3GPP TSG-RAN WG3 Meeting #122 R3-237928xxxx

Chicago, USA, 13 - 17 November 2023

**Agenda item: 26.2**

**Source: Nokia, Nokia Shanghai Bell, China Telecom, Qualcomm Incorporated**

**Title: (TP for TS 38.401 BL CR) RAN TSS reporting over F1**

**Document for: Discussion and Decision**

# 1 Introduction

In this paper, we identify some missing F1AP functionality to achieve the following WID objectives [1]:

# Annex A: Text Proposal for TS 38.401

*Start of modifications*

### 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 a threshold for each RAN TSS attribute it supports. The gNB-DU does not report RAN TSS attribute values better than the pre-configured thresholds, i.e. if a RAN TSS attribute has a value better than the pre-configured threshold, the gNB-DU reports the threshold value to the gNB-CU instead.

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.

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

2. 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. 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 RAN TSS attributes included in the report is up to gNB-DU implementation.

6. 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 “RAN node level” or “cell list level”.

7. Later, the gNB-DU detects a primary source event:

a) a RAN TSS attribute cannot meet a pre-configured threshold (i.e. status is degraded);

b) a RAN TSS attribute meets the pre-configured threshold again (i.e. status is no longer degraded);

c) event a) occurred and b) has not yet been reached, the gNB-DU performs periodic reporting or a previously reported RAN TSS attribute value can no longer be met.

NOTE 4: Additional primary source events, if any, are up to gNB-DU implementation.

8. Upon detecting the primary source event, 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

NOTE 1: 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 2: 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:

a) a RAN TSS attribute exceeds a pre-configured threshold (i.e. status is degraded); or

b) while the status is degraded, a previously reported RAN TSS attribute value can no longer be met; or

c) a RAN TSS attribute meets the pre-configured threshold again (i.e. status is no longer degraded).

NOTE 3: Additional primary source events, if any, are up to gNB-DU implementation.5. Upon detecting the primary source event, 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*