3GPP TSG-RAN WG2 Meeting #123 R2-230xxxx

Toulouse, France, 21st – 25th August 2023

Agenda Item: x.x.x

Source: Ericsson

Title: [Post122][055][Mob18] Discussion on RRC open issues list for LTM

Document for: Discussion, Decision

# 1 Introduction

This contribution is to address the following email discussion:

* [Post122][055][Mob18] 38.331 Running CR and Open issues (Ericsson)

 Scope: Reflect agreements, review the CR, address open issues, Capture newly identified open issues, determine points for R2#123 discussion.

 Intended Outcome: Running CR, Report.

 Deadline: Long

# 2 Discussion

According to the agreements and discussions taken so far in the context of LTM, a number of RRC open issues still remain to be addressed. Here the open issues are taken according to the section of the RRC running CR in which they are captured and grouped (whenever possible) if two of more Editor’s note refer to the same issue.

## FFS #1

*Editor’s Note: FFS on whether ltm-CandidateConfig applies also for the case of MBS or IAB.*

Generally, the interaction between different features is checked at the end of the release once that the specification work is done. About the interaction of LTM with MBS and IAB the proposal is to check this at the end of the release and leave this out for the time being.

**Question 1: Do companies agree to check the interaction of LTM with other features at the end of Release 18 once the work on LTM is completed?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comment |
| CATT | No strong view | If time allows, we can check it.  |
| ZTE | Agree |  |
| MediaTek | Agree | If time allows |
| Qualcomm | Agree |  |
| OPPO | Agree  |  |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Apple | Agree | If time allows (we doubt it) |
| Huawei, HiSilicon | No strong view |  |

## FFS #2

*Editor’s Note: FFS on whether the release of an SCell by an LTM candidate cell configuration is a valid case.*

According to legacy CellGroupConfig IE the SCell configuration is an AddModList/ToReleaseList structure and thus it should be possible for an LTM candidate cell configuration to add/modify/release SCell(s) at the UE upon an LTM cell switch procedure.

**Question 2: Do companies agree that it is possible for an LTM candidate cell configuration to add/modify/release SCell(s) at the UE?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comment |
| CATT | Agree | It is totally up to NW implementation. |
| ZTE | Agree |  |
| MediaTek | Agree | It is up to network implementation |
| Qualcomm | Agree | Up to NW implementation |
| OPPO | Agree  | It is up to NW implementation |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Apple | Agree | Preventing so adds more spec complexity |
| Huawei, HiSilicon | Agree | In general, there is no need to set any restriction on the contents of the IEs included in the message |

## FFS #3

*Editor’s Note: FFS on whether the UE performs the compliance check of the reference and LTM candidate cell configuration upon their reception of upon the execution of the LTM cell switch.*

*Editor’s Note: It is FFS is further actions are needed from the UE when a reconfiguration failure is detected because of an early compliance check of an LTM candidate.*

RAN2 has agreed already that the UE may perform early decoding and compliant check according to its implementation, and thus this Editor’s Note can be deleted. However, one remaining open issue is if some enhancements are needed in this particular case (e.g., UE reporting to the network which LTM candidate cell configurations have failed).

* The UE may perform early decoding and early validity check. FFS whether Early validity check triggers early re-establishment. FFS the possible timing, FFS subset of cells, FFS if need to specify anything or just up to UE impl, FFS if other signalling to notify network is needed.

So far when a UE detects a reconfiguration failure the RRC re-establishment procedure is triggered, and this should be the baseline also for the case of LTM. One question is whether there are any benefits in pursuing additional optimizations for a failure case and probably the easiest would be to align this behaviour with what we have for CHO.

**Question 3: Do companies agree that there is no need of further optimizations for the case on when an early compliance check on one or more LTM candidate cell configuration(s) fails?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comment |
| CATT | Agree | Please note that the current spec does not support any partial success or failure on the integrity check, so no subset of LTM candidates fail or success, and thus cannot notify NW to make reconfiguration of LTM candidates, or select one LTM candidates to perform the recovery. Besides, we believe that the compliance check failure is indeed some corner case, so prefer not to perform any optimization.  |
| ZTE | Agree  | Considering that the compliance check failure is a corner case, we are fine to follow the legacy behaviour, i.e. no further optimization is required. |
| MediaTek | Agree | We can do the same as in CHO. Compliance check failure is anyway a rare case. |
| Qualcomm | Agree | Early compliance check is UE implementation. Like all RRC reconfiguration procedures, if check fails, UE does reestablishment. Simple error flagging by UE is not useful. Detailed error flagging by UE requires tremendous UE burden and spec effort.  |
| OPPO | Agree  | We can leave the early compliance check to UE implementation. |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Apple | Agree | Prefer to follow the current procedure |
| Huawei, HiSilicon | Agree | No optimization is needed to handle error cases. |

