize the proposals in papers in R3-231182, R3-231447, R3-231459, R3-231510, R3-231573, R3-231652, R3-231678, R3-231747, R3-231807, and R3-231848, the following options are on the table:

* **Option 1: New F1 message , class 1 or class 2, like “LTM CELL CHANGE NOTIFICATION”.**
* **Option 2: Legacy message, i.e., “UE Context Modification Required message”**

Note that as we have agreed to design common messages for both intra-DU LTM and inter-DU LTM. Therefore, above options covers the two use cases.

**Q 3.2-1: Which option do you prefer between option 1, and option 2?**

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any |
| Google | Option 2 is preferred |  |
| NEC | either is workable, however prefer option2 to extend existing message in order to avoid a single signalling message only for one purpose. |  |
| E/// | Option 2 |  |
| China Telecom | Option 1 | We think define a new message is more reasonable, since the legacy Modification procedure aims to modify the established UE Context. The new introduced message can be a class 2 message which doesn’t require feedback information from the receiving node, in this way, the F1 interface ssignalling load and latency can be reduced. |
| CATT | Slightly prefer option 1 | Just due to the usage of the discussed message is not match any legacy message |
| NTT DOCOMO | Open for both options |  |
|  |  |  |
| Huawei | Either way is fine | We think that either way is feasible. And it is pending to the progress in RAN2 on how to support the RACH-less inter-DU LTM. And it depends on the purpose of this message. If the only purpose of this procedure is to inform the CU about the initiation of LTM, then a new class 2 procedure may be sufficient. But if this procedure is used to negociate something with CU or target DU, then, a class 2 procedure is needed. Either new message or legacy is feasible. |
| Samsung | Option 1 | Since this is specific for LTM, a new F1 message may be cleaner. On top of this, class 1 procedure would be more suitable. The reason is that we may need this message to transmit other information. |
| Lenovo | Option 1 | As described in TS 38.473, the purpose of the UE Context Modification Required procedure is to modify the established UE Context, e.g., modifying and releasing radio bearer resources, or sidelink radio bearer resources or candidate cells in conditional handover or conditional PSCell addition or conditional PSCell change. However, when the DU is to inform that the cell switch has been triggered, it is not about changing the UE Context. |
| ZTE | Option 2 | We should avoid defining new messages for single usage. The usage of the UE context modification required message can be extended to be reused. |
| Charter Comm | Option 2 |  |
| LGE | Option 2 | Though this signalling has only one purpose for LTM, additional information would be transmitted to the gNB-CU using it. |
| Qualcomm | Option 2 | Agree with NEC |
| Nokia | Option 1 | Defining a NEW procedure is preferable, and reuse of gNB-DU initiated UE Context Modification procedure is not appropriate. When a gNB-DU informs that LTM has been triggered, it is NOT modifying the actual UE Context nor modifying its prior configuration via this signaling. Thus, even if there is to be some level of information updated later on (e.g., as in an inter-gNB-DU scenario), that would be a decision handled at gNB-CU itself as a result of LTM procedure being carried out and not due to a “request from the source gNB-DU”. Therefore, a new message should be introduced. |
| CMCC | Option 1 | It is found that there is no suitable procedure in F1AP to inform gNB-CU about the initiation of the L1/L2 triggered mobility. |
| Intel | Option 2 |  |

**Moderator’s summary:**

* **Option 1: New F1 message , class 1 or class 2, like “LTM CELL CHANGE NOTIFICATION”.**
* **Option 2: Legacy message, i.e., “UE Context Modification Required message”**

Option 1:China Telecom (classs 2), CATT, Samsung (class 1), Lenovo, Nokia, CMCC

Option 2: Google, NEC, Ericsson, ZTE ,Charter Comm ,LGE ,Qualcomm, Intel

Either option 1 or option 2: NTT DOCOMO, Huawei

Moderator’s summary:

Technically, either option 1 or option 2 is feasible. Here are the questions needs to be clarified:

* What is the purpose of this message?
	+ Notify CU about the LTM initiation
	+ Modify to the UE context
	+ Negotiate other parameters with CU or target DU in inter-DU LTM?
* **Conclusion: For intra-DU LTM, a new class 2 message is preferred. For inter-DU LTM, pending to the progress in RAN2 on how to support the RACH-less inter-DU LTM.**

**To be continued.**

**DDDS:**

The following proposals are made by companies’ papers about DDDS:

**Proposal 3.2-1: For intra-DU LTM, DDDS from gNB-DU to CU-UP is not needed for those DRBs RLC is not re-established.**

**Proposal 3.2-2: For intra-DU LTM, the gNB-DU sends a DDDS frame about unsuccessfully transmitted downlink data to the gNB-CU after LTM cell switch if RLC reestablishment is configured.**

**Proposal 3.2-3: For inter-DU LTM, the DDDS should be sent from source gNB-DU to CU-UP when the LTM cell switch command is sent. Then the CU-UP can start forwarding the unsuccessfully transmitted data to target gNB-DU.**

**Proposal 3.2-4: For both intra-DU and intra-CU inter-DU LTM, target gNB-DU sends initial DDDS using the new UL TEID to CU-UP after target gNB-DU detects the UE access**

Q**3.2-2: Any comments on above proposals:**

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any |
| Google | OK with the proposals  |  |
| NEC | Agreeable to all proposals. |  |
| E/// | Fine |  |
| China Telecom | We are fine with the above proposals. |  |
| CATT | Ok with Proposal 3.2-1, 3.2-3, | For the proposal 3.3-2, the high level principle is ok, one concern is according to RAN2 discussion, in intra-DU case, there is no RLC re-established, so we why we need proposal 3.3-2? If we agree this proposal, may mislead other group that intra-DU case may have RLC re-establishe.[Moderator] As per RAN2 agreement, whether RLC is re-established or not is configurable by RRC.For 3.2-4, intra-DU, DDDS seems not needed.[Moderator] the DDDS is used on F1-U to inform the CU or CU-UP that the UE is reachable in the target cell. Same DU behaviour as legacy L3 HO. |
| NTT DOCOMO | OK with the proposals |  |
|  |  |  |
| Huawei | All above proposals are agreeable. |  |
| Samsung | Comments | We are not sure about the intention of the first three proposals. DDDS should be sent regardless of there is a handover or not. Even there is no RLC re-establishment, the DDDS is also needed since this is used by UP for flow control. For the fourth one, is it legacy behaviour?[Moderator] the intention of the proposals are to clarify the DU behaviour on F1-U during LTM. For the scenario of RLC is not re-established, DDDS is not prohibit but is not needed from standard pov. The fourth proposal is legacy behaviour. |
| Lenovo | Agree with the proposals. |  |
| ZTE | Agree |  |
| Charter Comm | OK with the proposals |  |
| Qualcomm | OK with the proposals. Please see comments for P3.2-4 | Since we already have the Access Success message, we were wondering what is the purpose of sending the initial DDDS message (we understand that the initial DDDS is a part of legacy handover execution, but wondering if it is needed here).  |
| Nokia | Agree with the proposals |  |
| CMCC | Agree with the proposals |  |

**Moderator’s summary:**

Majority companies agree to the proposals. Moderator’s clarifications are provided to CATT, Samsung and QC’s comments above inline.

