**TSG-CT WG3 Meeting #117-e *C3-214072***

**E-Meeting, 18th – 27th August 2021 (Revision of C3-214xyz)**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **29.514** | **CR** | 0329 | **rev** | **-** | **Current version:** | **17.1.0** |  |
|  | | | | | | | | |
| *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:*** | TSCTSF support for Time Sensitive Communication | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, Intel | | | | | | | | | |
| ***Source to TSG:*** | CT3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IIoT | | | | |  | ***Date:*** | | | 2021-08-18 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***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 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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | TSCTSF is defined in stage 2 for Time Sensitive Communication. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | PCF interacts with the TSCTSF to support time sensitive communication. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Not aligned with stage 2. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.2, 4.1.2, 4.1.3.2, 4.2.2.24, 4.2.2.31, 4.2.5.13, 4.2.5.16, 5.5.4.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 does not impact the OpenAPI file. | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**Additional discussion(if needed):**

**Proposed changes:**

\*\*\* 1st Change \*\*\*

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

5G-RG 5G Residential Gateway

AF Application Function

ARP Allocation and Retention Priority

ATSSS Access Traffic Steering, Switching and Splitting

BBF Broadband Forum

BSSID Basic Service Set IDentifier

CHEM Coverage and Handoff Enhancements using Multimedia error robustness feature

CHF Charging Function

DEI Drop Eligible Indicator

DNAI DN Access Identifier

DNN Data Network Name

DS-TT Device-side TSN translator

DSL Digital Subscriber Line

DTS Data Transport Service

E-UTRA Evolved Universal Terrestrial Radio Access

FLUS Framework for Live Uplink Streaming

FN-RG Fixed Network Residential Gateway

GEO Geosynchronous Orbit

GPSI Generic Public Subscription Identifier

HFC Hybrid Fiber-Coaxial

H-PCF PCF in the HPLMN

IMS IP-Multimedia Subsystem

JSON JavaScript Object Notation

LEO Low Earth Orbit

MA Multi-Access

MCPTT Mission Critical Push to Talk Service

MCVideo Mission Critical Video

MEO Medium Earth Orbit

MPS Multimedia Priority Service

NEF Network Exposure Function

NID Network Identifier

NR New Radio

NRF Network Repository Function

NWDAF Network Data Analytics Function

NW-TT Network-side TSN translator

PCC Policy and Charging Control

PCF Policy Control Function

PCP Priority Code Point

P-CSCF Proxy Call Session Control Function

PEI Permanent Equipment Identifier

PMIC Port Management Information Container

PON Passive Optical Network

PRA Presence Reporting Area

QoS Quality of Service

RFSP RAT Frequency Selection Priority

RTCP Real Time Control Protocol

RTP Real Time Protocol

SDF Service Data Flow

SDP Session Description Protocol

SIP Session Initiation Protocol

SMF Session Management Function

S-NSSAI Single Network Slice Selection Assistance Information

SNPN Stand-alone Non-Public Network

SSID Service Set IDentifier

SUPI Subscription Permanent Identifier

TNAP Trusted Non-3GPP Access Point

TSC Time Sensitive Communication

TSCAI Time Sensitive Communication Assistance Information

TSCTSF Time Sensitive Communication and Time Synchronization Function

TSN Time Sensitive Networking

UDR Unified Data Repository

UMIC User plane node Management Information Container

UPF User Plane Function

URSP UE Route Selection Policy

VID VLAN Identifier

VLAN Virtual Local Area Network

V-PCF PCF in the VPLMN

W-5GAN Wireline 5G Access Network

W-5GBAN Wireline 5G BBF Access Network

W-5GCAN Wireline 5G Cable Access Network

W-AGF Wireline Access Gateway Function

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

### 4.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Policy and Charging control related 5G architecture is also described in 3GPP TS 23.503 [4] and 3GPP TS 29.513 [7].

The only known NF service consumers of the Npcf\_PolicyAuthorization service are the Application Function (AF), the Network Exposure Function (NEF), the Time Sensitive Communication and Time Synchronization Function (TSCTSF) and the Policy Control Function for the UE (PCF for the UE).