**Question 4: Do companies agree that if an early compliance check on one or more LTM candidate cell configuration(s) fails, this triggers an RRC re-establishment procedure (i.e., legacy behaviour is followed)?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comment |
| CATT | Agree, but  | Please note that the current spec does not support any partial success or failure on the integrity check, so no need to differ **on one or more LTM candidate cell configuration(s) fails.**  |
| ZTE | Agree  |  |
| MediaTek | Partly agree | Agree for MCGDisagree for SCG:It would not be an appropriate action for the UE to trigger RRC re-establishment procedure, if an early compliance check for SCG LTM candidate cell configuration(s) fails. We think the UE should trigger SCG failure instead (assuming MCG transmission is not suspended), i.e., follow the legacy approach of SCG configuration failure; Refer to clause 5.3.5.8.2:3> if MCG transmission is not suspended:4> initiate the SCG failure information procedure as specified in clause 5.7.3 to report SCG reconfiguration error, upon which the connection reconfiguration procedure ends;3> else:4> initiate the connection re-establishment procedure as specified in clause 5.3.7, upon which the connection reconfiguration procedure ends; |
| Qualcomm | Agree |  |
| OPPO | Agree  | Legacy behavior can be followed. If the configuration is received through SRB1, UE triggers RRC reestablishment; If the configuration is received through SRB3, UE performs failure reporting. |
| Samsung | Agree |  |
| Ericsson | Agree | We can simply follow the legacy behavior (which may be different if the reconfiguration failure is detected on the MCG and SCG, as correctly pointed out by MTK).  |
| Apple | Agree | Also regarding the comment from MTK, we agree to follow SCG procedure, but think it’s better to limit LTM to MCG for R18. |
| Huawei, HiSilicon | Agree |  |

## FFS #4

*Editor’s Note: FFS on how and whether to indicate that no RACH is needed for an LTM candidate cell.*

*Editor’s Note: FFS on what are actions the UE shall perform when executing a RACH-less LTM cell switch.*

*Editor’s Note: FFS how to indicate to the UE that RACH should be skipped when doing an LTM cell switch.*

The understanding is that this topic will be covered in email discussion [058] about the content of the LTM cell switch MAC CE. The proposal is to wait the outcome of that email discussion and discuss these again in case the issue is still not solved. Maybe good to leave only one FFS and delete the others.

## FFS #5

*Editor’s Note: FFS on how UE should establish the TA for a LTM candidate cell.*

*Editor’s Note: FFS on how to handle the TA (and when the UE has no TA) in the source cell (in case no RACH is performed) upon an LTM cell switch and whether this should be specified in RRC or MAC.*

This issue is pretty much related to MAC and UE actions needs to be captured in TS 38.321 rather than in RRC. The proposal is to delete these issuee, unless companies have some concern about this.

## FFS #6

*Editor’s Note: FFS on the need of ltm-ConfigComplete to indicate to the UE that the LTM candidate cell configuration in ltm-Candidate is a complete configuration.*

RAN2 has discussed already this issue and the common understanding is that there could be a scenario where an LTM candidate cell configuration is a complete configuration itself, regardless of whether there is a reference configuration or not. According to this, in the RRC running CR has been proposed the use of the field *ltm-ConfigComplete* to indicate to the UE whether the received LTM candidate cell configuration is already a complete configuration or not, as this will impact the way how the complete LTM candidate cell configuration is generated. Since this flag has been already part of the RRC running CR for a couple of meetings and no objections has been received so far by companies it seems that this Editor’s Note can be deleted.

## FFS #7

*Editor’s Note: FFS on whether we need to rely on the full configuration procedure or a new procedure for LTM is created when the UE generates a complete LTM candidate cell configuration.*

RAN2 has agreed that at the execution of an LTM cell switch procedure only full configuration with respect to the current UE configuration is supported.

* Confirm that only the replacement procedure (the “full config without L2 reset”) is supported for Execution of LTM cell switch.

A remaining issue is now whether to re-use the legacy full configuration procedure or to spell out what actions are needed on the UE when an LTM cell switch procedure is executed. The current version of the RRC Running CR assumes that the legacy full configuration procedure (and flag in ASN.1) is not reused and only the necessary actions are spelled. Also, the full configuration procedure is not really about when generating the complete LTM candidate cell configuration but is when an LTM cell switch is executed.

**Question 5: Do companies agree with current implementation in RRC running CR about not re-using the legacy full configuration procedure (please note that this question is about the principle)?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comment |
| CATT | Agree | New procedure is more straightforward and forward compatible for further enhancement in next release.  |
| ZTE | Agree but | It is clearer to have a separate section to capture the handling on LTM cell switch. But we want to further clarify whether the legacy fullConfig IE can be configured in the LTM candidate cell configuration (e.g. if the complete LTM candidate cell configuration is somehow like the full configuration)? If yes, the legacy full configuration procedure should be performed during LTM cell switch. [Ericsson] Our understanding is that the legacy fullConfig flag will not be re-used for LTM (as we have a separate procedure for LTM). Also we agreed that the complete LTM candidate cell configuration is always a full configuration with respect to the current UE configuration at an LTM cell switch and thus there is no need to use any flag. |
| MediaTek | Agree | The current full configuration procedure is only used in three cases: (1) reconfiguration with sync for MCG, (2) RRC connection resume, and (3) the first RRC connection reconfiguration after RRC connection re-establishment. These are all MCG procedures. If the full configuration procedure were used for execution of the LTM cell switch, the actions which the UE performs in the full configuration procedure should be updated to cover execution of the SCG LTM cell switch. For clarity of the specification, it is better to keep the full configuration procedure to be associated only with reception of *fullConfig* field. |
| Qualcomm | Agree | As the rapporteur mentioned, the equivalent of full configuration would happen at LTM execution, whereas generation of complete configuration is something the UE may do earlier or defer to execution or never do for those candidates towards which LTM is never triggered. Thus, it is cleaner to keep the two procedures separate. |
| OPPO | Agree  | Introducing new procedure makes spec clearer. And restriction is required on prohibiting NW to set the legacy *fullConfig* flag to true for LTM candidate configuration. |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Huawei, HiSilicon | Agree | We don't see the need for the restriction suggested by OPPO |

## FFS #8

*Editor’s Note: FFS on whether it needs to be clarified that lower layers indicate an LTM candidate cell configuration ID, among other info.*

According to current implementation of TS 38.321 for LTM, when the MAC layer receives the LTM cell switch command one of the action is to send the Target Configuration ID to upper layer:

2> indicate to upper layers the Target Configuration ID included in the MAC CE;

This will be taken into account in the RRC running CR and the proposal is to delete this Editor’s Note. If more information are indicated by lower layer, this will be addressed in the RRC running CR accordingly.