The moderator therefore propose to agree on the following proposals:

**Proposal 3.2-1: For intra-DU LTM, DDDS from gNB-DU to CU-UP is not needed for those DRBs RLC is not re-established.**

**Proposal 3.2-2: For intra-DU LTM, the gNB-DU sends a DDDS frame about unsuccessfully transmitted downlink data to the gNB-CU after LTM cell switch if RLC reestablishment is configured.**

**Proposal 3.2-3: For inter-DU LTM, the DDDS should be sent from source gNB-DU to CU-UP when the LTM cell switch command is sent. Then the CU-UP can start forwarding the unsuccessfully transmitted data to target gNB-DU.**

**Proposal 3.2-4: For both intra-DU and intra-CU inter-DU LTM, target gNB-DU sends initial DDDS using the new UL TEID to CU-UP after target gNB-DU detects the UE access.**

**Agreements clarification:**

RAN3 made the following agreement on TEID assignment at RAN3#118 meeting which is same as the legacy.

|  |
| --- |
| **For intra-DU LTM, the gNB-CU assigns a new UL GTP TEID for each DRB and provides it to the gNB-DU via UE Context Modification Request message(s). The gNB-DU assigns the new DL GTP TEIDs per DRB per candidate cell (whether it should be per candidate cell needs to be further discussed) and provides them back to the gNB-CU in UE Context Modification Response message(s).****For inter-DU LTM, the gNB-CU assigns a new UL GTP TEID for each DRB and provides it to the target gNB-DU via UE Context Setup Request message(s). The target gNB-DU assigns the new DL GTP TEIDs per DRB per candidate cell (whether it should be per candidate cell needs to be further discussed) and provides them back to the gNB-CU in UE Context Setup Response message(s).** |

One thing which may be different from the legacy is that RAN2 agreed that the L2 can be continued without RLC re-establishment and PDCP recovery which is controlled by network as shown below.

|  |
| --- |
| * **R2 assumes that L2 is continued whenever possible (e.g. intra-DU), without Reset, with the target to avoid data loss, and the additional delay of data recovery.**
* **R2 assumes that at L1L2 cell switch: Whether the UE performs partial or full MAC reset (FFS what partial reset is, e.g. to avoid data loss), re-establish RLC, perform data recovery with PDCP is explicitly controlled by the network. R2 assumes that this can be configured by RRC. FFS if MAC CE indication(s) is/are needed.**
 |

For UL GTP-U tunnel switching, it is clear that if RLC is re-established, the gNB-DU shall continue sending UL PDCP PDUs to the gNB-CU using the previous UL GTP TEID until RLC is re-established which is the same as legacy. The new case needs to clarify is when to switch the UL GTP tunnel in case of RLF is not re-established.

Similar issue exits for the PDCP recovery case for DL. The proposal from company paper is that:

**Proposal 3.2-5: For intra-DU LTM, if RLC is not re-established, the gNB-DU shall continue sending UL PDCP PDUs to the gNB-CU using the previous UL GTP TEID until cell switch command, and after then start sending using the new UL GTP TEID.**

**Proposal 3.2-6: For intra-DU LTM, if PDCP data recovery is not configured, the gNB-CU shall continue sending DL PDCP PDUs to the gNB-DU using the previous DL GTP TEID until it receives the LTM signalling from DU, and after then start sending using the new DL GTP TEID.**

**Q3.2-3: Any comments on above proposals:**

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any |
| Google | OK with the proposals |  |
| NEC | For intra-DU LTM, if RLC is not re-established and PDCP data recovery is not configured, then will not need new UL/DL TEID. In intra-DU LTM, would this be not the normal case? | [Moderator]There seems no need that the UL/DL GTP tunnel setup is subject to L2 configuration. Decoupling them will make implementation easier. And may have a unified handling on F1 in subsequent handover if the L2 configuration is changed. |
| E/// | Same question as NEC |  |
| China Telecom | We are fine with the above proposals. |  |
| CATT | Same as NEC, why need new DL/UL TEID in intra-DU case |  |
| NTT DOCOMO | OK with the proposals |  |
| Huawei | Ok | we don't think that the UL/DL GTP tunnel setup is subject to L2 configuration. Decoupling them will make implementation easier. And may have a unified handling on F1 in subsequent handover if the L2 cofiguration is changed.Therefore, we support above proposals. |
| Samsung | Comments | In legacy case, the new TEID is used after RLC re-establish/PDCP recovery. Here, for RLC re-establishment/PDCP recovery is not carried out, is there any clear motivation to change the TEID?[Moderator] see clarification above. |
| Lenovo | Same view with NEC. |  |
| ZTE | Same view with NEC. |  |
| Charter Comm | Ok with the proposals |  |
| LGE | Same comment as NEC |  |
| Qualcomm | Agree with the proposals | Maybe we should add to the proposals “new DL GTP TEID corresponding to the candidate target cell”. |
| Nokia | Agree with the proposals |  |
| CMCC | Same view with NEC |  |
| Intel |  Ok with proposal |  |

**Moderator’s summary:**

Majority companies agree with the propsoals. Some companies questioned that if RLC is not established in intra-DU LTM, why change the UL GTP TEID? . Clarification from moderator is provided above inline.

And also provide the clarification here:

There seems no need that the UL/DL GTP tunnel setup is subject to L2 configuration. Decoupling them will make implementation easier. And may have a unified handling on F1 in subsequent handover if the L2 configuration is changed.

It is proposed to agree on the following proposals:

**Proposal 3.2-5: For intra-DU LTM, if RLC is not re-established, the gNB-DU shall continue sending** **UL PDCP PDUs to the gNB-CU using the previous UL GTP TEID until cell switch command, and after then start sending UL PDCP PDUs using the new UL GTP TEID.**

**Proposal 3.2-6: For intra-DU LTM, if PDCP data recovery is not configured, the gNB-CU shall continue sending DL PDCP PDUs to the gNB-DU using the previous DL GTP TEID until it receives the LTM signalling from DU, and after then start sending UL PDCP PDUs using the new DL GTP TEID.**

#### 3.3 Handover collision avoidance between LTM and L3 handover

In R3-231182, it is observed that blindly prioritizing LTM over L3-mobility leads to handover to wrong cells or ping pongs. In R3-231573, R3-231745 and R3-231458, it thinks that the priority of mobility should not be fixed. R3-231573, and R3-231458 proposes to leave the coexistence issue up to network implementation. R3-231745 and R3-231381 provide a set of proposals to clarify the network nodes behaviours in three cases. And R3-231652 proposes to wait for RAN2 decision on the priority.