The Npcf\_PolicyAuthorization service is provided by the PCF and consumed by the AF, the NEF, the TSCTSF and, when the PCF for the PDU session and the PCF for the UE are different, the PCF for the UE, as shown in figure 4.1.2-1 for the SBI representation model and in figure 4.1.2-2 for the reference point representation model.



Figure 4.1.2-1: Npcf\_PolicyAuthorization service Architecture, SBI representation



Figure 4.1.2-2: Npcf\_PolicyAuthorization service Architecture, reference point representation

The NEF and TSCTSF can act as an AF using N5 reference point.

NOTE: When the N43 reference point exists, the PCF for the UE interacts with the PCF for the PDU session.

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

#### 4.1.3.2 NF Service Consumers

The known NF service consumers are the AF, the NEF, the TSCTSF and the PCF (for a UE), as defined in 3GPP TS 23.502 [3].

The AF is an element offering control to applications that require the policy and charging control of traffic plane resources; specific user plane paths for the requested traffic, the monitoring of the required service QoS, and/or specific QoS and alternative QoS profiles. The AF uses the Npcf\_PolicyAuthorization service to provide service information to the PCF.

In 5GS interworking with TSN networks, the TSN AF is an element offering to TSN control functions an interface to 5GS to forward TSN bridge and TSN port management configuration, and to set the QoS policy required to forward the TSN traffic making use of the 5GS traffic plane resources.The AFs can be deployed by the same operator offering the access services or can be provided by external third-party service provider. If the AF is not allowed by the operator to access directly the PCF, the AF uses the external exposure framework via NEF to interact with the PCF, as described in subclause 5.20 of 3GPP TS 23.501 [2].

The Network Exposure Function (NEF) supports external exposure of capabilities of network functions.The AF trusted by the operator or the NEF can use the TSCTSF to interface with PCF to support time sensitive communication and time synchronization.

The PCF providing session management policy control for a UE (i.e. PCF for a PDU session) and the PCF providing UE policy control and/or access and mobility control for this same UE (i.e. PCF for a UE) may be different PCFs. When access and mobility policies depend on traffic plane events (as e.g. application detection control), the PCF for a UE may act as an NF service consumer of the PCF for the PDU session by subscribing to such events.

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

#### 4.2.2.24 Provisioning of TSCAI input Information and QoS related data

If the "TimeSensitiveNetworking" or "TimeSensitiveCommunication" feature is supported the NF service consumer (i.e. TSN AF or TSCTSF) may provide TSCAI input information and QoS related data to the PCF by the Npcf\_PolicyAuthorization\_Create service operation to describe the TSC traffic pattern and QoS characteristics for use in the 5G System.

The NF service consumer (i.e. TSN AF or TSCTSF) shall derive the TSCAI input information and the QoS related data for a given TSC stream or flow of aggregated TSC streams as defined in subclauses 5.27.2 and 5.28.4 of 3GPP TS 23.501 [2] respectively.

To indicate the TSCAI input information of a TSC stream or aggregated set of TSC streams, the NF service consumer (i.e. TSN AF or TSCTSF) may include for the uplink flow direction (ingress interface of the DS-TT/UE) in the "tscaiInputUl" attribute and/or for the downlink flow direction (ingress interface of the NW-TT) the "tscaiInputDl" attribute included in a media component entry of the "medComponents" attribute:

- the time period between the start of two bursts of a TSC stream or aggregated TSC streams in reference to the external GM encoded in the "periodicity" attribute;

- the arrival time of the first data burst of a TSC stream or aggregated TSC streams in reference to the external GM encoded in the "burstArrivalTime" attribute; and

- if the "TimeSensitiveCommunication" feature is supported, the time period an application can survive without any burst, i.e., the survival time, in terms of maximum number of messages encoded in the "surTimeInNumMsg" attribute or in time units encoded in the "surTimeInTime" attribute.

NOTE: A single burst (message is equivalent to burst) is expected within a single periodicity. The survival time in terms of maximum number of messages represents the time period result of multiplying the periodicy by the indicated number of messages.

The uplink and/or downlink flow of the TSC stream or aggregated set of TSC streams shall be encoded within the corresponding "MediaSubComponent" entries of the "medSubComps" attribute, in the "ethfDescs" attribute.