## FFS #9

*Editor’s Note: FFS on whether the radio bearer needs to be kept when execution the LTM cell switch.*

*Editor’s Note: FFS on whether some other configurations should be released or kept.*

In current RRC Running CR section 5.3.5.x.5 there is a UE action to keep *radioBearerConfig* or *radioBearerConfig2* when executing an LTM cell switch procedure and the main motivation for this is because RAN2 agreed that the RadioBearerConfig IE is optional within an LTM candidate cell configuration. Nevertheless, it is also questionable whether the RadioBearerConfig IE can be exactly the same upon doing an LTM cell switch but maybe this can be the case on when an intra-DU LTM cell switch is done. Either way, even if the UE keeps the *radioBearerConfig* or *radioBearerConfig2,* the LTM candidate cell configuration can always reconfigure the radio bearer at the UE and thus this should not be a big concern.

**Question 6: Do companies agree that UE should not release *radioBearerConfig* or *radioBearerConfig2* upon the execution of an LTM cell switch procedure?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comment |
| CATT | Please see comments | The only concern from our perspective is whether not releasing the RB or the RLC related configuration will lead to misalignment between UE and NW. If UE does not clear the radio bearer related configuration upon LTM cell switch, the RB reconfiguration procedure is performed on top of the UE’s current RB configuration. But this is not the intention of NW. E.g., in current configuration, there is DRB 1/2/3, while NW only want to configure the DRB 1/2 within the complete candidate LTM configuration, performing LTM cell switch will result in DRB 1/2/3 in UE side, while the NW may consider there is only DRB 1/2 (replacement procedure is used for LTM cell switch as RAN2 agreed). One may argue that NW can firstly instruct UE to perform the release procedure for all the RB/RLC via the toReleaseList, and then add, but the point is the corresponding entity will also be released as a consequence, regardless NW indication on L2 reset. So we think, before answering this question, maybe we need to clarify the following aspects which impacts:* What is complete configuration for LTM, does it is the same like the legacy complete configuration (all fields need to be used should be present even it is the same with the current configuration)? This impacts what fields/configurations shall be included within the complete LTM configurations.
* Which part of the configuration of the RLC bearer or Radio Bearer configuration, can be reconfigured within the LTM cell switch, i.e., the SN length or the number of the RLC logic channel or the number of the radio bearer?
 |
| ZTE | Generally agree, but see comments | Considering that the UE may be not required to perform RLC re-establishment and PDCP recovery upon LTM cell switch, the radio bearer and RLC bearer configuration should not be released when performing the UE configuration replacement procedure, e.g. to maintain state variables, and the data stored in transmission and reception buffers in PDCP and RLC entities. However, we have some sympathy with CATT’s concern that the current CR text upon LTM cell switch execution may cause the configuration misalignment between the NW side and the UE side.According to the current text in 5.3.5.x.4 Generation of UE LTM configuration, it seems that there is no elementsToReleaseList in the complete LTM candidate cell configuration. Thus, for each RLC bearer/DRB that is part of the current UE configuration but it is not part of the LTM candidate cell configuration (i.e. not included in the elementsToAddModList), the UE also needs to perform the RLC bearer/DRB release for such bearer. |
| MediaTek | Please see comments | Our understanding about the reason of RAN2 agreement to have *RadioBearerConfig* optional in LTM candidate config is that network may not reconfigure radio bearers e.g., in case of Intra-DU LTM. This somehow assumed that the candidate configuration was applied on top of UE’s current RRC configuration. However, we agreed later that a LTM candidate configuration is first applied on a reference configuration to generate a complete configuration, which is then applied by UE using a ‘replacement’ procedure. We need to first clarify how the ‘replacement’ procedure is done. For example, assume UE has DRB 1&2&3 in current source configurations, reference includes DRB 1&2, and candidate configuration does not include *RadioBearerConfig*. Then UE should release DRB 3 if the complete configuration is to ‘replace’ UE’s current configuration, but is this what network expects? |
| Qualcomm | Agree | These configs are not released in the legacy full configuration. For LTM, they shouldn’t be released either. |
| OPPO |  | Agree with CATT. We may need to discuss the content of complete configuration first. |
| Samsung | Generally agree, but need more discussion to clarify | We also think these configurations should not be released but the current procedure is not clear as other companies’ mentioned. |
| Ericsson | Agree but | Probably the easiest way would be to always release the radioBearerConfig, but if we want to keep it we agree that would be good to discuss how this is handled by the UE during an LTM cell switch. |
| Apple | Agree and | We think we should not complicate this… Radio bearer config should not be changed at LTM switch when the CU is still the same….we should go with this assumption atleast for R18. |
| Huawei, HiSilicon | See comments | The configuration of PDCP entities for SRBs/DRBs in the network node controlling the CG for which LTM is executed (MN-terminated bearers for MCG LTM, SN-terminated bearers for SCG LTM) should be entirely deleted, even though these PDCP entities should remain.Otherwise, need M fields from the source configuration that are absent in the complete configuration will remain, so there will be a mismatch between the UE and the network configuration.The same should apply to RLC bearers of the CG of LTM, even if, up to now, there is no need M field in them so there would not be any actual mismatch (but this could be introduced at any time in the future).Note to Qualcomm: the only things not released in the legacy full configuration are the pdu-Sessions, everything else is released:1> for each *pdu-Session* that is part of the current UE configuration:2> release the SDAP entity (clause 5.1.2 in TS 37.324 [24]);2> release each DRB associated to the *pdu-Session* as specified in 5.3.5.6.4;  |

A further question is whether some other configuration should be kept by the UE, e.g., the MeasConfig IE.