In summary, the following options for the LTM and L3 handover co-existence are on the table.

* **Option 1: OAM configured priority.**
* **Option 2: Network decides the priority based on scenario (intra-gNB-CU or inter-gNB-CU) and some assistance information (the measurement results, candidate target cells).**
* **Option 3: Flexible priority. The handover triggered first take the high priority.**

For option 3, The detailed description would be:

* **Case 1,** **L3 handover triggered earlier than LTM (the gNB-DU receives the L3 handover command before LTM is triggered), L3 handover has high priority.**
* **Case 2, LTM triggered earlier than L3 (the gNB-CU receives the LTM notify message from gNB-DU before L3 handover is triggered), LTM has high priority,**
* **Case 3, LTM and L3 handover are triggered almost simultaneously (cross signallings on F1). The (source) gNB-DU fails the L3 handover by responding with UE Context Modification Failure message with proper cause meaning LTM has high priority. This is to avoid to cancel the LTM command already sent to the UE which seems complex from moderator point of view.**

The moderator also thinks that OAM configured fixed priority is sub-optimal and should be excluded firstly. For option 2, the question needs to clarify is that the gNB-DU may not know the incoming L3 handover is for intra-CU or inter-CU based on the received UE Context Modification Request (with RRC L3 handover command).

With above understanding, the moderator would like to draw the following questions:

**Q3.3-1: Which option do you prefer (option 2 or option 3) for LTM and L3 handover co-existence?**

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | Option 3 |  |
| NEC | Option 3. | L3 Handover signally message will always need preparation in target side and if any erroneous during the preparation including the execution phase in network (i.e. before sending HO Command to the UE), network is able to cancel the L3 handover. Therefore for case 3, it would be simple to take LTM as high priority as before sending L3 HO Command to UE, the L3 Handover can be cancelled. |
| E/// | None of above | It seems the option proposed by use is not explicitly listed above.Our preference is not fixing any priority and leave this for network implementation. The reason is that when we are talking about the triggering, LTM is based on L1 measurements that are periodic while L3 mobility is triggered based on L3 measurements that are event based. In that case LTM would be triggered faster in most cases thus the coexistence does not happen often. Standardizing the priority may lead to reduced flexibility in the network, potentially resulting in decreased performance. |
| China Telecom | None | Agree with Ericsson, we prefer to leave the coexistence issue up to network implementation. |
| CATT | Option 3 |  |
| NTT DOCOMO | Option 2 and 3 | As described in R3-231182 (from Nokia), in order to avoid handover to wrong cells or ping-pong, the priority between LTM and L3 mobility should depend on network decision. We think the pre-configured priority generated by CU can be included in "some assistance information" and sent from CU to serving DU. However, if the priority is configured as "the first received mobility has higher priority", option 2 includes option 3. Alternatively, option 3 may be supported if the priority or assistance information is not indicated. |
| Huawei | Option 3 | Our understanding is that option 3 actually is aligned to what Ericsson is saying above. Option 3 means no fixed priority beween LTM and L3 is specified.I think the intention of option 3 is not to standardize the priority, but to clarify the RAN nodes behaviour if collision happens. Such kind of handling needs to be specified somewhere either in stage 2 or the abnormal case in stage 3, otherwise, ambiguity exits in spec and IOT issues between vendors, and may also cause extra unnecessary signalings to the UE, for example to cancel an ongoing LTM in the UE. |
| Samsung | Comments | This is not about the priority between L3 HO and LTM. It is about which one comes to DU first:* If LTM is already sent to the UE when L3 HO CMD is received at gNB-DU, L3 HO CMD can be rejected by gNB-DU
* If L3 HO CMD arrives gNB-DU before sending LTM CMD, L3 HO is performed first.
 |
| Lenovo | See comments | We don’t need to preconfigure or define any priority to LTM or L3 HO. Especially, in non-split architecture, it is totally upon gNB implementation to trigger LTM or L3 HO based on received measurement report. The collision issue only applies to CU-DU split architecture. And we would prefer to discuss the handling case by case without having a priority mindset, e.g., modified from moderator’s description.* **Case 1, if the gNB-DU receives the L3 handover command while gNB-DU is about to trigger LTM switching the UE to a different target cell**
	+ gNB-DU may need to decide whether to a) send L3 HO command b) send LTM command and fail L3 HO
* **Case 2, the gNB-CU receives the LTM notify message from gNB-DU after gNB CU has start preparing (inter-CU) L3 HO but has not triggered L3 HO**
	+ gNB-CU may need to cancel the prepared HO over Xn interface, or
	+ gNB-CU coordinate with DU before L3 HO preparation to avoid such collision
* **Case 3, if the gNB-DU receives the L3 HO command while gNB-DU has already triggered the LTM**
	+ This implies UE may have already switch to another cell, and L3 HO is no longer applicable, gNB-DU may fail the L3 HO with necessary indication about the cause
 |
| ZTE | None | We still believe that this issue is RAN2 related. If RAN2 decides not to support the coexistence of L3 HO and LTM , the collision would not happen. If we really need to discuss this issue before getting RAN2 decision, we agree with E///’s view, this can be left to implementation. |

|  |  |  |
| --- | --- | --- |
| Charter Comm | Option 3 | In particular the proposal in R3-231458 |
| LGE | None | Unless the purpose is to let the UE simultaneously receive the LTM command and L3 HO command, as mentioned in Ericsson, leave this for network implementation. |
| Qualcomm | Option 3, though we think RAN3 should wait for RAN2’s decision on the priority. Please also see comments | Regarding Option 1, it can lead to sub-optimal performance.Regarding Option 2, since the focus in Rel-18 is on intra-CU mobility, inter-CU case should not be considered. It is not specified in detail in Option 2 as to how network decides the priority, so we cannot evaluate this option. Regarding Option 3, for Case 1, we think a separate indication is needed from the CU to the DU along with the L3 handover message, since the L3 handover command is transparent to the DU. The indication can indicate that the RRC container in the message is the L3 handover command.  |
| Nokia | Left to network implementation | It should be left up to network implementation whether to prioritize LTM or L3-mobility based on the scenario (intra-gNB-CU or inter-gNB-CU) and the measurement results. Similarly, fixing a priority for all cases may lead to suboptimal performance. Thus, RAN3 should explore further whether CU can provide some additional assistance information to improve mobility decisions at the DU. |
| CMCC | Option 2 and Option 3 | We think it is necessary to decide the priority between LTM and L3 mobility depending on network decision and some assistance information. |

**Moderator’s summary:**

No consensus. Some companies agree to option 2, and somes agree to option 3. And some think that it is up to implementation.

