**3GPP TSG-RAN WG3 Meeting #122 R3-237802**

**Chicago, USA, November 13th – November 17th, 2023**

Agenda Item: 10.2.5

Source: Ericsson

Title: (TP for SON to BLCR for TS 38.300) LBT failures in MRO

Document for: Discussion and Approval

# 1 Introduction

This document contains a TP for TS 38.300 to capture the RAN3 agreements related to LBT failures occurred during the handover execution.

# TP for TS 38.300

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##### 15.5.2.2.2 Connection failure due to intra-system mobility

One of the functions of Mobility Robustness Optimization is to detect connection failures that occur due to Too Early or Too Late Handovers, or Handover to Wrong Cell. These problems are defined as follows:

- Intra-system Too Late Handover: an RLF occurs after the UE has stayed for a long period of time in the cell; the UE attempts to re-establish the radio link connection in a different cell.

- Intra-system Too Early Handover: an RLF occurs shortly after a successful handover from a source cell to a target cell or a handover failure occurs during the handover procedure; the UE attempts to re-establish the radio link connection in the source cell.

- Intra-system Handover to Wrong Cell: an RLF occurs shortly after a successful handover from a source cell to a target cell or a handover failure occurs during the handover procedure; the UE attempts to re-establish the radio link connection in a cell other than the source cell and the target cell.

In the definition above, the "successful handover" refers to the UE state, namely the successful completion of the RA procedure.

In case of CHO, the Too Late Handover, Too Early Handover and Handover to Wrong Cell in the definition above means Too Late CHO Execution, Too Early CHO Execution and CHO Execution to Wrong Cell.

**Detection mechanism**

A failure indication may be initiated after a UE attempts to re-establish the radio link connection at NG-RAN node B after a failure at NG-RAN node A. NG-RAN node B may initiate the Failure Indication procedure towards multiple NG-RAN nodes if they control cells which use the PCI signalled by the UE during the re-establishment procedure. The NG-RAN node receiving this selects the UE context that matches the received Failure Cell ID and C-RNTI, and, if available, uses the shortMAC-I to confirm this identification, by calculating the shortMAC-I and comparing it to the received IE.

A failure indication may also be sent to the node last serving the UE when the NG-RAN node fetches the RLF REPORT from UE by triggering:

- The Failure Indication procedure over Xn;

- The Uplink RAN configuration transfer procedure and Downlink RAN configuration transfer procedure over NG.

The detailed detection mechanisms for too late handover, too early handover and handover to wrong cell are carried out through the following in the NG-RAN node that served the UE before the reported connection failure:

- Intra-system Too Late Handover: there is no recent handover for the UE prior to the connection failure e.g. the UE reported timer is absent or larger than the configured threshold (e.g. Tstore\_UE\_cntxt), or if CHO is configured but the CHO execution is not initiated for the UE prior to the connection failure, e.g. the UE reported timer is absent or larger than the configured threshold (e.g. Tstore\_UE\_cntxt).

- Intra-system Too Early Handover: there is a recent handover for the UE prior to the connection failure e.g. the UE reported timer is smaller than the configured threshold (e.g. Tstore\_UE\_cntxt), and the first re-establishment attempt cell/the successful re-connect cell is the cell that served the UE at the last handover initialisation or fall back to the source cell configuration in case of DAPS HO.

- Intra-system Handover to Wrong Cell: there is a recent handover for the UE prior to the connection failure e.g. the UE reported timer is smaller than the configured threshold (e.g. Tstore\_UE\_cntxt), and the first re-establishment attempt cell/ the cell UE attempts to re-connect/the cell UE attempts CHO recovery is neither the cell that served the UE at the last handover initialisation nor the cell that served the UE where the RLF happened or the cell that the handover was initialized toward.

The "UE reported timer" above indicates the time elapsed since the last handover initialisation until connection failure or the time elapsed since the CHO execution until connection failure.

In case of Too Early Handover or Handover to Wrong Cell, the NG-RAN node receiving the failure indication may inform the NG-RAN node controlling the cell where the mobility configuration caused the failure by means of the Handover Report procedure over Xn or the Uplink RAN Configuration Transfer procedure over NG. This may include the RLF report.

Before performing MRO analysis, an NG-RAN node may take into account information regarding the LBT failures occurred during the handover for a specific UE, as detected in UL by the UE, and in DL by the target NG-RAN node.

**Retrieval of information needed for problem analysis**

In order to retrieve relevant information collected at the network side as part of the UE context, the UE provides C-RNTI used in the last serving cell. If the cause for the failure is identified as a "Too Early HO" or a "HO to Wrong Cell", the NG-RAN node controlling the last serving cell shall, include in the HANDOVER REPORT message the C-RNTI used in the source cell of the last completed handover before the failure. If the NG RAN node controlling that source cell provided the Mobility Information, it is also included in the HANDOVER REPORT message. If used, the Mobility Information is prepared at the source NG RAN node of a handover and may refer to or identify any handover-related data at this NG RAN node. When operating in shared spectrum, the source NG-RAN node can request the target NG-RAN node to provide information on DL LBT failures at the target NG-RAN node during handover execution.

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