**Question 7: Which other configurations (e.g., MeasConfig IE) do companies think that UE should not release upon the execution of an LTM cell switch procedure?**

|  |  |  |
| --- | --- | --- |
| Company | None/specify which ones | Comment |
| CATT |  | Similar comments as above, RAN2 need to first clarify:* What is complete configuration for LTM, does it is the same like the legacy complete configuration (all fields need to be used should be present even it is the same with the current configuration)? This impacts what fields/configurations shall be included within the complete LTM configurations.
* Which part of the configuration of the measConfig can be reconfigured?
 |
| ZTE | None | The complete LTM candidate cell configuration can include all necessary fields needed to perform the LTM cell switch. So for other configurations (unrelated to L2 reset), we think the simplest way is to release the current UE configuration, and then apply the corresponding fields in the complete LTM candidate cell configuration, regardless of whether the target LTM configuration is the same as the source configuration or not.  |
| MediaTek | None | Instead of discussion on where to keep or release individual IEs, we should first discuss the meaning and behavior of complete configuration. (See comments above) |
| Qualcomm | MeasConfig | This IE does not have to change with LTM execution. The network may modify this IE independently at any point in time. |
| OPPO |  | It depends on whether the complete configuration includes the MeasConfig. We may need to discuss the content of complete configuration first. |
| Samsung | Any configuration other than CellGroupConfig can be kept. | As only Intra-gNB LTM is supported in R18, any configuration other than the one’s configured by DU will most likely be same. So it might be efficient to keep any configuration other than CellGroupConfig. |
| Ericsson | Maybe MeasConfig but no strong view | Similar to the previous question, maybe the simplest would be to release all other fields but we see some cases in which MeasConfig can be kept, mostly in Rel-18 that LTM is intra-CU. However, we don’t have strong view and we can go with the majority.  |
| Apple | None | We may need to discuss, but our preference is to keep it as simple as possible for R18. |
| Huawei, HiSilicon | None | In case of inter-frequency LTM, measConfig needs to be modified (e.g. some A3 and A5 events are no more valid), so the complete configuration should include measConfig. |

## FFS #10

*Editor’s Note: FFS on whether ServingCellConfigCommon is always provided in a LTM candidate cell configuration or whether can be optional.*

Current RRC Running CR assumes that *ServingCellConfigCommon* is always provided within an LTM candidate cell configuration. While for a UE may be possible to maintain a use the existing *ServingCellConfigCommon* when perform an intra-DU LTM cell switch procedure, it may be necessary for the network to provide a new one when an inter-DU LTM cell switch procedure is performed. Since when an LTM candidate cell configuration is provided to the UE there is no guarantee on whether the next LTM cell switch is intra-DU or inter-DU, a safest approach would be to always provide *ServingCellConfigCommon*.

**Question 8: Do companies agree that *ServingCellConfigCommon* is always provided within an LTM candidate cell configuration (as implemented in current RRC running CR)?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comment |
| CATT | Agree |  |
| ZTE | Agree |  |
| MediaTek | Agree | *ServingCellConfigCommon* contains physical cell identity of the target cell (field *physCellId*), which is mandatory target cell parameter for the UE. For this reason, the existing *ServingCellConfigCommon* can't be maintained by the UE, not even for intra-DU LTM cell switch. |
| Qualcomm | Agree | The ServingCellConfigCommon IE is a cell-specific configuration which would change for both intra-DU and inter-DU LTM cell switch. |
| OPPO | Agree  |  |
| Samsung | Disagree | *ServingCellConfigCommon* is cell specific. So agree that even for Intra-DU case, *ServingCellConfigCommon* may change. However for LTM, the candidate cells can be serving cells. It need not be mandatory to provide the *ServingCellConfigCommon* within LTM candidate configuration when a candidate is a serving cell.[Ericsson] Our understanding is that if the network wants to provide a serving cell as an LTM candidate cell configuration, this should be signalled separately within the LTM-Config. Therefore, the LTM candidate configuration cannot inherit the *ServingCellConfigCommon* or the serving cell. |
| Ericsson | Agree |  |
| Apple | Agree |  |
| Huawei, HiSilicon | The CR does not actually require that assumption. | *ServingCellConfigCommon* will always be present in the reference configuration then for SCells of the candidate delta configuration whose identity matches with an SCell of the reference configuration, *ServingCellConfigCommon* can be absent.I.e. even if *ServingCellConfigCommon* needs to always be in the generated complete configuration but not necessarily in the candidate delta configuration.The CR does not make a difference where it is provided, so the understanding in this comment is aligned with the CR, unlike the above statement. |

## FFS #11

*Editor’s Note: The handling of the MAC and RLC entity is still FFS as it depends on how the L2 reset is indicated by the network.*

*Editor’s Note: FFS on how to capture UE actions when the L2 reset is needed.*

*Editor’s Note: FFS on the UE actions (for L2 reset) based on ltm-CandidateNoResetL2-List.*

*Editor’s Note: FFS on whether the LTM-CandidateNoResetL2-List field should include separate reset flags for MAC, RLC, and PDCP recovery.*

RAN2 has reached the following agreements about L2 reset during an LTM cell switch procedure:

* To determine if to reset L2 or not is based on RRC configuration (e.g. set of cells. FFS if separate for RLC, MAC, PDCP).
* RAN2 assumes that network implementation allows speedy data recovery for RLC AM bearer at intra-DU LTM cell switch without specification impact.
* The PDCP data recovery procedure can be applied to the RLC AM bearers for inter-DU LTM cell switch.
* Will not support HARQ continue at LTM cell switch in this release.