**To be continued.**

#### 3.4 Candidate cell modify and release

Quite lots of papers (R3-231182, R3-231315, R3-231447, R3-231573, R3-231745, R3-231747, R3-231807, R3-231813, and R3-231848) address the candidate cells modification and release issue.

All the proposals seem similar. Therefore, the moderator summarizes all the proposals as following:

**Proposal 3.4-1: The gNB-CU may modify or release L1/2 Triggered Mobility (LTM) candidate cells in the gNB-DU.**

**Proposal 3.4-2: The gNB-DU may cancel already configured L1/2 Triggered Mobility (LTM) candidate cells.**

Note that although some proposals are made towards to the LTM completion phase, the moderator thinks that the above proposals should be applicable also to the LTM configuration phase.

**Q3.4-1: Are above proposals from moderator agreeable?**

Comments or wordings to above proposals, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | OK with the proposals |  |
| NEC | Agreeable. |  |
| E/// | Ok | For P3.4-2, when DU cancels the configured LTM candidate cell(s), it needs to tell CU. |
| China Telecom | We are fine with the above proposals. |  |
| CATT | Agree with both |  |
| NTT DOCOMO | OK with the proposals |  |
| Huawei | OK with the proposals | Agree with Ericsson. |
| Samsung | OK  |  |
| Lenovo | Agree with the proposals. | Agree with Ericsson. |
| ZTE | Agree |  |
| Charter Comm | OK with the proposals |  |
| Qualcomm | Agree with the proposals |  |
| Nokia  | Agree with the proposals |  |
| CMCC | Agree with the proposals |  |

**Moderator’s summary:**

**All companies agree to the propsoals with a minor comment.**

**Therefore, it is proposed:**

**Proposal 3.4-1: The gNB-CU may modify or release L1/2 Triggered Mobility (LTM) candidate cells in the gNB-DU.**

**Proposal 3.4-2: The gNB-DU may cancel already configured L1/2 Triggered Mobility (LTM) candidate cells.**

If the answer of Q3.4-1 is yes, the messages to be used for candidate cells modification and release should be decided. The moderator provides the following proposals based on the papers addressed this issue.

**Proposal 3.4-3: The gNB-CU may use the UE Context Modification procedure to modify or release the prepared resources of candidate cells in the gNB-DU and use the UE Context Release procedure to release the UE context in the gNB-DU.**

**Q3.4-2: Are above proposal from moderator agreeable?**

Comments or wordings to above proposal, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | Yes |  |
| NEC | agreeable |  |
| E/// | Yes |  |
| China Telecom | Yes |  |
| CATT | agree |  |
| NTT DOCOMO | Yes |  |
| Huaweic | Yes |  |
| Samsung | Yes |  |
| Lenovo | Agree with the proposal. |  |
| ZTE | Yes |  |
| Charter Comm  | Yes |  |
| Qualcomm | Agree with the proposal |  |
| Nokia | Agree |  |
| CMCC | Yes |  |

**Moderator’s summary:**

**All companies agree to the propsoals with a minor comment.**

**Therefore, it is proposed:**

**Proposal 3.4-3: The gNB-CU may use the UE Context Modification procedure to modify or release the prepared resources of candidate cells in the gNB-DU and use the UE Context Release procedure to release the UE context in the gNB-DU.**

For the gNB-DU initiated candidate cells release (de-configuration), R3-231182 provides the following options and propose to adopt option 2b:

* Option 1a: Reuse of gNB-DU Initiated UE Context Modification procedure (i.e. UE CONTEXT MODIFICATION REQUIRED message).
* Option 1b: Similar to Option 1a, but with introduction of a new F1AP procedure requesting LTM target candidate cells DE-configuration.
* Option 2a. Have the gNB-DU directly DE-configure the LTM target candidate cells. That is, the gNB-DU signals the UE via an L1 message the target candidate cells to be DE-configured. Likewise, the gNB-DU removes the resources utilized for the LTM target candidate cells, and informs the gNB-CU the target candidate cells that have been DE-configured (likely via a new F1AP message).
* Option 2b: Similar to Option 2b, in that gNB-DU could DE-configure the target cells from itself. However, with difference that gNB-DU then signals the target cells that were de-configured to the gNB-CU, and it is kept a gNB-CU responsibility to build an appropriate RRC message and update the configuration to the UE.

Although, the majority view among the papers seems to prefer option 1a, the moderator would like to draw the following question:

**Q3.4-3: Which option do you prefer for the gNB-DU initiated candidate cells release?**

Comments or wordings to above proposal, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | Option 1a  |  |
| NEC | Option 1a. | The simple way of course is to reuse the current signalling message, without creating new signalling message only for this small purpose as cancelling from source gNB-DU does not seems a normal case. |
| E/// | Option 1a |  |
| China Telecom | Option 1a |  |
| CATT | Option 1a with enhancement | First, we support that when the candidate DU decided to release some candidate cell, this request can not be rejected by CU. This is because such release is usually due to overload or DU’s own problems, the candidate cell cannot provide services any more.We think option1a is OK, but maybe we can do some enhancements to ensure CU will not refuse the candidate cell release require to make sure this procedure can execute success each time.For the option 2a and 2b, we are confused why the target can send L1 message to UE, especially in inter- DU case. In our understanding, UE is still connected with the serving DU and cannot receive the message from any candidate cells. |
| NTT DOCOMO | Option 1a | Option 1a/1b should be adopted if similar signaling design is adopted as much as possible in both inter-DU and intra-DU cases. In intra-DU, it is possible for DU to DE-configure some of the candidate cells from itself, but in inter-DU case, if the candidate DU releases the cells before informing the serving DU, cell switch failure may occur. |
| Huawei | Option 1a |  |
| Samsung | Option 1a |  |
| Lenovo | Option 1a. |  |
| ZTE | Option 1a. |  |
| Charter Comm | Option 1a |  |
| Qualcomm | Option 1a |  |
| Nokia | Option 1a or 2b | In our view, the important aspect is that the deconfiguration should always succeed. Hence, if RAN3 decides to go for Option 1a, we should consider enhancing the specification so that a deconfiguration request cannot be rejected by the CU. |
| CMCC | Option 1a |  |

Moderator’s summary:

All companies think that option 1a is agreeable. Two companies think that enchement may be needed to avoid the CU reject the DU initiated candidate cell release.

