**3GPP TSG-RAN WG3 Meeting #123 *R3-240885***

**Athens, GR, 26 Feb – 01 Mar, 2024**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.300** | **CR** |  | **rev** |  | **Current version:** | **18.0.0** |  |
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| *For* [***HE******LP***](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 |  | Radio Access Network | **x** | Core Network | **X** |

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| ***Title:*** | Correction of network timing synchronization status monitoring [Title to be updated] | | | | | | | | | |
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| ***Source to WG:*** | Huawei, Nokia, Nokia Shanghai Bell, ZTE, Ericsson, Qualcomm | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TRS\_URLLC-NR-Core | | | | |  | ***Date:*** | | | 2024-02-28 |
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| ***Category:*** | **F** |  | | | | | ***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 can be 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | This CR is to make stage2 changes to make it concise, and accurate. | | | | | | | | |
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| ***Summary of change:*** | | On the Network timing synchronization status monitoring:   * For TSS report to CN, to make the descriptions accurate and add the reference to TS 38.401 * For TSS report to UE: remove the details, and add the reference to TS 38.401.   On the Support for TSN enabled Transport Network   * Remove the PDU session related descriptions.   And make miscellaneous wording changes to align with SA2 specification and stage 3 specification. | | | | | | | | |
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| ***Consequences if not approved:*** | | Not accurate stage 2 descriptions on the network timing synchronization status monitoring. | | | | | | | | |
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| ***Clauses affected:*** | | 16.8.2.1, 16.8.2.2, 16.8.2.3, 16.17, 18.1 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specification | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
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| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | | Rev0: R3-240408  Rev2: R3-240885 | | | | | | | | |

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| **Change Begins** |

### 16.8.2 Network timing synchronization status monitoring

#### 16.8.2.1 General

While time synchronization service is offered by the 5GS, the network timing synchronization status of the gNB may change. The gNB detects timing synchronization degradation or improvement locally and informs the consumer of the information as specified in TS 23. 501 [3] as follows:

- TSCTSF may receive information about timing synchronization status from the gNB via the AMF based on node-level reporting configuration or via OAM;

- UE may receive clock quality information from the gNB based on UE-level clock quality reporting control information.

#### 16.8.2.2 Network timing synchronization status monitoring towards CN

The gNB may receive a request for RAN timing synchronization status (TSS) information from the AMF as specified in TS 23.501 [3]. The RAN TSS information includes one or more of the following attributes: synchronization state, traceable to UTC, traceable to GNSS, frequency stability, clock accuracy, parent time source, as defined in TS 23.501 [3].

The gNB may be pre-configured with threshold for each RAN TSS attribute it supports. When the gNB detects a primary source event as defined in TS 38.401 [4], a timing synchronisation status report is triggered towards the AMF to provide the current RAN timing synchronisation status information.

#### 16.8.2.3 Network timing synchronization status monitoring towards UE

The gNB may receive clock quality reporting control information for a UE from the AMF, see TS 23.501 [3]. The clock quality reporting control information contains the clock quality detail level (i.e., "metrics" or "acceptable/not acceptable indication") and clock quality acceptance criteria for the UE (if the clock quality detail level equals "acceptable/not acceptable indication"). Based on the clock quality reporting control information, the gNB determines clock quality information to the UE:

- If the clock quality detail level equals "clock quality metrics", the gNB provides clock quality attribute values supported by the gNB to the UE.

- If the clock quality detail level equals "acceptable/not acceptable indication", the gNB indicates "acceptable" to the UE if the gNB's timing synchronization status matches the acceptance criteria received from the AMF; otherwise, the gNB indicates "not acceptable" to the UE.

To provide clock quality information to the UEs:

- For UEs in the RRC CONNECTED state, the gNB uses unicast RRC signalling. The RRC signalling includes Event ID and clock quality information.

- For UEs that are not in the RRC\_CONNECTED state, the UE first needs to establish or resume the RRC connection to receive the clock quality information from the gNB via unicast RRC signalling. The gNB broadcasts Event ID in SIB9 to notify its timing synchronization status. Event ID or gNB ID change serves as a notification for the UEs reading the SIB information that the RAN timing synchronization status information has changed.

The following figure describes the signalling procedure of gNB reporting clock quality information to a UE:



Figure 16.8.2-1: Signalling procedure of gNB reporting clock quality information to a UE

0. The gNB is pre-configured with a threshold for each RAN TSS attribute it supports as described in TS 23.501 [3]. When there is a primary source event as defined in TS 38.401 [4], the gNB may detect a change on its timing synchronization state (e.g., degradation, failure, recovery).

1. The gNB notifies a change on its timing synchronization operation using Event ID in SIB9. The Event ID scope is local to gNB.

2. The UE in RRC\_INACTIVE or RRC\_IDLE determines if there is clock quality information update available at the gNB based on SIB9 information. For a UE in RRC\_CONNECTED state, steps 2-3 can be skipped.

3. If there is a RAN timing synchronization status update available, the UE's RRC layer indicates this to the NAS layer which may request the RRC layer to initiate RRC Setup or RRC Resume procedure.

4. The gNB determines clock quality information reporting to the UE (e.g., metrics or "acceptable/not acceptable").

5. The gNB sends the clock quality information to the UE via unicast RRC signalling.

### 16.8.3 RAN feedback for adaptation of Burst Arrival Time and Periodicity

The NG-RAN may support the proactive feedback and reactive feedback mechanisms as specified in TS 23.501 [3]. The NG-RAN can provide the feedback in order to align the arrival of the traffic bursts with the next expected transmission opportunity over the air interface in each direction (i.e. DL or UL) for a QoS flow.

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| **Next Change** |

16.17 Support for TSN enabled Transport Network

The NG-RAN may support the TSN enabled Transport Network as specified in TS 23.501 [3].

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| **Next Change** |

## 18.1 Support of SDT procedure over RACH

For SDT procedure over RACH, if the UE accesses a gNB other than the last serving gNB, the UL SDT data/signalling is buffered at the receiving gNB, and then the receiving gNB triggers the XnAP Retrieve UE Context procedure. The receiving gNB indicates SDT to the last serving gNB and the last serving gNB decides whether to relocate the UE context or not. Other SDT assistance information (e.g., single packet, multiple packets) may also be provided by the receiving gNB to help the decision of UE context relocation. If the UE is configured with the clock quality control information, the last serving gNB performs full UE context relocation to enable the receiving gNB to provide clock quality information.

If the last serving gNB decides not to relocate the full UE context, it transfers a partial UE context containing SDT RLC context information necessary for the receiving gNB to handle SDT via the Partial UE Context Transfer procedure.

Then, in case SDT is used for user data over DRBs, UL/DL tunnels are established for DRBs configured for SDT between the receiving gNB and the last serving gNB. The PDCP PDU of UL/DL data is transferred over the tunnels, until the last serving gNB terminates the SDT session and directs the UE to continue in RRC\_INACTIVE by sending the *RRCRelease* message.

Or in case SDT is used for signalling, SRB PDCP PDUs are transferred between the receiving gNB and the last serving gNB via the XnAP RRC Transfer procedure, until the last serving gNB terminates the SDT session and directs the UE to continue in RRC\_INACTIVE by sending the *RRCRelease* message.

During the SDT session, in case the receiving gNB detects that no more packets are to be transmitted, or radio link problem is detected, the receiving gNB may also request to terminate the SDT session to the last serving gNB via the UE Context Retrieve Confirmation procedure.

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| **Change Ends** |