3GPP TSG-RAN WG2 Meeting #127bis R2-240xxxx

Hefei, China, Oct 14th – 18th, 2024

**Title: [draft] LS on RAN2 agreements for inter-CU LTM**

**Response to:**

**Release: Rel-19**

**Work Item: NR\_Mob\_Ph4-Core**

**Source: ZTE [to be RAN2]**

**To: RAN3**

**Cc:**

**Contact person: Jing Liu**

 **liu.jing30@zte.com.cn**

**Send any reply LS to: 3GPP Liaisons Coordinator,** **mailto:3GPPLiaison@etsi.org**

**Attachments:** **None**

# 1 Overall description

Regarding Rel-19 Inter-CU LTM, RAN2 made the following agreements at RAN2#127bis meeting:

* RAN2#127bis:

**Agreements on inter-CU LTM**

1. The Rel18 handling on failure is reused in R19 if the UE selects an intra-CU LTM candidate cell after intra-CU LTM failure; for other cases, e.g. inter-CU LTM failure, the failure handling is FFS (related to SA3’s inputs).
2. For non-DC case, if the new Rel-19 IDs of the serving cell and the target cell have same values, the UE compares the ltm-ServingCellNoResetID and ltm-NoResetID and performs the corresponding L2 reset operation as defined in Rel-18.
3. The SCPAC-similar security update configuration is introduced for inter-CU SCG LTM, i.e. similar to IEs sk-CounterConfiguration, servingSecurityCellSetId and securityCellSetId. The names of the new IEs are to be discussed in stage3.
4. Regarding the candidate and reference configuration generation and signaling design, the following SCPAC-similar principles can be applied for inter-CU SCG LTM as baseline:

 - The reference configuration for inter-CU SCG LTM at least include SCG part, FFS on MCG part.

 - FFS: Network ensures that when UE combines the reference and candidate configuration for inter-CU SCG LTM, the configuration generated by UE must contain both MCG and SCG part configurations.

 - The candidate configuration and reference configuration are modeled as an MN RRCReconfiguration message.

 - Upon inter-CU SCG LTM, the UE performs reconfiguration with sync towards SCG, but the reconfiguration with sync in MCG is not allowed.

 - The MN generates the MCG part of the reference configuration (if any), while the SN (source or candidate) generates the SCG part of the reference configuration.

 - The MN is responsible for the reference configuration generation for SN initiated inter-CU SCG LTM. It can be up to the NW implementation whether to include the MCG part.

 - The MN can request an SCG reference configuration from any of the involved SNs.

5. For SN initiated inter-CU SCG LTM, the candidate SN provides the SCG part configuration of each candidate PSCell, and may also provide the L1 RS (e.g. a list of SSB or a list of CSI-RS) configuration for L1 measurement, early UL sync configuration or TCI-state configuration, to the MN.

6. The source SN is responsible to generate the common CSI resource configuration for L1 measurement on candidate SCG cells.

7. The MN sends the received L1 RS configuration, early UL sync configuration, or TCI-state configuration of candidate cells to the source SN. And the source SN responds with the common CSI resource configuration to the MN.

8. In order to support subsequent inter-CU SCG LTM, the MN needs to transfer, during the LTM preparation phase, the common CSI resource configuration and the collected information of candidate cells to the candidate SN(s). Accordingly, the candidate SN(s) responds with the updated candidate SCG configuration to the MN.

9. Upon execution of inter-SN SCG LTM, the UE sends an MN RRCReconfigurationComplete message to the MN, which includes an SN RRCReconfigurationComplete message.

10. Re-use legacy LTM Cell Switch Command MAC CE for inter-SN LTM.

11. RAN2 confirms to support coexistence of following cases, it is up to network implementation to ensure simultaneous execution for both MCG and SCG will not happen:

 - Inter-MN LTM and intra-SN LTM

 - Inter-SN LTM and intra-MN LTM

In addition, RAN2 also made below agreements regarding inter-CU LTM at RAN2#126 and RAN2#127 meetings:

* RAN2#126:

**Agreements on inter-CU LTM:**

**Clarification of DC**

1. An LTM configuration with inter-CU LTM candidate cells can be configured either by the MCG or SCG (but not for both simultaneously) and it is up to the network to handle this (further details up to RAN3, if any). No restriction for intra-CU LTM candidate cells.

**Xn-based and N2-based inter-CU LTM**

1. Xn-based inter-CU LTM is prioritized in Rel-19.

**Stage-2 signaling flows and procedures**

1. The preparation of inter-CU LTM configuration is initiated by the source gNB-CU.
2. For each candidate cell, the preparation of lower layer configuration is initiated by the candidate gNB-CU, based on the LTM request from the source gNB-CU. RAN2 assumes the interaction between the candidate gNB-CU and candidate gNB-DU follows the same signaling procedure for intra-CU LTM.
3. The source gNB-CU is responsible to collect the configurations and information of candidate cells from multiple candidate gNB-CUs and generates the common CSI resource configuration for L1 measurement on candidate cells.
4. In order to support subsequent LTM, the source gNB-CU needs to inform the candidate gNB-CU(s) about the common CSI resource configuration and the collected information of candidate cells from multiple candidate gNB-CUs. The candidate gNB-CU(s) responds with the candidate configuration to the source gNB-CU accordingly (if needed).

