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

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

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **23.502** | **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)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **x** | Core Network | **X** |

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|  |
| ***Title:***  | 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 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)* |
|  |  |
| ***Reason for change:*** | 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*

#### 4.15.6.6 Setting up an AF session with required QoS procedure



Figure 4.15.6.6-1: Setting up an AF session with required QoS procedure

1. The AF sends a request to reserve resources for an AF session using Nnef\_AFsessionWithQoS\_Create request message (UE address, AF Identifier, Flow description(s), QoS reference, (optional) Alternative Service Requirements (containing one or more QoS reference parameters in a prioritized order)) to the NEF. Optionally, a period of time or a traffic volume for the requested QoS can be included in the AF request. The NEF assigns a Transaction Reference ID to the Nnef\_AFsessionWithQoS\_Create request. For TSC QoS the AF request may in addition specify a 5GS delay, TSC Burst Size, a Guaranteed Flow Bit Rate, a Time Domain or Traffic Pattern Parameters (Flow Direction, Burst Arrival Time at UE (uplink) or UPF (downlink), Burst Periodicity).

2. The NEF authorizes the AF request and may apply policies to control the overall amount of pre-defined QoS authorized for the AF. If the authorisation is not granted, steps 3 and 4 are skipped and the NEF replies to the AF with a Result value indicating that the authorisation failed.

3. The NEF interacts with the PCF by triggering a Npcf\_PolicyAuthorization\_Create request and provides UE address, AF Identifier, Flow description(s), the QoS reference and the optional Alternative Service Requirements (containing one or more QoS reference parameters in a prioritized order). Any optionally received period of time or traffic volume is also included and mapped to sponsored data connectivity information (as defined in TS 23.203 [24]).

For TSC QoS hold and forward buffer configuration, the NEF creates a Port Management Information Container containing Gate control information (see clause 5.28.3 of TS23.501 [2]) and sends it to the PCF. The PCF transparently forwards the container to the UE/DS-TT or UPF/NW-TT as described in Annex F.2. If received from the AF, the NEF also sends the 5GS delay, TSC Burst Size, a Guaranteed Flow Bit Rate a Time Domain or Traffic Pattern Parameters to the PCF. If the PCF determines that the SMF needs updated policy information, the PCF issues a Npcf\_SMPolicyControl\_UpdateNotify request with updated policy information about the PDU Session as described in the PCF initiated SM Policy Association Modification procedure in clause 4.16.5.2.

4. The PCF determines whether the request is authorized and notifies the NEF if the request is not authorized.

 If the request is authorized, the PCF derives the required QoS parameters based on the information provided by the NEF and determines whether this QoS is allowed (according to the PCF configuration for this AF), and notifies the result to the NEF. In addition, if the Alternative Service Requirements are provided, the PCF derives the Alternative QoS parameter set(s) from the one or more QoS reference parameters contained in the Alternative Service Requirements in the same prioritized order (as defined in TS 23.503 [20]).

For TSC QoS, as authorized the PCF sets the PDB and/or MDBV according to the received 5GS Delay and Burst Size received from the AF, and the GFBR according to the AF requested Guaranteed Flow Bit Rate. AF specified parameter values are used to over-ride default values for the 5QI corresponding to the AF provided QoS Reference. If an AF request for a parameter value exceeds an authorization, the PCF may assign the highest authorized value and indicate the assigned value in the response to the NEF.

 If the request is not authorized, or the required QoS is not allowed, NEF responds to the AF in step 5 with a Result value indicating the failure cause.

5. The NEF sends a Nnef\_AFsessionWithQoS\_Create response message (Transaction Reference ID, Result) to the AF. Result indicates whether the request is granted or not. For TSC QoS, the response includes the assigned value of parameters if they did not meet the requested values.

6. The NEF shall send a Npcf\_PolicyAuthorization\_Subscribe message to the PCF to subscribe to notifications of Resource allocation status and may subscribe to other events described in clause 6.1.3.18 of TS 23.503 [20].

7. When the event condition is met, e.g. that the establishment of the transmission resources corresponding to the QoS update succeeded or failed, the PCF sends Npcf\_PolicyAuthorization\_Notify message to the NEF notifying about the event.

8. The NEF sends Nnef\_AFsessionWithQoS\_Notify message with the event reported by the PCF to the AF.

The AF may send Nnef\_AFsessionWithQoS\_Revoke request to NEF in order to revoke the AF request. The NEF authorizes the revoke request and triggers the Npcf\_PolicyAuthorization\_Delete and the Npcf\_PolicyAuthorization\_Unsubscribe operations for the AF request.

#### 4.15.6.6a AF session with required QoS update procedure



Figure 4.15.6.6a-1: AF session with required QoS update procedure

1. For an established AF session with required QoS, the AF may send a Nnef\_AFsessionWithQoS\_Update request message (AF Identifier, Transaction Reference ID, [Flow description(s)], [QoS reference], [Alternative Service Requirements (containing one or more QoS reference parameters in a prioritized order)]) to NEF for updating the reserved resources. Optionally, a period of time or a traffic volume for the requested QoS can be included in the AF request. The Transaction Reference ID provided in the AF session with required QoS update request message is set to the Transaction Reference ID that was assigned, by the NEF, to the Nnef\_AFsessionWithQoS\_Create request message. For TSC QoS the AF request may in addition specify a 5GS delay, TSC Burst Size, a Guaranteed Flow Bit Rate and a Time Domain or Traffic Pattern Parameters (Flow Direction, Burst Arrival Time at UE (uplink) or UPF (downlink), Burst Periodicity).

