**3GPP TSG-CT3 Meeting #121e C3-222145**

**E-Meeting, 6th – 12th April 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **29.512** | **CR** | **0923** | **rev** | **-** | **Current version:** | **17.6.0** |  |
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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 |  | Core Network | **X** |

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|  |
| ***Title:***  | Handling of time domain |
|  |  |
| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | IIoT |  | ***Date:*** | 2022-04-12 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *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:*** | As the defined in clause 5.27.2.4 of TS 23.501, depending on whether the Time Domain is provided in the TSC Assistance container, SMF may perform the following:* the SMF provisions the UPF/NW-TT to report the clock drifting between 5G clock and the external GM clock for the (g)PTP time domain number that is configured to the NW-TT.
* the SMF provisions the UPF/NW-TT to report the clock drifting between 5G clock and the external GM clock for the given Time Domain number.

The SMF uses the N4 Association Setup or Update procedures as described in clause 4.4.3 of TS 23.502 [3] to provision the UPF to report the clock drifting.If the SMF has clock drift information for a Time Domain, and if the Time Domain matches with the Time Domain in the TSC Assistance Container (i.e. clock drift between 5G timing and AF supplied Time Domain determined based on UPF reporting), or Time Domain information is not provided in the TSC Assistance Container, then SMF may adjust the TSCAI information so that it reflects the 5GS Clock as described in clause 5.27.2.1. If the SMF does not have synchronization information for a requested Time Domain in the TSC Assistance Container, or the Time Domain in the TSC Assistance Container is set to a value = "5GS", then the TSCAI information will be used without adjustment.In C3-222146, value 0 is reserved to indicate that AF doesn’t provide the time domain by the TSCTSF. |
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| ***Summary of change:*** | If the "TimeSensitiveCommunication" feature is supported, depending on whether the Time Domain information is included in the "tscaiTimeDom" attribute of the PCC rule, SMF may perform the following:* if the "tscaiTimeDom" attribute is not included in the PCC rule, the SMF provisions the UPF/NW-TT to report the clock drifting between 5G clock and the external GM clock for the (g)PTP time domain number that is configured to the NW-TT.
* If the "tscaiTimeDom" attribute is included in the PCC rule, the SMF provisions the UPF/NW-TT to report the clock drifting between 5G clock and the external GM clock for the received Time Domain information.

The SMF shall use the N4 Association Setup or Update procedures as described in 3GPP TS 29.244 [13] to provision the UPF to report the clock drifting.If the SMF receives the clock drifting from the UPF for a Time Domain, and * if the received Time Domain matches the Time Domain information within the "tscaiTimeDom" attribute included in the PCC rule; or
* the "tscaiTimeDom" attribute is not included within the PCC rule,

then the SMF may determine the time offset and cumulative rateRatio (when available) based on received Time Domain information and adjust the TSCAI information as described above.If the received the clock drifting from the UPF does not match the Time Domain information within the "tscaiTimeDom" attribute of the PCC rule or the received "tscaiTimeDom" attribute of the PCC rule indicates Time Domain = "5GS", then the SMF will not adjust the TSCAI information. |
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| ***Consequences if not approved:*** | The SMF can’t adjust the parameter correctly. |
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| ***Clauses affected:*** | 2, 4.2.3.24 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | This CR doesn’t impact any OpenAPI files. |
|  |  |
| ***This CR's revision history:*** |  |

\* \* \* \* Start of Changes \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[5] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[6] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".

[7] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

[8] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

[9] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[10] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.

[11] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[12] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

[13] 3GPP TS 29.244: "Interface between the Control Plane and the User Plane of EPC Nodes".

[14] Void.

[15] 3GPP TS 29.519: "5G System; Usage of the Unified Data Repository service for Policy Control Data, Application Data and Structured Data for Exposure; Stage 3".

[16] 3GPP TS 23.228: "IP multimedia subsystem; Stage 2".

[17] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[18] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point 5".

[19] 3GPP TS 32.291: "5G System; Charging service; Stage 3".

[20] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[21] 3GPP TS 23.380: "IMS Restoration Procedures".

[22] 3GPP TS 29.502: "5G System; Session Management Services; Stage 3".

[23] 3GPP TS 29.212: "Policy and Charging Control (PCC); Reference points".

[24] 3GPP TS 32.422: "Telecommunication management; Subscriber and equipment trace; Trace control and configuration management".