According to this agreement, a possible implementation on how to indicate during an LTM cell switch on whether L2 reset is needed or not (and what are the UE actions) is provided in the RRC Running CR and companies are invited to provide their inputs directly there. These Editor’s Notes can be deleted.

## FFS #12

*Editor’s Note: FFS on whether to use a new timer or re-use timer T304.*

*Editor’s Note: FFS on the supervision timer for the LTM cell switch.*

Current RRC Running CR assumes that a new timer is used for the LTM cell switch procedure as the start and stop of the timer may be different with respect to the legacy T304 (e.g., due to the RACH-less LTM). This will make the procedure a bit more clean and will also give the possibility to set value of this new timer differently from what we have in legacy T304 given also the nature of LTM (when the LTM cell switch is suppose to be much faster than normal L3 handover).

**Question 9: Do companies agree to use a new timer for the LTM cell switch procedure (as implemented in current RRC running CR)?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Comment |
| CATT | Yes to use timers other than T304, but | We prefer two new timers, one for RACH-based, one for RACH-less, since the RACH-less LTM cell switch is faster than the RACH-based LTM cell switch. Or alternatively, we can also accept that there is one timer, but with a set of candidate values, and then NW indicate the value to be used in LTM cell switch command based on whether it is RACH-based and RACH-less cell switch, but this solution also requires the MAC to indicate to RRC on the value for the timer. |
| ZTE | Agree | It’s fine to define a new timer for LTM considering that LTM cell switch shall be faster than the L3 handover. We can further consider whether two new timers or one new timer with two values are required for RACH-based LTM and RACH-less LTM, respectively. |
| MediaTek | Agree | T304 is related to reconfiguration with sync. Since LTM cell switch does not use legacy reconfiguration with sync procedure, we think it should not use T304 either.We also need to discuss the suitable value range for this new timer. It may not be that long as t304, since LTM targets fast cell switch. |
| Qualcomm | See comment | The current range for the t304 timer starts at 50ms. Agree to extend this range to smaller values for LTM. Whether the timer is called t304 or a different name is not critical. Maybe cleaner solution to define a new timer. |
| OPPO | Agree  |  |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Apple | Agree |  |
| Huawei, HiSilicon | Prefer no (see comments) | The UE behaviours at expiry should be exactly the same like t304, introducing a new timer will duplicate specification for no gain.Of course, it is possible to have additional values applicable only for LTM, but this does not mean duplicate the timer. |

However, about the supervision timer, one open issue that is still open is when the supervision timer should be stopped. Last time this topic was discussed, the outcome was that the UE should stop the supervision timer when upon successful completion of the RACH-less LTM cell switch procedure (i.e., reception of the first UL data). However, about how the UE determines the correct reception of the first UL data there are still three options on the table. About these three options the following can be observed (as also emerged by the last offline when this was discussed):

Option 1. RLC ACK of the *RRCReconfigurationComplete* message

* With this solution the UE determines that the *RRCReconfigurationComplete* has been received by the network and that the *RRCReconfiguration* message has been correctly applied. The RLC ACK delay may trigger the supervision timer expiry and LTM RLF is triggered. However, the maximum number of RLC re-transmissions is configurable by the network, so this should not be an issue.

Option 2. C-RNTI addressed PDCCH

* In case the C-RNTI can be send to the UE in PDCCH but this does not provide really an acknowledge. Even if this can generally work, also if UE has no UL data to transmit/schedule this may inefficient.

Option 3. DL Contention Resolution MAC CE

* With this solution the network is forced to send a MAC CE at every LTM cell switch procedure and probably not the most desirable option.

**Question 10: Which option companies believe should be considered for the UE to determine the correct reception of its first UL data by the network?**

|  |  |  |
| --- | --- | --- |
| Company | Option | Comment |
| CATT | Option 3 |   |
| ZTE | Option 2 | The reception of the C-RNTI addressed PDCCH for the new transmission from the target cell can be taken as the implicit confirmation of the successful first UL transmission. And it can be up to NW implementation to ensure a fast C-RNTI addressed PDCCH scheduling after receiving the first UL transmission, e.g. to schedule UE for transmitting padding if there is no new data transmission/scheduling. |
| MediaTek | Option 2 | Option 3 should not be considered, since DL Contention Resolution MAC CE is related to random access procedure and this open issue is about RACH-less LTM cell switch. Using RA related MAC CE for RACH-less LTM cell switch would make the specification confusing and unclear. If a MAC CE is going to be used, a new MAC CE for this purpose should be defined.Notice that the same topics is also included in the discussion on MAC CE (#058). Since RRC receives indication from lower layer, we suggest referring to the conclusion of RLC/MAC discussions. |
| Qualcomm | Option 2 (do not copy LTE or NTN) | In LTE, the CRC for PDCCH was 16 bits, so the false alarm rate was of concern and one of the justifications for MAC CE based solution.In NR, the CRC for PDCCH is 24 bits, so the false alarm rate is very low. That’s why any PDCCH addressing the UE’s C-RNTI (for UL scheduling or for DL scheduling) is sufficient.If NR RACH-less NTN copied the LTE solution, we do not have to do so since it is unjustifiable to send a 48-bit MAC CE whose content the UE will ignore anyway.Option 1 incurs high latency. |
| OPPO | Option 3 | Option 2 may be inefficient if no DL/UL transmission is expected. Option 3 is preferred and we can have common solution as LTE RACH-less HO as well as NTN. |
| Samsung | Option 2 | In our understanding UL grant used by UE to send first UL data is dedicated to UE. So, option 2 seems sufficient. |
| Ericsson | Option 2 (ok also with Option 1) |  |
| Apple | Op 2 | At this stage, prefer to go with op2 |
| Huawei, HiSilicon | Option 3 | If the UE uses a configured grant for the initial UL transmission and the network only schedules the UE after receiving an initial transmission, option 2 can work. Otherwise, something different would be needed, e.g. PDCCH scheduled for the same HARQ process with the NDI toggled. Therefore, option 2 looks more complicated.Option 1 would work but we prefer option 3 in order to make specification simpler and align with other cases. |