Therefore, it is proposed:

**Proposal 3.4-3a: the gNB-DU may use the UE Context Modificaiton Required message to release the candidate cells, and the gNB-CU shall not reject .**

If Q3.4-3’s answer is option 1a, the moderator would like to check companies view on below proposal:

**Proposal 3.4-4:** **The gNB-DU may use the UE Context Modification Required procedure to request to cancel the prepared resources of candidate cells in the gNB-DU and use the UE Context Release Request procedure to request to release the UE context in the gNB-DU.**

**Q3.4-4: Are above proposal from moderator agreeable?**

Comments or wordings to above proposal, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | Yes |  |
| NEC | Agreeable. | With these procedures, it will be confirmed that basically the mobility is under gNB-CU control. |
| E/// | With comments | It needs to be clear that the first gNB-DU is the same as the second gNB-DU, which means the candidate DU. |
| China Telecom | Agree |  |
| CATT | Yes  | Same comment as above |
| NTT DOCOMO | Yes |  |
| Huawei | agree | Ericsson’s clarification is also correct. |
| Samsung | Comments | Depends on whether all candidate cells are requested to be released or not. * If a subset of candidate cells is requested to be released, UE context modification required message can be used.
* If all candidate cells are requested to be released, UE context release request message can be used.

To be clear, the proposal can be rephrased as:**The gNB-DU may use the UE Context Modification Required procedure to request to cancel the prepared resources of a subset of candidate cells in the gNB-DU and use the UE Context Release Request procedure to request to release all candidate cells ~~the UE context~~ in the gNB-DU.** |
| Lenovo | Agree with the proposal. |  |
| ZTE | Agree | Samsung’s proposal seems more clear |
| Charter Comm | Yes |  |
| Qualcomm | Agree with the proposal |  |
| Nokia | Agree with comments | As mentioned in the previous question, additional care is needed to avoid rejection by the CU of a LTM deconfiguration request. |
| CMCC | Agree |  |

**Moderator’s summary:**

All company agree to the proposal. And some companies provide some wording on the proposal.

The proposal from Samsung are used for agreement:

**Proposal 3.4-4: The gNB-DU may use the UE Context Modification Required procedure to request to cancel the prepared resources of a subset of candidate cells in that gNB-DU and use the UE Context Release Request procedure to request to release all candidate cells in that gNB-DU.**

#### 3.5 Subsequent LTM

Regarding to subsequent LTM, below is the previous agreement that RAN3 made:

RAN3 works on the same signaling procedure for both initial cell switch and subsequent cell switch for intra-DU L1/L2 handover.

And among the papers in R3-231315. R3-231510, R3-231678, R3-231745, R3-231807, and R3-231813 in this meeting, the following issues and proposals are raised:

**Q3.5-1: When subsequent LTM is configured?**

* **Option 1:** **Subsequent LTM is configured together with initial LTM.**
* **Option 2: Subsequent LTM is configured after each LTM completion. E.g., when the gNB-CU receives the Access Success message from (target) gNB-DU,**

The point of option 1 is that RAN2 has agreed that there is no further RRC reconfigurations for subsequent LTM after initial LTM. Therefore, the configurations required for subsequent LTM should be prepared together with initial LTM. The configuration for initial LTM and subsequent LTM is sent to UE in the same RRC reconfiguration message for the first LTM preparation.

Then subsequent LTM can be executed multiple times referring to the execution part of the stage 2 procedure as captured in BLCR (i.e. step 9 ~ step 13, including L1 measurement reporting, LTM cell switch notify and ACCESS SUCCESS message).

While option 2 thinks that after each LTM, the CU may transmit a UE Context Modification Request to indicate to the DU to keep resources associated with a subset of the candidate cells for subsequent LTM. And it is pending to RAN2 discussion as there is UE impact.

Comments and answers to above question, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | Option 1 | As answered in section 3.4, the candidate cells may be modified or released by the CU or DU and the left candidate cells can be used for subsequent LTM |
| NEC | Option 1 will be one shot of signalling which seems simpler. |  |
| E/// | Wrong assumption | The question is inadequately described. The network does not configure subsequent LTM. The UE is configured only for one time for one candidate cell. DU should keep the resources for the UE until it releases the LTM cell.Thus it is incorrect to say whether subsequent LTM is configured together with initial LTM or not. Subsequent LTM is feasible once the UE is configured. |
| China Telecom | Option 1 |  |
| CATT | Option 1 |  |
| NTT DOCOMO | Option 1 | Option 1 should be considered as a Subsequent LTM, while Option 2 may require re-configuration of the UE at each cell switch, which is considered a kind of re-initiation. The only difference between initial LTM and subsequent LTM with Option 2 is whether or not the candidate DUs have already prepared resources for the LTM. |
| Huawei | Option 1 | We have the same view as Ericsson. |
| Samsung | Comments | When to configure the subsequent LTM seems to be gNB-CU’s implementation issue. Specifically, as long as subsequent LTM candidates are decided, gNB-CU can inform it to gNB-DU. Even this issue needs discussion, it should be discussed in RAN2 first since subsequent LTM is introduced by RAN2 first. |
| Lenovo | Option 1 with comments | It is unclear what is the subsequent LTM configuration. In our understanding, the subsequent LTM is feasible when the candidate DU with the new source cell is aware of the candidate cell(s) configuration the UE has stored. |
| ZTE |  | Share same view as E/// and HW |
| Qualcomm | Option 1 |  |
| Nokia | Option 1 with comments | Similar view as Ericsson. “Subsequent LTM” is not something that is configured. Instead, the basis is that a cell either has LTM configured or not. The configuration remains valid regardless of whether a single or multiple LTM operations occur utilizing the same configuration.  |
| CMCC |  | Share same view as E/// and HW |

Moderator’s summary:

Most companies agree with option 1. And few companies think that subsequent LTM is not sth that can be configured.

The moderator would like to propose to combine option 1 and the major commemnts:

**Proposal 3.5-1: Subsequent LTM is considered feasible once the UE is configured in initial LTM configuration.**

**Q3.5-2: Which node decides the candidate cells to support subsequent LTM?**

There is only 1 proposal to propose the gNB-CU to decide.

**Proposal 3.5-2: the gNB-CU decides whether or which candidate cells need support subsequent LTM.**

**Proposal 3.5-3: Candidate gNB-DU can accept/reject the request for support subsequent cell switch from the gNB-CU.**

**Proposal 3.5-4: Introduce sequential cell switch supported indicator in the UE context setup/modification request message, whether it is per cell or pre node is still FFS.**

Comments on above question and proposals, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | OK with the proposals 3.5-2 and 3.5-3. | Not sure if proposal 3.5-4 is needed |
| NEC | Agreeable with the proposals. |  |
| E/// | ? | As explained in Q3.5-1, subsequent LTM is available once the UE is configured for LTM. There is no special handling for CU compared with “initial” LTM. Therefore, we don’t see the need to discuss this proposal. |
| China Telecom | We are fine with the proposals. |  |
| CATT | yes |  |
| NTT DOCOMO | OK with the proposals | Regarding proposal 3.5-4, candidate cells for subsequent LTM should be explicitly indicated in the UE context setup/modification request in order to ensure that the candidate cells are maintained in candidate DUs after initial LTM without explicit signaling and can be selected as target cells in subsequent LTM. |
| Huawei | None of them | We have the same understaning as Ericcsion. Subsequent LTM needs no additional decision and configuration. It will be supported once LTM is configured to the UE. |
| Samsung | Comments | In our understanding, it should be gNB-CU’s decision on the subsequent LTM candidates. However, the final decision should be made by RAN2 first. |
| Lenovo |  | See comments in Q3.5-1. |
| ZTE |  | Share same view as E/// and HW |
| Qualcomm | Agree with P3.5-2 and P3.5-3  | We would like to better understand P3.5-4 |
| Nokia | None | Similar view with Ericsson and Huawei. No additional indicators are needed either. |
| CMCC |  | Share same view as E/// and HW |

Moderator’s summary:

Some companies agree with the proposals. And companies think that no any addition indication is needed for subsequent LTM.