[25] 3GPP TS 29.507: "5G System; Access and Mobility Policy Control Service; Stage 3".

[26] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[27] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[28] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".

[29] 3GPP TS 29.510: "Network Function Repository Services; Stage 3".

[30] 3GPP TS 32.290: "5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".

[31] IETF RFC 7807: "Problem Details for HTTP APIs".

[32] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

[33] 3GPP TS 23.527: "5G System; Restoration Procedures".

[34] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[35] 3GPP TS 32.255: "Charging management; 5G data connectivity domain charging; stage 2".

[36] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[37] 3GPP TS 29.274: "3GPP Evolved Packet System (EPS); Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[38] 3GPP TR 21.900: "Technical Specification Group working methods".

[39] 3GPP TS 29.521: "5G System; Binding Support Management Service; Stage 3".

[40] 3GPP TS 29.524: "Cause codes mapping between 5GC interfaces; Stage 3".

[41] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification".

[42] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

[43] 3GPP TS 24.193: "Access Traffic Steering, Switching and Splitting (ATSSS); Stage 3".

[44] 3GPP TS 24.519: "Time-Sensitive Networking (TSN) Application Function (AF) to Device-Side TSN Translator (DS-TT) and Network-Side TSN Translator (NW-TT) protocol aspects; Stage 3".

[45] IEEE 802.1Q: "Virtual Bridged Local Area Networks".

[46] 3GPP TS 29.551: "5G System; Packet Flow Description Management Service; Stage 3".

[47] BBF TR-456: "AGF Functional Requirements".

[48] CableLabs WR-TR-5WWC-ARCH: "5G Wireless Wireline Converged Core Architecture".

[49] 3GPP TS 24.539: "5G System (5GS); Network to TSN translator (TT) protocol aspects; Stage 3".

[50] 3GPP TS 29.564: "5G System; User Plane Function Services; Stage 3".

[51] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[52] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[x] 3GPP TS 29.565: "5G System; Time Sensitive Communication and Time Synchronization Function Services; Stage 3".

\* \* \* \* Next change \* \* \* \*

#### 4.2.3.24 Provisioning of TSCAI input information and TSC QoS related data

The PCF may receive the TSCAI input information in the TSC assistance container and TSC traffic QoS related information from the TSN AF or TSCTSF.

If the feature "TimeSensitiveNetworking" or "TimeSensitiveCommunication" is supported by both the SMF and PCF as described in subclause 5.8, the PCF shall provide for the derived PCC rule(s):

- the 5G QoS parameters and the optional 5G QoS characteristics corresponding to a 5QI for a delay-critical GBR derived from the TSC traffic QoS information received from the TSN AF or TSCTSF encoded within a QosData type referred in the "refQosData" of the PCC rule; and

- the TSCAI input information as received from the TSN AF or TSCTSF, with the periodicity, burst arrival time and survival time encoded in the "tscaiInputUl" attribute and/or "tscaiInputDl" attribute of the PCC rule and, when the feature "TimeSensitiveCommunication" is supported, the (TSN)AF (g)PTP domain encoded in the "tscaiTimeDom" attribute.

The values of MDBV and PDB applied to the derived 5QI shall follow principles defined in subclause 5.27.3 of 3GPP TS 23.501 [2].

For IEEE TSN networks, the value of the MBR, if applicable, and the GBR are derived using the Maximum Bit Rate provided by the TSN AF. For other time sensitive communication networks, the value of the GBR may be derived using the input provided by the TSCTSF (e.g. the Minimum Bit Rate) and applying the QoS mapping procedures as specified in subclause 7.3.3 of 3GPP TS 29.513 [7].

The ARP is assigned a value preconfigured for TSC services.

As specified in subclause 4.2.3.22, when the PCF receives a QoS reference from the TSCTSF, the PCF shall derive the above QoS parameters based on pre-defined QoS parameters referenced by the QoS reference. If the PCF receives Alternative Service Requirements from the TSCTSF, the PCF shall derive the alternative QoS parameter set(s) based on the pre-defined QoS parameters referenced by the received Alternative Service Requirements as defined in subclause 4.2.3.22.

Editor's Note: It is FFS to check the above paragraph about QoS parameters handling and add the details about the combination of individual QoS parameters and QoS reference, and the derivation of TSC Assistance Container information from QoS reference, when the respective stage 2 requirements are mature enough.