## FFS #13

*Editor’s Note: FFS on whether it is allowed to trigger an LTM cell switch (at the MCG or SCG) while timer T316 is running.*

This FFS is to address the scenario on when there is timer T316 running, and network may decide to trigger an LTM cell switch at the UE. In this case, if timer T316 is running it means that transmissions on the MCG are suspended and thus the network may not be able to trigger an LTM cell switch procedure at the MCG. However, the network may still trigger an LTM cell switch procedure at the SCG due one may question what is the benefit in doing so when the MCG is failed and the UE may need to do anyway a L3 handover. Therefore, the simplest solution would be to not trigger an LTM cell switch while timer T316 is running (or after receiving an *MCGFailureInformation* message).

**Question 11: Do companies agree that an LTM cell switch procedure should not be triggered while an MCG failure recovery procedure is ongoing?**

|  |  |  |
| --- | --- | --- |
| Company | None/specify which ones | Comment |
| CATT | Yes for both MCG LTM and SCG LTM | If radio link of failure on MCG happen, how can UE to receive the LTM command for MCG LTM? And also, how can UE to feedback the *RRCReconfigurationComplete* message for MCG LTM and SCG LTM via SRB1 case? |
| ZTE | Agree  | When timer T316 is running, the MCG transmission was suspended due to the MCG failure. The NW can not send the MCG LTM MAC CE via the MCG. And currently, it’s also impossible to send the MCG LTM MAC CE via the SCG. |
| MediaTek | Agree | If the UE has encountered MCG failure (and therefore sent *MCGFailureInformation* to MN), the UE has suspended MCG transmission of all RB's. The UE resumes the MCG transmission of RB's only upon MCG reconfiguration with sync, see clause 5.3.5.5.2. Therefore, we think the UE should not perform MCG LTM, if T316 is running.Similarly, if the UE has encountered SCG failure (and therefore sent *SCGFailureInformation*), the UE has suspended SCG transmission for all RB's. A reconfiguration with sync is required to resume the transmission. Therefore, we think the UE should not perform SCG LTM, if SCG transmission of all RB's is suspended. |
| Qualcomm | Agree |  |
| OPPO | Agree  |   |
| Samsung | Agree | Agree to follow the simplest approach. This also means that, UE should stop LTM measurements and reporting after sending *MCGFailureInformation* message. |
| Ericsson | Agree |  |
| Apple | Agree |  |
| Huawei, HiSilicon | Maybe but there is no need to specify anything | We understand that the network will not do that but we don't want any specification impact for such a case. |

## FFS #14

*Editor’s Note: FFS on whether the “apply” of the LTM configuration should explicitly refer to section 5.3.5.3.*

According to the inputs received by companies in previous meetings/offlines, current RRC Running CR the application of the complete LTM candidate cell configuration upon an LTM cell switch execution explicitly refer to section 5.3.5.3 and thus this Editor’s Note can be deleted.

## FFS #15

*Editor’s Note: FFS on whether to reuse the reconfiguration with sync procedure and IE.*

Current RRC Running CR implementation assumes that the reconfiguration with sync procedure (and ASN.1 IE) is not re-used for LTM. This is mainly for three reasons:

1. So far the presence of the reconfigurationWithSync within an RRCReconfiguration message always implies that random access procedure is triggered. This implies that exception for the RACH-less LTM would need to be captured in e.g., section 5.3.5.3 and section 5.3.5.5.2.

2. The UE actions upon the presence of the field reconfigurationWithSync are widely spread in the procedural text and ASN.1 field description (there are current about 125 where ”reconfigurationWithSync” is mentioned in RRC) and it would take much more effort to capture exceptions and restrictions if legacy reconfiguration with sync is reused rather than if a new procedure is specified for LTM.

3. Only few actions of section 5.3.5.5.1 are needed for LTM

Therefore, the proposal would be to not re-use the legacy reconfiguration with sync procedure for LTM.

**Question 12: Do companies agree to not re-use the legacy reconfiguration with sync procedure (and ASN.1 IE) in case of LTM (as implemented in current RRC running CR)?**

|  |  |  |
| --- | --- | --- |
| Company | None/specify which ones | Comment |
| CATT | yes | It is more straightforward and forward compatible to have new procedure and new IE. |
| ZTE | Agree |  |
| MediaTek | Agree | It is clear approach to keep LTM and L3 mobility (reconfiguration with sync) as separate procedures.  |
| Qualcomm | Agree |  |
| OPPO | Agree |  |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Huawei, HiSilicon | The arguments look wrong | 1) "This implies that exception for the RACH-less LTM would need to be captured in e.g., section 5.3.5.3 and section 5.3.5.5.2" is correct but this is not a problem.2) There are many occurrences of reconfigurationWithSync where it is mandatory for some specific change. In many cases, LTM is likely to be perfectly suitable so if LTM does not reconfigurationWithSync, changes will be needed there.In any case, the 125 occurrences of reconfigurationWithSync must be checked. Using a different field for LTM will not avoid any such checking work.3) Perhaps the rapporteur meant "only few actions from 5.3.5.5.**2** are needed for LTM". However, this was never discussed and our impression is that this statement is not true.5.3.5.5.2 is not so small and duplication would increase maintenance work and the risk of discrepancies.Besides, the rapporteur did not ask about this, but the rapporteur also decided to duplicate the structure. In our understanding, this is also increasing maintenance work and we have doubts on the benefits.About MediaTek's comment: when changes are needed in both sides, it makes the work more difficult, especially if the structure is different. Don't forget that LTM supports the case with RACH as well. |

