3GPP TSG RAN#102
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RP-233522

Rel-19 mobility enhancements

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Rel-19 Even further NR mobility enhancements Justification

- L1/L2 Triggered Mobility (LTM) in Rel-18 is limited to intra-CU operation and no security key change is supported. DAPS can be used for inter-CU low latency handover with short interruption but has limitations such as no support for CA/DC and FR2<->FR2 DAPS is not supported.

- The L1 measurement reporting for LTM in Rel-18 is supports periodic and gNB-scheduled reporting. This causes frequent L1 reporting and results in high overhead. Event-triggered reporting can reduce overhead and has been previously proposed for intra-cell beam management.

- The L1 measurements on LTM candidate cells only supports SSB-based measurements in Rel-18.

- LTM (and DAPS) expects to provide mobility with short interruption time but may still suffer from lost measurement reports and/or lost LTM cell switch commands e.g. when UE is on cell edge. Conditional reconfigurations such as CHO and (subsequent) CPAC addresses robustness in also in scenarios such as small cells, FR2 and/or high-speed UEs. There is not yet a solution which combines the short interruption time provided in LTM with the high robustness in conditional reconfigurations.

For reference: This page is from the chair input RP-232745

Mobility Enhancements WI

- References: RWS-230488, RP-231540, RP-232618
- Potential objectives:
  - Specify support for inter-CU Layer 2 Mobility (LTM)
    - Prioritize the case when CU is acting as MN when DC is not configured
    - Whether to additionally support e.g. when CU is acting SN? (focus on practical deployments)
      - In this case, ~~whether~~ it is supported for ~~EN-DC and/or~~ NR-DC only~~?~~
  - Measurements related enhancements for purpose of supporting LTM:
    - Specify event triggered L1 measurement reporting for triggering LTM → depending on the detailed discussion in RAN#102, resolve how to avoid overlapping with similar objective in MIMO WI
    - Specify support for CSI-RS measurements for LTM procedures and enable CSI-RS based beam management and/or other physical layer operations on candidate cells before LTM
  - Support of conditional mobility (including set of candidate cells, UE evaluated mobility conditions, ability for UE to perform subsequent mobility procedures without need for RRC configuration) along with short mobility interruption time (similar to that achievable with LTM).
    - Next Step question to consider the most appropriate approach to achieve this aim. For example, by specifying conditional triggering of LTM, or specifying support of Early TA or RACHless (as defined for LTM) to be used as part of layer 3 CHO, or possibly other approaches. If this questions cannot be concluded during the Rel-19 scoping discussion then it may be possible to start with a RAN2 study phase.
  - Anything else (e.g., RAN4 related)?

Discussion on the potential objectives in the chair input RP-232745

- On 1st objective "inter-CU LTM", whether to include also "CU is acting SN"?
  - We think the order of priority is as follows:
    - Higher priority: CU is acting as MN when DC is not configured (the simplest case)
    - Medium priority: Inter-SN (NR-DC with FR1+FR2 is a "practical deployment" and this will add more use cases for LTM in FR2)
    - Lower priority: inter-MN with NR-DC configured (at least with keeping/releasing SCG)
- On 2nd objective "measurement related enhancements for support of LTM", avoiding overlapping with MIMO WI?
  - For "event triggered L1 measurement reporting for triggering LTM", while we think there are similarities with the UE-initiated reporting in the MIMO WID, the requirements are not fully overlapping and therefore different solutions may be motivated. Note that only a partial solution is expected to be specified in MIMO – the report format and content.
  - Proposed resolution: Do not explicitly align the event-driven reporting with the UE-initiated reporting in the MIMO WID
- On 3rd objective "conditional mobility with short interruption time", which approach to be used?
  - If this objective should be kept, the two main alternatives are:
    - Conditional LTM, triggered by a lower-layer event
      - The events specified for event-triggered L1 measurement reporting (second objective) should be considered
    - CHO enhanced for subsequent operation and RACH-less execution
  - If no solution can be selected at RAN#102, we think that a study phase during one quarter is needed to select between two alternative solutions which are clearly identified in the objective.
    - Scope should also include solutions for early UL/DL synchronization for conditional mobility
    - Other details (e.g. support for inter-CU, NR-DC, SN mobility etc) to be determined as part of the study phase

Rel-19 Even further NR mobility enhancements Objectives

- Specify mechanisms and procedures for inter -CU L1/L2 Triggered Mobility (LTM)
  - Signalling support for configuration of inter-CU candidate cells [RAN2, RAN3]
  - Signalling support for L1 measurements configuration, early UL/DL sync [RAN2, RAN3]
  - Signalling support and RRM requirements for inter-CU LTM cell switch [RAN2, RAN3, RAN4]
    - Note 1: Rel-18 LTM shall be the baseline
    - Note 2: Inter-CU LTM should support at least security key change
    - Note 3: NR-DC mobility cases to be considered in the work are (in priority order)
      - Inter-MN change when DC is not configured
      - Inter-MN change in NR-DC with keeping/releasing SN
      - Inter-SN change with MN involvement
      - Inter-MN change in NR-DC with SN modification/change/addition
- Measurements related enhancements for purpose of supporting LTM:
  - Specify event triggered L1 measurement reporting over MAC for triggering LTM [RAN1, RAN2, RAN4]
    - Note 1: L3 events are baseline
    - Note 2: Legacy scheduling request to request UL resource
  - Specify LTM procedures using CSI-RS [RAN1, RAN2, RAN4]
    - Aperiodic RS for acquisition of T/F sync before/after cell switch command
  - Early CSI acquisition
    - Measurements
    - Note: the CSI-RS for mobility is baseline
- Study and specify conditional mobility with short interruption [RAN2, RAN3]
  - Note 1: Study duration one quarter
  - Note 2: Candidate solutions are at least:
    - Conditional triggering of LTM
    - CHO enhanced with at least early sync/RACH-less and potentially subsequent execution without RRC reconfiguration
  - Note 3: At most one solution should be specified