The SMF shall convert the received TSCAI input information from the external GM into the 5G GM based on the time offset and cumulative rateRatio (when available) between external time and 5GS time as measured and reported by the UPF and, forward the derived TSCAI parameters per QoS Flow basis to the AN-RAN as follows:

- For the traffic in downlink direction, the SMF shall correct the value of the "burstArrivalTime" attribute of the "tscaiInputDl" attribute based on the latest received time offset measurement from the UPF and set the downlink TSCAI Burst Arrival Time as the sum of the corrected value and the CN PDB as described in subclause 5.7.3.4 of 3GPP TS 23.501 [2], representing the latest possible time when the first packet of the data burts arrives at the AN.

- For the traffic in uplink direction, the SMF shall correct the value of "burstArrivalTime" attribute of the "tscaiInputUl" attribute based on the latest received time offset measurement from the UPF and set the uplink TSCAI Burst Arrival Time as the sum of corrected value and the UE-DS-TT Residence Time representing the latest possible time when the first packet of the data burst arrives at the egress of the UE.

- The SMF shall correct the value of "periodicity" attribute of the "tscaiInputUl" and/or "tscaiInputDl" using the cumulative rateRatio if the cumulative rateRation measurement was previously received from the UPF and set the TSCAI Periodicity as the corrected value. Otherwise, the SMF shall set the periodicity in the TSCAI Periodicity without any correction.

- If the "TimeSensitiveCommunication" feature is supported and the TSCAI Survival Time Information is received:

- when the "surTimeInNumMsg" attribute is received, the SMF shall convert the value of "surTimeInNumMsg" attribute of the "tscaiInputUl" and/or "tscaiInputDl" attributes into time units by multiplying its value by the corrected uplink TSCAI Periodicity and/or downlink TSCAI Periodicity respectively, and set the TSCAI Survival Time to the calculated value; or

- when the "surTimeInTime" is received, the SMF shall correct the value of "surTimeInTime" attribute of the "tscaiInputUl" and/or "tscaiInputDl" attributes using the cumulative rateRatio if the cumulative rateRatio measurement was previously received from the UPF and set the TSCAI Survival Time to the corrected value. Otherwise, the SMF shall set the TSCAI Survival Time without correction.

If the "TimeSensitiveCommunication" feature is supported, depending on whether the Time Domain information is included in the "tscaiTimeDom" attribute of the PCC rule, SMF may perform the following:

* if the "tscaiTimeDom" attribute is not included in the PCC rule, the SMF provisions the UPF/NW-TT to report the clock drifting between 5G clock and the external GM clock for the (g)PTP time domain number that is configured to the NW-TT.
* If the "tscaiTimeDom" attribute is included in the PCC rule, the SMF provisions the UPF/NW-TT to report the clock drifting between 5G clock and the external GM clock for the received Time Domain information.

The SMF shall use the N4 Association Setup or Update procedures as described in 3GPP TS 29.244 [13] to provision the UPF to report the clock drifting.

If the SMF receives the clock drifting from the UPF for a Time Domain, and

* if the received Time Domain matches the Time Domain information within the "tscaiTimeDom" attribute included in the PCC rule; or
* the "tscaiTimeDom" attribute is not included within the PCC rule,

then the SMF may determine the time offset and cumulative rateRatio (when available) based on received Time Domain information and adjust the TSCAI information as described above.

If the received the clock drifting from the UPF does not match the Time Domain information within the "tscaiTimeDom" attribute of the PCC rule or the received "tscaiTimeDom" attribute of the PCC rule indicates Time Domain = "5GS", then the SMF will not adjust the TSCAI information.

NOTE: The Time Domain value corresponding to "5GS" is locally configured in the SMF and in the TSCTSF and indicates that the AF does not provide a Time Domain, as specified in 3GPP TS 29.565 [x], and it is not needed to adjust the TSCAI input information. The omission of the Time Domain within the "tscaiTimeDom" attribute of the PCC rule indicates it is needed to apply the TSN AF time domain, configured in the NW-TT, to adjust the TSCAI input information.

The provisioning of TSCAI input information and TSC traffic QoS configuration per PCC Rule shall be performed using the PCC rule provisioning procedure as defined in subclause 4.2.6.2.1.

\* \* \* \* End of change \* \* \* \*