When the feature "TimeSensitiveCommunication" is supported, to indicate the time domain the NF service consumer is located in (i.e. the (g)PTP domain), the NF service consumer may include the "tscaiTimeDom" attribute in the corresponding media component entry of the "medComponents" attribute.

To indicate the TSC QoS related data of a TSC stream or aggregated set of TSC streams, the NF service consumer (i.e. TSN AF or NEF) may include in the "tsnQos" attribute included in a media component entry of the "medComponents" attribute;

- the maximum burst size encoded in the "maxTscBurstSize" attribute;

- the maximum time a packet may be delayed encoded in the "tscPackDelay" attribute;

- the TSC traffic priority in scheduling resources among other TSC streams encoded in the "tscPrioLevel" attribute.

The NF service consumer (i.e. TSN AF or TSCTSF) may also include the max bitrates in uplink and downlink within the "marBwUl" attribute and the "marBwDl" attribute of the "medComponents" attribute respectively.

The PCF shall reply to the NF service consumer (i.e. TSN AF or TSCTSF) as described in subclause 4.2.2.2.

The PCF shall check whether the received TSCAI input container and TSC QoS related data require to create PCC rules to provide the SMF with derived QoS characteristics and the received TSCAI input container. Provisioning of PCC rule(s) to the SMF shall be carried out as specified in 3GPP TS 29.512 [8].

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

#### 4.2.2.31 Subscription to TSC user plane node related events

This procedure is used by the NF service consumer (i.e. TSN AF or TSCTSF) if the "TimeSensitiveNetworking" or "TimeSensitiveCommunication" feature is supported to subscribe to notifications of updated TSC user plane node information, e.g., DS-TT PMIC and/or NW-TT PMIC(s) and/or UMIC availability within the Individual Application Session Context resource created to handle the TSC user plane node in the context of a PDU session.

The NF service consumer shall use the "EventsSubscReqData" data type as described in subclause 4.2.2.2 and shall include in the HTTP POST request message within the "evSubsc" attribute an event within "events" attribute with the "event" attribute set to the value "TSN\_BRIDGE\_INFO" to subscribe to the reception of TSC user plane node information.

The PCF shall reply to the NF service consumer with an HTTP response message as described in subclause 4.2.2.2.

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

#### 4.2.5.13 Notification about TSC user plane node management information and/or port management information detection, Individual Application Session Context exists

If the "TimeSensitiveNetworking" or "TimeSensitiveCommunication"feature is supported and if the PCF becomes aware that, for an existing Individual Application Session Context resource, updated TSC user plane node information is available, e.g., a UMIC and/or a DS-TT PMIC and/or one or more NW-TT PMIC(s) are available, the PCF shall inform the NF service consumer accordingly, if the NF service consumer has previously subscribed as described in subclause 4.2.2.31.

The PCF shall notify the NF service consumer by including the "EventsNotification" data type in the body of the HTTP POST request as described in subclause 4.2.5.2.

The PCF shall include in the "evNotifs" attribute an entry with the "event" attribute set to the value "TSN\_BRIDGE\_INFO", and the "tsnBridgeManCont" attribute and/or the "tsnPortManContDstt" attribute and/or the "tsnPortManContNwtts" attribute as received from the SMF if the PCF is aware that a UMIC and/or a DS-TT PMIC and/or one or more NW-TT PMIC(s) are available or updated.

Upon the reception of the HTTP POST request from the PCF, the NF service consumer shall acknowledge that request as specified in subclause 4.2.5.2.

The NF service consumer (i.e. TSN AF or TSCTSF) may use the received UMIC and/or the received DS-TT PMIC and/or NW-TT PMIC(s) and the local configuration to construct the DS-TT port and or NW-TT port management information required to interwork with the external network (e.g. TSN).

If port management information shall be sent as a response of the received notification, the NF service consumer triggers the Npcf\_PolicyAuthorization\_Update service operation to send the port management information to the PCF as specified in subclause 4.2.3. The NF service consumer (i.e. TSN AF or TSCTSF) delivers to the PCF the derived port management information containers as described in subclause 4.2.3.25.