Therefore, the moderator would like to conclude that:

**The proposals are noted.**

The third question that the moderator thinks needs to clarify is about the option 1 in Q3.5-1:

**Q3.5-3: How to indicate LTM to the UE and the gNB-DU for option 1 in Q3.5-1 ?**

* **Option 1: all candidate cells/UE contexts configured are maintained for subsequent LTM by default after LTM initial configuration and release of them should be done by explicit signalling.**
* **Option 2; the candidate cells that should be maintained for subsequent LTM are explicitly indicated and the others without indications are released after LTM.**

Comments on above question and options, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | Option 2 is slightly preferred |  |
| NEC | Another option 3: all candidate cells that should be maintained for subsequent LTM are explicitly indicated and the other will be released by explicit signalling.  |  |
| E/// | Option 1? | Some clarification is needed. Does the explicit signaling mean the cancellation of candidate cell, in the same way as “initial” LTM? If so, then the answer is yes. If new signaling is introduced, then the answer is no. |
| China Telecom | Option 2 |   |
| CATT | Option 2 |  |
| NTT DOCOMO | Option 2 |  |
| Huawei | Option 1 | As clarified in above questions, no explicit subsequent LTM config is needed. Normal LTM configuration means subsequent is supported by defaut. And normal candidate cells cancellation means no need subsequent LTM to those cells. |
| Samsung | Comments | Before making choice between opt1 and opt2, the most important thing for RAN3 is to discuss whether F1 signalling should be enhanced to inform subsequent LTM candidate cells to gNB-DU. In our understanding, this enhancement is needed. So, we propose to agree:**The subsequent LTM candidate cells should be configured to the gNB-DU.** The above options are different on whether subsequent LTM candidate cells are all LTM candidate cells or a subset of LTM candidate cells. This seems to be RAN2 issue. |
| Lenovo | See comments. | The indications to the UE and DU are different.For the UE, all candidate cells which should be maintained for subsequent LTM are explicitly indicated.For the DU, since the candidate cells will be from different candidate DUs, the candidate DU with the new source cell should be aware of the candidate cell(s) configuration the UE has stored. |
| ZTE | Option 1 | Share same view as E/// and HW |
| Qualcomm | Prefer Option 1, though both options work |  |
| Nokia | Option 1 with comments | As mentioned in previous questions, the LTM configuration should remain valid regardless of single or multiple LTM operations. Similarly, additional indicators are not needed. |
| CMCC | Option 1 |  |

Moderator’s summary:

Companies views are quite different. More clarification and discussion is needed.

**Proposals are noted.**

#### 3.6 E1 Aspects

The discussions in papers R3-231182, R3-231315, R3-231573, and R3-231746 begin with the WF which was agreed at last meeting.

**In case of CP UP separation, once CUCP receives LTM cell switch signling from (source)DU , CU CP initiates E1 bearer context modification including DL tunnel ID per DRB for target cell, and security keys corresponding to target cell (if updated) for data transmission.**

Some companies observed that RAN2 agreed that no security update support in Rel-18 with L1/L2 based mobility. Based on that, the following proposal is made:

**Proposal 3.6-1: For intra-CU-UP case, propose to turn the following WF to an agreement:**

**In case of CP UP separation, once CUCP receives LTM cell switch signling from (source)DU , CU CP initiates E1 bearer context modification to the CU UP including DL tunnel ID per DRB for target cell, for data transmission.**

Furthermore, the proposal for inter-CU-UP would look like:

**Proposal 3.6-2: For inter-CU-UP LTM, once the CU-CP receives LTM cell switch signaling from (source) DU, the CU-CP initiates E1 bearer context modification to the target CU UP including DL tunnel ID per DRB for data transmission.**

Comments on above proposals, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above proposals | Comments if any. |
| Google | OK with the proposals |  |
| NEC | For inter-DU LTM, agree with the proposal.For intra-DU LTM and intra-UP (i.e. no change of CU-UP), there will be no need to create new TEID, actually no signalling will be exchange with CU-UP? |  |
| E/// | Yes |  |
| China Telecom | We are fine with the proposals. |  |
| CATT | ok | One concern is whether can realize CU UP change without security key update? This case is very limited and we prefer to consider it later. |
| NTT DOCOMO | OK with the proposals |  |
| Huawei | yes | Regarding the question from NEC,Our understanding is that the UL TEID may be kept no change in such case. But he DL TEID may be reallocated by the DU? |
| Samsung | OK |  |
| Lenovo | Agree with the proposal. |  |
| ZTE | Yes |  |
| LGE | OK |  |
| Qualcomm | Agree with the proposals. Please see comments | For P3.6-2, we were wondering why the CU-UP would be changed, i.e., we wanted to understand the motivation for considering the inter-CU-UP LTM case in the first place, further considering that Rel-18 LTM is for intra-CU.  |
| Nokia | OK |  |
| CMCC | OK |  |

**Most of companies agree with the proposals.**

**Questions needs to be clarified online:**

1. For intra-DU LTM and intra-UP (i.e. no change of CU-UP), there will be no need to create new TEID, actually no signalling will be exchange with CU-UP?
2. whether can realize CU UP change without security key update? This case is very limited and we prefer to consider it later.
3. why the CU-UP would be changed, i.e., we wanted to understand the motivation for considering the inter-CU-UP LTM case in the first place, further considering that Rel-18 LTM is for intra-CU.

