3GPP TSG-RAN WG3 Meeting #121 R3-233815

Toulouse, France, 21 - 25 August 2023

**Agenda item: 26.2**

**Source: Nokia, Nokia Shanghai Bell, Samsung, Qualcomm, CATT**

**Title: (TP for TS 38.401 BL CR) Stage 2 for timing resiliency and URLLC**

**Document for: Discussion and Decision**

# 1 Introduction

In this paper, we further discuss the overall signalling framework for RAN TSS reporting and provide a Stage 2 text proposal.

# Annex A: Text Proposal for TS 38.401

*start of modifications*

## 8.x Timing resiliency service

The following clauses describe the overall procedures for RAN Timing Synchronisation Status (TSS) reporting involving gNB-CU/gNB-DU.

### 8.x.1 RAN TSS reporting towards the CN

The signaling flow for RAN TSS reporting towards the CN is shown in Figure 8.x.1-1. This procedure is used when the TSCTSF subscribes to RAN TSS reporting at the AMF as described in TS 23.502 [x].



Figure 8.x.1-1 RAN TSS reporting towards the CN

0. The gNB-DU is pre-configured with thresholds for each RAN TSS attribute it supports.

NOTE 1: It is assumed the pre-configured thresholds in the gNB-DU are sufficient to meet UE time sync performance requirement which are configured by the operator. The gNB-CU may also be pre-configured with the thresholds.

1. The AMF requests RAN TSS reporting by sending the TIMING SYNCHRONISATION STATUS REQUEST message to the gNB-CU.

2. Upon receiving the request from the AMF, the gNB-CU requests RAN TSS reporting from at least one gNB-DU by sending the TIMING SYNCHRONISATION STATUS REQUEST message to the gNB-DU.

NOTE 2: It is up to gNB-CU implementation whether to send the request to all its gNB-DUs or to a particular subset of its gNB-DUs, depending on e.g. network topology.

3. The gNB-DU replies to the gNB-CU by sending the TIMING SYNCHRONISATION STATUS RESPONSE message.

4. Upon receiving the response from the gNB-DU, the gNB-CU replies to the AMF by sending the TIMING SYNCHRONISATION STATUS RESPONSE message. If the gNB-CU does not receive a successful response from at least one gNB-DU, the gNB-CU replies to the AMF by sending the TIMING SYNCHRONISATION STATUS FAILURE message and the flow stops at this step.

5. Upon sending the response to the gNB-CU, the gNB-DU provides a first RAN TSS report to the gNB-CU by sending the TIMING SYNCHRONISATION STATUS REPORT message.

NOTE 3: The list of RAN TSS attributes included in the report is up to gNB-DU implementation.

6. Upon receiving the report from the gNB-DU, the gNB-CU sends the TIMING SYNCHRONISATION STATUS REPORT message to the AMF. The message contains the RAN TSS attributes received from the gNB-DU and the *RAN TSS Scope* IE to indicate whether the scope of the RAN TSS report is “all cells within the gNB” or “list of Cell IDs within the gNB”.

NOTE 4: The CN may use the received RAN TSS report for determining the RAN TSS reporting capabilities of the gNB or list of cells.

7. Later, the gNB-DU detects a primary source event, for example a RAN TSS attribute exceeds a pre-configured threshold (i.e. status degradation) or a RAN TSS attribute meets the threshold again (i.e. status improvement).

8. Upon detecting the primary source event (e.g., degradation, failure, recovery), the gNB-DU provides an updated RAN TSS report to the gNB-CU by sending a TIMING SYNCHRONISATION STATUS REPORT message.

9. Same as step 6.

### 8.x.2 RAN TSS reporting towards the UE

The signaling flow for RAN TSS reporting towards the UE in RRC\_CONNECTED state is shown in Figure 8.x.2-1.

Figure 8.x.2-1 RAN TSS reporting towards the UE in RRC\_CONNECTED state

0. The gNB-DU is pre-configured with thresholds for each RAN TSS attribute it supports.

NOTE 1: It is assumed the pre-configured thresholds in the gNB-DU are sufficient to meet UE time sync performance requirement which are configured by the operator. The gNB-CU may also be pre-configured with the thresholds.

NOTE 2: In this signalling flow, it is assumed that RAN TSS reporting is already enabled at the gNB-DU.

1. The AMF sends the INITIAL CONTEXT SETUP REQUEST message to the gNB-CU, containing the *Clock Quality Reporting Control Information* IE within the *Time Synchronization Assistance Information* IE. The clock quality reporting control information indicates the clock quality detail level to provide to the UE, i.e. “metrics” or “acceptable/not acceptable indication”. If clock quality detail level equals “acceptable/not acceptable indication”, the clock quality reporting control information also contains the clock quality acceptance criteria.

NOTE 3: The clock quality reporting control information can also be provided in the UE CONTEXT MODIFICATION REQUEST, HANDOVER REQUEST, or PATH SWITCH REQUEST ACKNOWLEDGE messages.

2. The gNB-CU replies to the AMF by sending the INITIAL CONTEXT SETUP RESPONSE message.

3. The gNB-CU sends the latest clock quality information to the UE by sending the *DLInformationTransfer* message. The clock quality information provided to the UE depends on the clock quality detail level received in step 1 (i.e., “metrics” or “acceptable/not acceptable indication”).

4. Later, the gNB-DU detects a primary source event, for example a RAN TSS attribute exceeds a pre-configured threshold (i.e. status degradation) or a RAN TSS attribute meets the threshold again (i.e. status improvement).

5. Upon detecting the primary source event (e.g., degradation, failure, recovery), the gNB-DU provides an updated RAN TSS report to the gNB-CU by sending a TIMING SYNCHRONISATION STATUS REPORT message.

6. Same as step 3.

*end of modifications*