**SA WG2 Meeting #143eS2-210xxxx**

**Feb 24th – March 9th, 2021 ; Elbonia (revision of S2-210)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **23.501** | **CR** | **xx** | **rev** | **-** | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network | **X** |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | KI#3A-1: AF Support for TSC QoS | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | S2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IIoT | | | | |  | ***Date:*** | | | 2021-01-18 |
|  |  | | | |  | |  | | |  |
| ***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:*** | | This contribution addresses the following item in the work plan:   * KI#3A-1: Impact to exposure procedures to introduce TSCAI parameters and support of hold and forward buffering   Provide normative text to implement the Conclusion in TR23.700-20 clause 8.5 for Exposure of deterministic QoS. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | A new sub-section describing Exposure for TSC QoS is proposed | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Agreed approach for exposure of deterministic QoS for TSC is incomplete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.33.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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's revision history:*** | |  | | | | | | | | |

*FIRST CHANGE*

## 5.3x Exposure for TSC QoS

### 5.3x.1 General

TSC QoS allows an AF that has knowledge of deterministic application requirements to request TSC services from the 5GS and as authorized, be notified of pertinent network events. TSC QoS is used to support low latency, bounded delay (not too early or too late) and enables the 5GS to exploit periodic deterministic traffic characteristics known to the AF. TSC QoS is applicable for scenarios where endpoints require TSC but IEEE TSN is not deployed in the DN. It comprises the following capabilities:

- The AF may learn 5GS capabilities to support TSC QoS

- The AF may request QoS with specified requirements and supply information that can be used by the SMF to derive TSCAI for 5GS QoS flows.

- For Ethernet PDU Sessions the AF may provide information so that the NEF can send a PMIC with IEEE 802.1Qbv parameters which are used by a DS-TT or NW-TT to configure hold and forward buffers at the 5GS egress.

For applications that request TSC QoS, the QoS Reference used in AF QoS requests may be supplemented with requirements for specific parameters. When a requirement for a specific parameter is provided in the AF request, the PCF may, for the referenced QoS profile, dynamically replace default values with values that meet the specific requirement provided by the AF.

In addition, the AF may request subscription to events defined in Table 6.1.3.18-1, TS 23.503 [45]. Example of relevant events are Resource allocation outcome, QoS targets can no longer (or can again) be fulfilled, QoS Monitoring parameters, and Service Data Flow deactivation (when the QoS flow is removed). The PCF may decide to subscribe to PCRTs in the SMF example PCRTs that may be used as defined in, Table 6.1.3.5-1, TS 23.503 [45] such as GFBR of the QoS Flow can no longer (or can again) be guaranteed. The AF may also subscribe to of QoS Monitoring for URLLC, as described in clause 5.33.3.2.

Internal Note: it is assumed that additional events and PCRTs are not needed (we are allowed to consider them “in the normative phase” as per the solution description

### 5.3x.2 AF Request for TSC QoS

The AF requests TSC QoS by providing service requirements and traffic pattern assistance parameters in the "Setting up an AF session with required QoS procedure" (see TS23.502 [3] Clause 4.15.6.6). The AF may send 5GS delay and Guaranteed Flow Bit Rate service requirement parameters and the following traffic pattern parameters:

* Flow Direction, Burst Arrival Time at UE/DS-TT (uplink) or UPF/NW-TT (downlink), Burst Size, Burst Periodicity, Survival Time, and a Time Domain.

The AF also provides UE address, AF Identifier, Flow description(s), and a QoS reference as it does when setting up an AF session with required QoS. GPSI may be used to identify the individual UE in a manner similar to that used for AF influence on Traffic Routing (see clause 5.6.7).

The NEF authorizes the AF request and forwards it to the PCF. If traffic pattern parameters were supplied by the AF the NEF request to the PCF includes the TSC Assistance Container, which is used by the SMF as described in clause 5.27.2

- The PCF, according to PCC rule authorization, chooses a 5QI based on the QoS Reference and requested delay, Burst Size, Burst Periodicity and Guaranteed Flow Bit Rate requirements, if received from the AF. As authorized, AF specified parameter values are used to over-ride default values for the 5QI. If an AF request for a parameter value exceeds an authorization, the PCF may assign the highest authorized value.

- Based on the information in the TSC Assistance Container, the SMF, may set the TSCAI Burst Arrival Time (BAT), Periodicity and Survival Time according to the requested Periodicity, Burst Arrival Time and Survival Time received from the NEF. The TSCAI parameters are determined by the SMF as described in clause 5.27.2

- If Time Domain information was supplied by the AF and the SMF uses the same Time Domain, then no adjustment is needed for deriving TSCAI information. If the Time Domain provided by AF is different from 5GS Time Domain and the SMF has clock drift information for that Time Domain (i.e. clock drift between 5G timing and AF supplied Time Domain determined based on UPF reporting), then 5GS may adjust the TSCAI information so that it reflects the 5GS Clock. If Time Domain information is not provided or the SMF does not have synchronization information for a requested Time Domain, then the TSCAI information will be used without adjustment.

- If the AF provides burst spread, the 5GS will provide burst spread as part of TSCAI to the NG-RAN.

The NEF uses the traffic pattern parameters (Flow Direction, Burst Arrival, Burst Size, Burst Periodicity and Time Domain) if supplied by the AF to determine Gate Control Information for the PMIC (see clause 5.28.3 table 5.28.3.1-1). A PMIC containing the Gate Control Information is sent to the UE/DS-TT or UPF/NW-TT which configures hold and forward buffers at the egress port of the QoS Flow as described in clause 5.27.4.

### 5.3x.2 5GS Deterministic Capability Exposure

The 5GS exposes Deterministic QoS Capability information to aid the AF in formulating a request for TSC QoS.

* If support for TSC is indicated in UE 5GSM Core Network Capability (at PDU Session Establishment), the DS-TT includes UE-DS-TT Residence Time in the SM Container, which is sent to the PCF via the SMF Initiated SM Policy Association Modification procedure (see TS 23.502 clause 4.16.1).

As described in TS 23.502 Clause xxxx (new procedure from Fig. 6.5.3-2 of the TR), the AF queries the NEF with its AF identifier and at least one UE MAC address, GPSIs or IP address. The NEF finds the PCF(s) (e.g. using the BSF) and sends requests to each PCF. For each PDU Session, a PCF responds to the NEF with the UE-DS-TT Residence Time and the PDB for the 5QI allowed for the AF identifier. The NEF then determines the “minimum 5GS delay supported" and "maximum 5GS delay supported” between each UE and the UPF/NW-TT. The NEF responds to the AF with the 5GS delays. For devices whose MAC address has not been detected by the UPF as a Source Address in an uplink frame, or where the IP address or GPSI is not recognized, the NEF indicates to the AF that the device is not connected via a PDU Session.

*End of CHANGEs*