**The following proposals are for agreememnt if above questions are clarified:**

**Proposal 3.6-1: For intra-CU-UP case, propose to turn the following WF to an agreement:**

**In case of CP UP separation, once CUCP receives LTM cell switch signling from (source)DU , CU CP initiates E1 bearer context modification to the CU UP including DL tunnel ID per DRB for target cell, for data transmission.**

**Proposal 3.6-2: For inter-CU-UP LTM, once the CU-CP receives LTM cell switch signaling from (source) DU, the CU-CP initiates E1 bearer context modification to the target CU UP including DL tunnel ID per DRB for target cell for data transmission.**

For intra-CU-UP LTM, one paper proposed the following signaling optimization:

**Proposal 3.6-3: One option that can minimize the impact on CU-UP when performing LTM is that the steps 3 and 4 are executed together with steps 9 and 10.**

**Proposal 3.6-4: One more option that can minimize the impact on CU-UP when performing LTM is that the CU-UP provides only one UL TNL address which will only be used by the target cell after successful execution of LTM cell switch.**



Comments on above proposals, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above proposals | Comments if any. |
| Google |  | Not sure if signalling optimization is needed |
| NEC | If intra-DU LTM, probably no need to have new TEID since security update will not be needed for LTM, as agreed by RAN2. |  |
| E/// | Yes | To clarify, it is not optimization, but to simplify the signalings design at the beginning of LTM feature. |
| China Telecom | Seems agreeable. |  |
| CATT | Agree with NEC |  |
| NTT DOCOMO | Open | We do not have strong view for those proposals. |
| Huawei |  | The issue is that if steps 3 and 4 are executed together with steps 9 and 10, what happens if step 9 and 10 are failed, for example due to CUUP overload? There is no time for the CU to find out another suitable target UP. But if not optimise the signalling, during LTM preparation in UP, if step 3 and 4 fails due to lack of resources in UP, the CU still can choose other Ups. |
| Samsung | Comments | Can we start the baseline procedure first? The optimization can be considered after the baseline is settle down. |
| Lenovo | See comments | Prefer to design the basic message flow first to have a whole picture. After that, we can discuss whether optimization is needed. |
| ZTE |  | Prefer to focus on the baseline procedure first and then consider the potential enhancements |
| LGE | Similar view to Samsung and Lenovo. |  |
| Qualcomm |  | Prefer to comment after seeing more details on the proposals. |
| Nokia | No | Disagree with the proposals. These proposals also break the basic framework we have for establishing UE/Bearer contexts in disaggregated architecture. |
| CMCC |  | Prefer to focus on baseline procedure first. |

**Moderator’s summary:**

**2 companies agree with the proposal. 1 company disagree.**

**Most of companies would like to see the basic message flow first and discuss the potential optimisation after.**

**Therefore, it is proposed:**

**Proposal 3.6-3a: Revisit the following proposals after the basic procedure is stable.**

* **One option that can minimize the impact on CU-UP when performing LTM is that the steps 3 and 4 are executed together with steps 9 and 10.**
* **One more option that can minimize the impact on CU-UP when performing LTM is that the CU-UP provides only one UL TNL address which will only be used by the target cell after successful execution of LTM cell switch.**

**To be continued.**

Furthermore, in case of inter CU-UP LTM, before cell switch there are some unsuccessfully transmitted DL data and new DL data already buffered at source CU-UP. For avoiding data loss, some papers propose that E1 bearer context modification shall be also used for getting the PDCP status at source CU-UP and exchanging the data forwarding information for data forwarding from source CU-UP to the target CU-UP. The target CU-UP can then (re)transmit the data to UE via the target cell after UE has accessed the target cell.

Then, the following is proposed by the moderator:

**Proposal 3.6-3: For inter-CU-UP LTM, the CU-CP initiates E1 bearer context modification to the source CU-UP for retrieving the latest PDCP status at the source CU-UP and exchanging the data forwarding information to target CU-UP.**

**Proposal 3.6-4: In case of gNB-CU-UP change, the gNB-CU triggers the source gNB-CU-UP to start data forwarding after receiving LTM cells switch signalling from DU.**

Comments on above proposals, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | OK with the proposals |  |
| NEC | Need time to check in detail after discussion. |  |
| E/// | Not for first round |  |
| China Telecom | Seems agreeable. |  |
| CATT | Agree |  |
| NTT DOCOMO | OK with the proposals |  |
| Huawei | OK |  |
| Samsung | OK |  |
| Lenovo | Agree with the proposals. |  |
| ZTE | Yes |  |
| Qualcomm | Overall agree with the proposals | As mentioned earlier, we were wondering whether CU-UP change case should be considered at all. |
| Nokia | OK |  |
| CMCC | OK |  |

**Moderator’s summary:**

**Most of companies agree to the proposals. 1 company would like to further check in second round.**

**Therefore, the following proposals are proposed for agreement and can be revisited in second round:**

**Proposal 3.6-3: For inter-CU-UP LTM, the CU-CP initiates E1 bearer context modification to the source CU-UP for retrieving the latest PDCP status at the source CU-UP and exchanging the data forwarding information to target CU-UP.**

**Proposal 3.6-4: In case of gNB-CU-UP change, the gNB-CU triggers the source gNB-CU-UP to start data forwarding after receiving LTM cells switch signalling from DU.**

In addition, thanking to the Access Success message from the target gNB-DU, the CU-CP may know that the UE has successfully accessed to the target cell, it then initiates the path switch procedure towards the CN for switching transmission of the subsequent DL data to the target CU-UP, e.g. via the new path.

Then, the following is proposed by the moderator:

**Proposal 3.6-5: For inter-CU-UP LTM, Path switch procedure is performed towards the core network after detecting the UE has accessed to the target cell.**

Comments on above proposals, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | OK with the proposal |  |
| NEC | Agreeable. |  |
| E/// | Not for first round |  |
| China Telecom | Seems agreeable. |  |
| CATT | Agree |  |
| NTT DOCOMO | OK with the proposal |  |
| Huawei | OK. |  |
| Samsung | Comments | Is this the legacy procedure? |
| Lenovo | Agree with the proposal. |  |
| ZTE | Yes |  |
| Charter Comm | Yes |  |
| Qualcomm | Agree with the proposal |  |
| Nokia | OK |  |
| CMCC | Yes |  |

**Moderator’s summary:**

**Most of companies agree to the proposal. And clarification from moderator is that the proposal is the same as the legacy procedure.**

**The following proposal is for agreement:**

**Proposal 3.6-5: For inter-CU-UP LTM, Path switch procedure is performed towards the core network after detecting the UE has accessed to the target cell.**

If above proposals are agreeable, the following shows the tentative overall message flow for inter-CU-UP LTM. For intra-CU-UP LTM message flow, the moderator thinks that it is simple and could be treated part of the inter-CU-UP case. The only difference is in step 2 and 3, in which Bearer Context Modification will be used in case of intra-CU-UP LTM.

**Figure : Inter-DU LTM with gNB-CU-UP change**

0. The source gNB-DU forwards thce Measurement Report to the gNB-CU-CP.

1. The gNB-CU-CP decides to initiate LTM configuration.

2. The gNB-CU-CP sends a BEARER CONTEXT SETUP REQUEST message containing UL TNL address information for NG-U to setup the bearer context in the gNB-CU-UP.

