**3GPP TSG-RAN WG2 Meeting #119 Electronic R2-22xxxxx**

**Online, August 17 – 29, 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.300** | **CR** | **Draft CR** | **rev** | **-** | **Current version:** | **17.1.0** |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  | 38.300 running CR for introduction of NR further mobility enhancements |
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| ***Source to WG:*** | MediaTek Inc. |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_mob\_enh2-Core |  | ***Date:*** | 2022-09-02 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | This CR introduces the support of Rel-18 L1/L2-based inter-cell mobility. |
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| ***Summary of change:*** | Introduction of L1/L2-based inter-cell mobility, including general description, and illustration for component of mobility latency. Agreements up to R2#119e are reflected in the draft so far.  |
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| ***Consequences if not approved:*** | Rel-18 L1/L2-based inter-cell mobility are not supported in NR.  |
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| ***Clauses affected:*** | TBD |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS 38.331 CR TBDTS 38.321 CR TBD |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*Start of change*

9.2.3.x L1/L2 based inter-cell mobility

9.2.3.4.1 General

L1/L2-based inter-cell mobility is a procedure in which a gNB receives L1 measurement reports from UEs, and relying on which the gNB changes UEs’ serving cell(s) through on L1/L2 signaling. The gNB prepares one or multiple candidate cells and provides the candidate cell configurations to the UE.

Editor’s note: Current options to configure a L1/L2 inter-cell mobility candidate cell:

a. One *RRCReconfiguration* message for candidate target cell

b. One *CellGroupConfig* IE for each candidate target cell

c. One SpCellConfig IE for each candidate target cell

Editor’s note: FFS measurement for preparation could be L3.

The following principles apply to L1/L2 based inter-cell mobility:

- The gNB prepares the candidate cell configurations capable of dynamic switching without need for full configuration.

- User plane is continued whenever possible (e.g. intra-DU), without reset, with the target to avoid data loss and the additional delay of data recovery

L1/L2-based inter-cell mobility supports both intra-DU and intra-CU inter-DU mobility. Inter-cell beam management is also supported, but is not considered as a prerequisite for using L1/L2-based inter cell mobility. It supports following scenarios:

- PCell change in non-CA scenario,

- PCell and SCell(s) change in CA scenario.

Editor’s note: The design for intra-DU and inter-DU L1/L2-based mobility should share as much commonality as reasonable. FFS which aspects need to be different.

Editor’s note: We assume that L1/L2-based inter-cell mobility supports CA scenarios (PCell and SCell). This includes the following cases:

a) The target PCell/target SCell(s) is not a current serving cell (CA-to-CA scenario with PCell change)

b) FFS the target PCell is a current SCell

c) FFS the target SCell is the current PCell.

Editor’s note: DC scenarios are FFS

9.2.3.4.2 C-plane handling

9.2.3.4.3 U-plane handling

9.2.3.4.4 Data Forwarding

*End of change*

# Annex X (informative)

# Components of Mobility Latency

Outcome of [Post-119e][036] to be added here

HO interruption time for L1/L2-based inter-cell mobility is the time from UE receives the cell switch command to UE performs the first DL/UL reception/transmission on the indicated beam of the target cell.

Editor’s note: FFS if TRS tracking after HO and CSI RS measurement should also be included, i.e. the time to use a high-performance beam.

Editor’s note: To reduce HO interruption time, investigate e.g. solutions to reduce the time for UE reconfiguration (already in the WID), downlink and uplink synchronization after handover decision (other parts of dynamic switch not precluded).

Editor’s note: Measurement delay can/may be considered in this work.

The components of mobility latency is illustrated in Figure x-1.



Figure x-1: Components of Mobility Latency

Each component of mobility latency is described in table Table x-1.