And/or if TSC user plane node management information shall be sent as a response of the received notification, the NF service consumer includes the UMIC in the Npcf\_PolicyAuthorization\_Update service operation as described in subclause 4.2.3.25.

Editor’s Note: Detailed impacts for the support of Time Synch and other time sensitive communications are FFS.

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

#### 4.2.5.16 Notification about TSC user plane node Information, no Individual Application Session Context exists

If the "TimeSensitiveNetworking" or "TimeSensitiveCommunication" feature is supported and if the PCF becomes aware that TSC user plane node information for an external network (e.g. TSN) is available, but there is no "Individual Application Session Context" resource bound to the SM Policy Association updated with TSC user plane node related information, the PCF shall inform the NF service consumer (i.e. TSN AF or TSCTSF) about the detection of a TSC user plane node information in the context of a PDU session by sending a notification request to the request URI locally configured in the PCF for this external network.

NOTE: PCF configuration of TSN AF or TSCTSF URI needs to ensure that the notification is addressed to a TSN AF or TSCTSF that connects to the same external network the UPF/NW-TT connects to. How it is achieved is implementation specific. It can be based e.g. on dedicated DNN/S-NSSAI combinations or on the received TSC user plane node information.

Figure 4.2.5.16-1 illustrates the notification about port detection when there is no Individual Application Session Context bound to the SM Policy Association.



Figure 4.2.5.16-1: Notification about TSC user plane node Information, no AF session context exists

When the PCF determines that the AF application session context does not exist for the SM Policy Association that detected new port information, the PCF shall invoke the Npcf\_PolicyAuthorization\_Notify service operation by sending the HTTP POST request (as shown in figure 4.2.5.16-1, step 1) using the notification URI locally configured in the PCF for this external network, and appending the "new-bridge" segment path at the end of the URI, to trigger the NF service consumer (i.e. TSN AF or TSCTSF) to request the creation of an Invidual Application Session Context resource to handle the TSC user plane node detected in the context of a PDU session, configuring ports and TSC user plane node port management information, and providing the corresponding TSCAI input containers and TSC traffic QoS related data (see subclauses 4.2.2.2, 4.2.2.24, 4.2.2.25 and 4.2.2.31).

The PCF shall provide in the body of the HTTP POST request the "PduSessionTsnBridge" data type including TSC user plane node information as follows:

- the "tsnBridgeInfo" attribute as received from the SMF;

- the "tsnBridgeManCont" attribute as received from the SMF, if available; and

- the "tsnPortManContDstt" attribute and/or "tsnPortManContNwtts" attribute as received from the SMF, if available.

Upon the reception of the HTTP POST request from the PCF, the NF service consumer shall acknowledge that request.

With the received information, the NF service consumer (i.e. TSN AF or TSCTSF) shall immediately trigger the creation of an Individual Application Session Context resource to handle in this association the configuration of the new TSC user plane node in the context of this PDU session, as described in subclauses 4.2.2.2, 4.2.2.24, 4.2.2.25 and 4.2.2.31.

The NF service consumer (i.e. TSN AF or TSCTSF) may use the received TSC user plane node information and/or the received DS-TT port management information container and/or NW-TT port management information containers and the local configuration to construct the DS-TT port and or NW-TT port management information required to interwork with the external network.

Editor’s Note: How and whether this procedure applies to Time Sensitive Communication applications other than TSN is FFS.

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

#### 5.5.4.1 Description

The Detected TSC user plane node for a PDU session operation is used by the PCF to notify the NF service consumer about the detection of TSC user plane node information in the context of a PDU session and to trigger in the NF service consumer (i.e. TSN AF or TSCTSF) the creation of a new Individual Application Session Context to associate it with the detected TSC user plane node for the PDU session.

The PCF shall use the locally configured notification URI of the NF service consumer (i.e. TSN AF or TSCTSF) as request URI of the notification request. The "callback" definition in the OpenAPI specification is associated to the "ApplicationSessions" resource.

Editor’s Note: How and whether this procedure applies to Time Sensitive Communication applications other than TSN is FFS.

\*\*\* End of Changes \*\*\*