3. The gNB-CU-UP responds with a BEARER CONTEXT SETUP RESPONSE message containing the UL TNL address information for F1-U, and DL TNL address information for NG-U.

4 - 5. F1 UE context setup procedure is performed to setup one or more bearers in the gNB-DU.

6. The gNB-CU-CP notifies the source gNB-DU and sends the RRC Reconfiguration message to the UE.

7. The source gNB-DU make the LTM decision.

8. The source gNB-DU sends the LTM cell switch notify message to the gNB-CU-CP with the selected target cell ID.

9-10. The gNB-CU-CP performs the Bearer Context Modification procedure to retrieve the PDCP UL/DL status and to exchange data forwarding information for the bearer.

11-12. The gNB-CU-CP performs the Bearer Context Modification procedure to send the DL TNL address information for F1-U and data forwarding between source gNB-CU-UP and target gNB-CU-UP, and PDCP status..

13. The target gNB-DU detects the UE in the target cell.

14. The target gNB-DU sends an Access Success message to the gNB-CU-CP.

15. Data Forwarding may be performed from the source gNB-CU-UP to the target gNB-CU-UP.

16 - 18. Path Switch procedure is performed to update the DL TNL address information for the NG-U towards the core network.

19-20. Bearer Context Release procedure may be performed to release the UE context in the source gNB-DU. This step may be skipped in case that subsequent LTM is supported.

**Q3.6-6: Any comments on above tentative message flow for inter-CU-UP LTM?**

Comments on the tentative inter-CU-UP LTM message flow, please provide here.

|  |  |  |
| --- | --- | --- |
| Companies | Your company view on above question | Comments if any. |
| Google | Generally ok  | Should it be Q3.6-6? |
| NEC | Need time to check later after the discussion. |  |
| E/// | Not for first round |  |
| China Telecom | We prefer to check the message details in the second round. |  |
| CATT | Generally ok, need time for further check  |  |
| Huawei | Further check at second round. |  |
| Samsung | Can take it as baseline for further check |  |
| Lenovo | No need for the first round. |  |
| ZTE | Further check at second round. |  |
| Qualcomm | Overall ok. Would like to have another look at it after a set of proposals have been agreed.  |  |
| Nokia | Further check at second round | Likewise, the data forwarding is marked unnecessarily late in the diagram (after ACCESS SUCCESS). This can occur at an earlier stage. |
| CMCC | Further check at second round. |  |

**Moderator’s summary:**

**Check details in second round.**

# 4 Conclusion

# 5 Reference

|  |  |  |
| --- | --- | --- |
| [R3-231182](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231182.zip) | TP (BL CR TS 38.401) L1/2 Triggered Mobility (LTM) Procedures (Nokia, Nokia Shanghai Bell) | other |
| [R3-231183](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231183.zip) | Discussion on TA Acquisition for LTM (Nokia, Nokia Shanghai Bell) | discussion |
| [R3-231239](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231239.zip) | gNB-DU initiated target cell re-configuration for L1/L2 triggered mobility (Rakuten Symphony) | discussion |
| [R3-231315](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231315.zip) | Signalling Support for LTM (Qualcomm Incorporated) | discussion |
| [R3-231381](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231381.zip) | co-existence between LTM and L3 mobility (NEC) | discussion |
| [R3-231382](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231382.zip) | (TP to TS 38.473 on LTM) co-existence between LTM and L3 mobility (NEC) | other |
| [R3-231388](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231388.zip) | (TP for L1L2Mob BLCR for TS 38.401) Discussion on reference configuration in LTM (Google Inc.) | other |
| [R3-231447](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231447.zip) | Discussion on L1L2 based inter-cell mobility (Lenovo) | discussion |
| [R3-231448](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231448.zip) | (TP to TS 38.401 & TS 38.470) Support of L1L2 based inter-cell mobility (Lenovo) | other |
| [R3-231458](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231458.zip) | Collision between L1/L2-triggered mobility and L3 mobility (vivo) | discussion |
| [R3-231459](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231459.zip) | Discussion on L1/L2-triggered Mobility (vivo) | discussion |
| [R3-231510](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231510.zip) | Discussion on remaining issues for LTM procedure (China Telecommunication) | discussion |
| [R3-231511](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231511.zip) | (TP to TS 38.473 BL CR) On support of LTM procedure (China Telecommunication) | other |
| [R3-231573](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231573.zip) | (TP for LTM BL CR to TS 38.401) Solutions for LTM (Ericsson) | other |
| [R3-231574](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231574.zip) | (TP for LTM BL CR to TS 38.473) F1AP impacts for LTM (Ericsson) | other |
| [R3-231652](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231652.zip) | Discussion on LTM related issues (LG Electronics Inc.) | discussion |
| [R3-231653](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231653.zip) | (TP for NR\_Mob\_enh2 BL CR for TS 38.401) Discussion on LTM related issues (LG Electronics Inc.) | other |
| [R3-231654](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231654.zip) | (TP for NR\_Mob\_enh2 BL CR for TS 38.473) Discussion on LTM related issues (LG Electronics Inc.) | other |
| [R3-231678](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231678.zip) | Discussion on left issues for L1/L2 mobility (CATT) | discussion |
| [R3-231679](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231679.zip) | (TP for L1L2 Mob BLCR for TS 38.401) Support of L1L2 based inter-cell mobility (CATT) | other |
| [R3-231745](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231745.zip) | (TP for L1L2Mob BLCR for TS 38.401): L1/L2 Mobility procedure on F1 (Huawei) | other |
| [R3-231746](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231746.zip) | (TP for L1L2Mob BLCR for TS 38.401): L1/L2 Mobility procedure on E1 (Huawei) | other |
| [R3-231747](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231747.zip) | (TP to Mob\_enh2 BL CR TS38.401) Discussion on L1/L2 based Inter-cell Mobility (Samsung Electronics France SA) | discussion |
| [R3-231751](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231751.zip) | Considerations on parallel vs single (including TPs for TS 38.473) (Intel Corporation) | discussion |
| [R3-231807](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231807.zip) | Discussion on L1L2 based Inter-Cell Mobility (CMCC) | discussion |
| [R3-231808](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231808.zip) | (TP to TS 38.401) L1L2 based Inter-Cell Mobility (CMCC) | other |
| [R3-231813](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231813.zip) | Further discussion on LTM (NTT DOCOMO INC.) | discussion |
| [R3-231848](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231848.zip) | (TP for LTM BL CR to TS 38.473) Discussion on L1/L2 triggered mobility (ZTE) | other |
| [R3-231849](file:///D%3A%5C%E4%BC%9A%E8%AE%AE%E7%A1%AC%E7%9B%98%5CTSGR3_119bis-e%5CDocs%5CR3-231849.zip) | TP for LTM BL CR to TS 38.401 (ZTE) | other |