## FFS #16

*Editor’s Note: FFS on whether the sending of the RRCReconfigurationComplete message should be triggered in this section or in section 5.3.5.3 (i.e., Reception of an RRCReconfiguration by the UE).*

In current RRC Running CR the assumption is that the *RRCReconfigurationComplete* message is sent only after that the UE has confirmed that the UE has switched to the indicated target cell in the LTM cell switch MAC CE (e.g., the UE is switched to the new beam indicated). Therefore, due to these MAC-RRC interactions there are benefits to have the sending of the *RRCReconfigurationComplete* message within section 5.3.5.x.5 rather than in 5.3.5.3.

**Question 13: Do companies agree to have the sending of the *RRCReconfigurationComplete* message within the LTM cell switch execution section (as implemented in current RRC running CR, section 5.3.5.x.5)?**

|  |  |  |
| --- | --- | --- |
| Company | None/specify which ones | Comment |
| CATT | No | Firstly, we do not think this will lead to more MAC-RRC interaction (the assumption that the *RRCReconfigurationComplete* message is sent only after that the UE is switched to the new beam indicated), since RRC spec just specifies the generation of the RRCReconfigurationComplete message and then delivery it to lower layer, when to send the message totally up to MAC. Secondly, the current description in 5.3.5.3 can be simply modified/reused to cover the case for sending the RRCReconfigurationComplete message within the LTM cell switch execution section procedure, so no need to separate the procedure here and there.  |
| ZTE | No | It seems that the sending of the RRCReconfigurationComplete message within the LTM cell switch execution section is similar to what is captured in the section 5.3.5.3. And the UE execution order is the same, i.e. after applying the LTM configuration in ue-LTM-Config within VarLTM-UE-Config related to the LTM candidate cell configuration identity as received by lower layers according to clause 5.3.5.3.So we prefer to reuse the existing text in the clause 5.3.5.3 with some small modification for the LTM case.  |
| MediaTek | Yes | This can be agreed in principle, and we can check detailed text later.  |
| Qualcomm | Yes |  |
| OPPO | No  | We think the existing text in 5.3.5.3 can be reused when UE applies LTM candidate configuration. Otherwise redundant *RRCreconfigurationcomplete* message will be generated. |
| Samsung | Agree |  |
| Ericsson | Agree | The legacy procedure in 5.3.5.3 cannot be re-used anyway as the RRC recondifuration complete message should be send only upon receiving an indication from MAC that the UE has switched to the beam received in the LTM cell switch command. Since something is needed anyway, having the sending directly within the LTM execution section looks a bit more simple and clean. |
| Huawei, HiSilicon | No | Agree with ZTE. Moreover, there are many actions in 5.3.5.3 upon mobility completion which are missing in the draft CR and would need to be duplicated. |

## FFS #17

*Editor’s Note: FFS on whether further UE actions need to be specified for e.g., subsequent LTM cell switch or interaction with lower layers.*

This FFS is mostly related to the case on whether a subsequent LTM cell switch procedure is explicitly indicated to the UE or whether this is transparent from UE perspective. RAN2 has already made an agreement that during a subsequent LTM a UE does not need to be reconfigured an thus this imply that the same configured may be valid for both the “first” LTM cell switch procedure toward that particular LTM candidate cell but also for any subsequent LTM cell switch to the same LTM candidate cell.

In general, the understanding is that there are no particular differences on the UE actions for the case of a LTM cell switch and an LTM cell switch and thus we see no need to indicate a subsequent LTM cell switch explicitly to the UE.

**Question 14: Do companies agree that a subsequent LTM cell switch does not need to be explicitly indicated to the UE?**

|  |  |  |
| --- | --- | --- |
| Company | None/specify which ones | Comment |
| CATT | no | There is some difference on UE behavior for one-shot LTM and subsequent LTM:* For one-shot LTM, UE need to release the configurations within the UE variable for LTM (so as to release the LTM candidate configuration and RACH configurations for LTM) upon triggering the LTM execution procedure;
* For one-shot LTM, UE need to release L1 measurement and TCI configuration for LTM after the LTM cell switch execution procedure is successfully complete;
 |
| ZTE | Agree | We think the subsequent LTM cell switch can be taken as a default behaviour for the supporting of LTM, according to the following objective in the WID:1. To specify mechanism and procedures of L1/L2 based inter-cell mobility for mobility latency reduction:
	* Configuration and maintenance for multiple candidate cells to allow fast application of configurations for candidate cells [RAN2, RAN3]

So there is no need to explicitly indicate a subsequent LTM cell switch to the UE. Anyway, if the NW does not want to allow the subsequent LTM for a candidate cell, the NW can explicitly release the cell after a cell switch execution. |
| MediaTek | Agree |  |
| Qualcomm | Agree; Subsequent LTM is baseline | At LTM execution, the UE retains the LTM candidate configurations unless explicitly told by the network to release those configurations via a separate RRC message. If that’s the case, for subsequent LTM, the UE just receives a new LTM MAC CE and performs LTM cell switch yet another time. The UE does not need to be told that this is a subsequent LTM switch. |
| OPPO | Agree  |  |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Apple | Agree | Same views as ZTE |
| Huawei, HiSilicon | Agree | The network can explicitly release LTM at any time, there is no need for any UE-autonomous release |

About the cross-layer interaction, part of them are to be discussed in the MAC running CR and thus we can align the behaviour in RRC once that these interaction in MAC have been clarified.