Table x-1: Components of Mobility Latency

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| --- | --- | --- |
| **Component** | **Meaning** | **Value** |
| TRRC | Processing time for *RRCReconfiguration* carrying candidate configurations | Up to XmsUp to [10] ms |
| Tprocessing,1 /Tprocessing,2 | Time for UE processing, before and after cell switch command, respectively. This may include L2/3 reconfiguration, RF retuning, baseband retuning, security update if needed, etc. | Up to YmsUp to [20] ms for same FRUp to [40] ms for different FR |
| Tmeas | The time UE measures target cell (from target appears to cell switch command) |  |
| Tcmd | Time for processing L1/L2-command (HARQ and parsing) | Up to ZmsUp to [5] ms |
| Tsearch | Time required to search the target cell | 0ms (if cell is known)Up to 15ms (if cell is unknown)Up to [60] ms (if cell is unknown) |
| TΔ | Time for fine tracking and acquiring full timing information | SMTC periodicity (typ. [20] ms) |
| Tmargin | Time for SSB or CSI-RS post-processing | Up to [2] ms |
| TIU | interruption uncertainty in acquiring the first available PRACH occasion in the new cell | Typ. [15] ms |
| TRAR | Time for RAR delay | Typ. [4] ms |
| Tfirst-data | Time for UE performs the first DL/UL reception/ transmission on the indicated beam of the target cell, after RAR | - |

# Annex - RAN2 agreements

Green highlight – agreement captured in stage-2 specifications

Blue highlight – agreement captured as editor’s notes

No highlight – agreement with no direct impact on specifications

## RAN2#119-e

L1/L2-based inter-cell mobilty

* Assumption: HO interruption time for L1/L2-based inter-cell mobility is the time from UE receives the cell switch command to UE performs the first DL/UL reception/transmission on the indicated beam of the target cell. FFS if TRS tracking after HO and CSI RS measurement should also be included, i.e. the time to use a high-performance beam (can be clarified further).
* Assumption: To reduce HO interruption time, investigate e.g. solutions to reduce the time for UE reconfiguration (already in the WID), downlink and uplink synchronization after handover decision (other parts of dynamic switch not precluded).
* Confirm to Support L1/L2-based inter-cell mobility for inter-DU scenario (as well as intra-DU scenarios).
* The design for intra-DU and inter-DU L1/L2-based mobility should share as much commonality as reasonable. FFS which aspects need to be different.
* 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.
* ICBM is one scenario considered for L1L2 mobility, but is not the only one, and is not a prerequisite for using L1L2 mobility.
* RAN2 to consider preparation of target cell configurations capable of dynamic switching without need for full configuration.
* Measurement delay can/may be considered in this work
* Assume that we rely on L1 measurements to trigger L1L2 mobility (still measurement for preparation could be L3, FFS)
* R2 will initially focus on PCell mobility.
* R2 assumption: Rel-18 L1/L2 mobility includes both non-CA (PCell only) and CA scenarios (PCell and SCell). This includes the following cases

a) the target PCell/target SCell(s) is not a current serving cell (CA 🡪 CA scenario with PCell change)

b) FFS the target PCell is a current SCell

c) FFS the target SCell is the current PCell.

* DC scenarios are FFS (e.g. PSCell mobility may be a low hanging fruit FFS).
* Current options on the table: to configure a L1/L2 inter-cell mobility candidate cell:

a. One RRCReconfiguration message for candidate target cell

b. One CellGroupConfig IE for each candidate target cell

c. One SpCellConfig IE for each candidate target cell

NR-DC with selective activation cell of groups

* The selective activation of cell groups should correspond to support of subsequent conditional changes (CPC) after a cell group change (normal or conditional). CPA FFS.
* Initial focus on SCG
* There is interest to support delta configuration, to reduce the signalling overhead (FFS if some other objective should be achieved)
* FFS how many subsequent conditional changes are targeted (and what is the impact of such assumption).
* FFS whether there is a security issue: e.g. to determine vertical or horizontal key derivation, e.g. security parameters re-used as part of subsequent CG switch (for the case when UE goes back to a previous cell, maybe in another SN), and FFS on the procedure/method with which the UE derives the SN security, e.g. based on a prior MN config (without RRC CPC config at the time of SN switch).

CHO with one or multiple candidate SCGs

* Observation: Current RAN2 Stage-3 specifications can support CHO including target MCG and target SCG in Rel-17.
* CHO configuration referring to or including CPC/CPA configuration (intended to be applicable together) can be supported.
* FFS: When triggering CHO, UE perform CPC/CPA configuration to start CPC/CPA evaluation, FFS if CHO evaluation and CPC/CPA evaluation is concurrent or sequential.