**Preparation:**

**RRC Configuration/structure**

1. The RRC signalling structure and modelling for Rel-18 LTM is taken as the baseline for inter-CU LTM.

**LTM Candidate ID**

1. For inter-CU LTM, LTM candidate ID is unique across all the participating gNB-CUs.

**Max number of LTM candidate IDs**

1. The maximum number of LTM candidate cell configuration is 8, regardless of whether these are intra-CU or inter-CU LTM candidate configurations.

**Early sync:**

**RAR based option**

1. RAR-based TA acquisition is not supported for inter-CU LTM for non-conditional LTM. FFS on conditional LTM.

**Execution:**

**LTM Cell Switch Command**

1. R18 LTM CSC MAC CE is baseline to trigger LTM cell switch for inter-CU LTM.

**LTM Cell switch completion**

1. Support CG-based RACH-less and DG-based RACH-less procedures for inter-CU LTM.
2. The LTM completion defined for intra-CU LTM is followed for R19 LTM.
* RAN2#127:

**Agreements on inter-CU LTM**

Reference configuration:

1. Inter-CU LTM re-uses the reference configuration from Rel-18 LTM. No additional reference configurations (no multiple reference configurations) are supported.

CSI resource and report configuration:

1. The Rel-18 signaling structure for LTM CSI resource and report configuration is reused for inter-CU LTM, i.e. a common CSI resource configuration and cell-specific CSI report configuration.
2. The source CU is responsible to generate the common CSI resource configuration.

Early DL sync:

1. For inter-CU LTM, the R18 candidate TCI State activation/deactivation design (including MAC CE and related UE handling) is reused.

Inter-CU LTM switch:

1. For inter-CU LTM cell switch, it’s the source DU that triggers the MAC CE and informs the source CU about the target LTM cell.

RLC and PDCP re-establishment in inter-CU LTM:

1. If the security key update is required, the UE shall perform MAC reset, RLC re-establishment and PDCP re-establishment. As baseline introduce a new Rel-19 ID in RRC: if the Rel-19 ID is different for the source cell and the target cell, the UE performs PDCP re-establishment, including security key update, however dependent on SA3 response, we can revisit it.

Handling of candidate configuration after inter-CU LTM cell switch:

1. As in Rel-18 LTM, the UE keeps its LTM candidate cell configurations after at least a inter-CU LTM cell switch procedure where the UE is not configured with DC, unless these are explicitly released by the network.

DRB/PDU session mismatch in subsequent inter-CU LTM:

1. RAN2 understand NW implementation can handle the concern raised in P6, R2-2407421.

LTM and L3 HO:

1. L3 mobility (including both the network triggered L3 HO and CHO) can be configured to UE, while the inter-CU LTM is configured (w/o DC), and the following items can be considered (follow Rel-18 intra-CU LTM):

 - When performing the L3 mobility (HO or CHO), the UE does not autonomously release inter-CU LTM configurations, unless these are explicitly released by the network.

 - The RRCReconfiguration message to execute an L3 mobility (HO or CHO) procedure may reconfigure inter-CU LTM configurations.

 - For the execution order between CHO and LTM, Rel-18 principle is applied.

Inter-CU SCG LTM:

1. Inter-CU SCG LTM preparation can be initiated by source SN.
2. The inter-CU SCG LTM configuration, SN generates SCG part configuration, MN includes it into its MN RRC configuration message.
3. For inter-CU SCG LTM, the LTM cell switch command MAC CE is sent by source SN.
4. RAN2 understands for the security key update of inter-CU SCG LTM, SCPAC security key update mechanism is taken as baseline. We will send LS to SA3 to ask them to take it into account for their works.
5. Only SN-initiated inter-SN LTM (including LTM configuration, early DL/UL synch and LTM execution) is supported in Rel-19.

Inter-CU MCG LTM:

1. SCG configuration can be changed in inter-CU MN and leave how to handle SCG part up to NW implementation (e.g. release or reconfiguration).
2. Upon execution of inter-CU MN LTM with DC, the UE is required to perform refresh of security key, re-establishment of RLC and PDCP, and MAC reset at both MN and SN side (i.e. Rel-15 principle is applied).
3. For the SN key update in inter-CU MN LTM with DC, the UE applies legacy R15 RRC reconfiguration with sync procedure.

# 2 Actions

**To RAN3 group**

**ACTION:** RAN2 kindly asks RAN3 to take the above agreements into consideration in future work.

# 3 Dates of next TSG-RAN WG2 meetings

TSG-RAN2 Meeting #128 18 - 22 November 2024 Orlando, US

TSG-RAN2 Meeting #129 17 - 21 February 2025 Athens, GR