## FFS #18

*Editor’s Note: FFS on how to provide the UL grant to the UE in case no RACH is performed during the LTM cell switch.*

RAN2 made the following agreements and thus this Editor’s Note can be deleted:

* Dynamic grant can be used for RACH-less LTM, for the first UL data transmission to the target cell:

- the UE monitors PDCCH for dynamic scheduling from the target cell, upon LTM cell switch.

- upon cell switch decision, R2 assumes that the source DU informs the target DU about the selected beam, so that the target DU can start scheduling dynamic UL grant.

* Configured grant can be used for RACH-less LTM, for the first UL data transmission to the target cell, the UE selects the configured grant occasion, which is associated with the beam indicated in the LTM MAC CE (as set by source cell). FFS further optimization

## FFS #19

*Editor’s Note: It is FFS how the UE receives the LTM MCG and the LTM SCG configurations and how to handle the SCG if LTM MCG is executed.*

In current RRC running CR there is an FFS on how the UE gets the *LTM-Config* for the MCG and SCG. Since RAN2 already agreed that LTM is done independently on the MCG and SCG and that on the SCG only the intra-SN LTM cell switch procedure (without MN involvement) is supported, the current assumption is that an MCG LTM configuration will not include any SCG LTM related fields. In few words, the *LTM-Config* IE is per-cell group and if the SN wants to configure LTM at the UE, it should either send the *LTM-Config* IE within an *RRCReconfiguration* via SRB3, or within an SCG *RRCReconfiguration* that is embedded within an MCG *RRCReconfiguration*. For this latter case, the *LTM-Config* will be part of the field nr-SCG within *MRDC-SecondaryCellGroupConfig*.

**Question 15: Do companies agree that the *LTM-Config* IE is per cell group and contains either the MCG LTM configuration or the SCG LTM configuration (i.e., not both)?**

|  |  |  |
| --- | --- | --- |
| Company | None/specify which ones | Comment |
| CATT |  | The question is a bit confusing, does it mean:* For SCG triggered LTM configuration, the LTM configuration cannot include any MCG configuration (SCG LTM without MN involvement); or
* For MCG triggered LTM configuration, the LTM configuration cannot contian any SCG configuration (SA/DC to SA after MCG LTM execution); or
* Both of above

In general, considering the limited time, we do not support both of the above case in R18. |
| ZTE | Generally agree, but see comments | We generally agree that the LTM is configured per cell group, i.e. not include the SCG configuration in MCG LTM configuration, vice verse. But we wonder how to implement MCG LTM in NR-DC case, e.g. how to handle with the current SCG configuration at MCG LTM? There are several options to be considered:* Option 1: MCG LTM is not allowed in NR-DC, i.e. the MN should explicitly release the SCG before/when configuring MCG LTM.
* Option 2: MCG LTM execution shall cause the SCG release (i.e. DC to SA mobility). In this case, the target cell can configure SCG release in the LTM candidate cell configuration, i.e. the MCG LTM configuration includes mrdc-SecondaryCellGroupConfig set to release.
* Option 3: Only support MCG LTM without SN involvement, i.e. the MCG LTM execution shall not impact the current SCG configuration, and then there is no need to release SCG due to MCG LTM execution.

[Ericsson] Our understanding is that these options are related to the handling of the SCG in case MCG LTM is executed, which is a bit unrelated to the configuration of LTM at the MCG and SCG. This to us is a separate topic that needs to be discussed by RAN2. |
| MediaTek | Agree |  |
| Qualcomm | Agree |  |
| OPPO | Agree  |  |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Huawei, HiSilicon | The question is rather vague | On ZTE's comment: option 2 would require interaction with the SN. |

**Question 16: Do companies agree that the *LTM-Config* IE for an SCG can be received by the UE either via an SCG *RRCReconfiguration* via SRB3 or embedded via an MCG *RRCReconfiguration* via SRB1 (i.e., contained in *nr-SCG* within** ***MRDC-SecondaryCellGroupConfig*)?**

|  |  |  |
| --- | --- | --- |
| Company | None/specify which ones | Comment |
| CATT | Yes | Yes if the SCG LTM can be supported in the quite limited time budget remained for R18.  |
| ZTE | Agree |  |
| MediaTek | Agree | Can SN *RRCReconfiguration* message embedded in *RRCResume* message contain SCG *LTM-Config* IE? |
| Qualcomm | Agree |  |
| OPPO | Agree  |  |
| Samsung | Agree |  |
| Ericsson | Agree |  |
| Huawei, HiSilicon | Agree but | at SCG LTM, it is not clear how the UE knows on which AM DRBs to apply PDCP data recovery. |

## FFS #20

The following Editor’s Note are related to aspect for which we would need input from RAN1. Therefore, the proposal would be to keep them as a placeholder until the RRC parameter list from RAN1 is received.

*Editor’s Note: FFS on what the configuration of ltm-EarlyUlSync actually is (e.g., RACH-Dedicated, CFRA, or something else). Wait for more RAN1 progresses.*

*Editor’s Note: This is a placeholder the advance TCI state pool configuration for LTM and what this IE should exactly include is FFS*

*Editor’s Note: This is a placeholder* *for the CSI report configuration for LTM and what this IE should exactly include is FFS*

*Editor’s Note: This is a placeholder* *for the CSI resource configuration for LTM and what this IE should exactly include is FFS*

# 3 Conclusion

Based on the discussion in the previous sections we propose the following:

# 4 References