2. The NEF authorizes the AF request of updating AF session with required QoS and may apply policies to control the overall amount of pre-defined QoS authorized for the AF. If the authorisation is not granted, steps 3 and 4 are skipped and the NEF replies to the AF with a Result value indicating that the authorisation failed.

3. The NEF interacts with the PCF by triggering a Npcf\_PolicyAuthorization\_Update request and provides UE address, AF Identifier, Flow description(s), the QoS reference and the optional Alternative Service Requirements (containing one or more QoS reference parameters in a prioritized order). Any optionally received period of time or traffic volume is also included and mapped to sponsored data connectivity information (as defined in TS 23.203 [24]).

For TSC QoS hold and forward buffer configuration. the NEF creates a Port Management Information Container containing Gate control information (see clause 5.28.3 of TS23.501 [2]) and sends it to the PCF. The PCF transparently forwards the container to the UE/DS-TT or UPF/NW-TT as described in Annex F.2. If received from the AF, the NEF also sends the 5GS delay, TSC Burst Size, a Guaranteed Flow Bit Rate, a Time Domain or Traffic Pattern Parameters to the PCF. If the PCF determines that the SMF needs updated policy information, the PCF issues a Npcf\_SMPolicyControl\_UpdateNotify request with updated policy information about the PDU Session as described in the PCF initiated SM Policy Association Modification procedure in clause 4.16.5.2.

4. The PCF determines whether the request is authorized.

 If the request is authorized, the PCF derives the required QoS parameters based on the information provided by the NEF and determines whether this QoS is allowed (according to the PCF configuration for this AF), and notifies the result to the NEF. In addition, if the Alternative Service Requirements are provided, the PCF derives the Alternative QoS parameter set(s) from the one or more QoS reference parameters contained in the Alternative Service Requirements in the same prioritized order (as defined in TS 23.503 [20]).

For TSC QoS. as authorized the PCF sets the PDB and/or MDBV according to the received 5GS Delay and Burst Size received from the AF, and the GFBR according to the AF requested Guaranteed Flow Bit Rate. AF specified parameter values are used to over-ride default values for the 5QI corresponding to the AF provided QoS Reference. If an AF request for a parameter value exceeds an authorization, the PCF may assign the highest authorized value and indicate the assigned value in the response to the NEF. The PCF transparently forwards the Port Management Information Container to the UE/DS-TT or UPF/NW-TT as described in Annex F.2

 If the request is not authorized or the required QoS is not allowed, NEF responds to the AF in step 5 with a Result value indicating the failure cause.

5. The NEF sends a Nnef\_AFsessionWithQoS\_Update response message (Transaction Reference ID, Result) to the AF. Result indicates whether the request is granted or not. For TSC QoS, the response includes the Assigned TSC Parameter Values if they did not equal the requested values.

6. The PCF sends Npcf\_PolicyAuthorization\_Notify message to the NEF when the modification of the transmission resources corresponding to the QoS update succeeded or failed.

7. The NEF sends Nnef\_AFsessionWithQoS\_Notify message with the event reported by the PCF to the AF.

*Second Change*

#### 5.2.6.9 Nnef\_AFsessionWithQoS service

##### 5.2.6.9.1 General

See clause 4.15.6.6.

This service is also used to support subscription and notification of QoS Monitoring for URLLC, as described in TS 23.501 [2] clause 5.33.3.2.

##### 5.2.6.9.2 Nnef\_AFsessionWithQoS\_Create service operation

**Service operation name:** Nnef\_AFsessionWithQoS Create

**Description:** The consumer requests the network to provide a specific QoS for an AF session.

**Inputs, Required:** AF Identifier, UE address (i.e. IP address or MAC address), Flow description(s), QoS Reference.

**Inputs, Optional:** time period, traffic volume, Alternative Service Requirements (containing one or more QoS reference parameters in a prioritized order), QoS parameter(s) to be measured, Reporting frequency, Target of reporting as described in clause 6.1.3.21 of TS 23.503 [20], 5GS delay, TSC Burst Size, a Guaranteed Flow Bit Rate, a Time Domain and Traffic Pattern Parameters.

**Outputs, Required:** Transaction Reference ID, result.

**Output (optional):** Assigned TSC Parameter Values.

##### 5.2.6.9.3 Nnef\_AFsessionWithQoS\_Notify service operation

**Service operation name:** Nnef\_AFsessionWithQoS Notify

**Description:** NEF reports the QoS Flow level event(s) to the consumer.

**Inputs, Required:** Reports of the events as defined in clause 6.1.3.18 of TS 23.503 [20].

**Inputs, Optional:** When the event report is for QoS Monitoring for URLLC, includes Packet delay for UL, DL, or round trip of the single UP path or two UP paths in the case of redundant transmission, as defined in clause 5.33.3.2 of TS 23.501 [2].

**Outputs, Required:** None.

**Output (optional):** None.

##### 5.2.6.9.4 Nnef\_AFsessionWithQoS\_Revoke service operation

**Service operation name:** Nnef\_AFsessionWithQoS Revoke

**Description:** The consumer requests the network to revoke the AF session with requested QoS or the AF session with requested QoS including Alternative Service Requirements.

**Inputs, Required:** Transaction Reference ID.

**Inputs, Optional:** None.

**Outputs, Required:** Transaction Reference ID, result.

**Output (optional):** None.

##### 5.2.6.9.5 Nnef\_AFsessionWithQoS\_Update service operation

**Service operation name:** Nnef\_AFsessionWithQoS Update

**Description:** The consumer requests the network to update the Service Requirement(s) and/or additional Alternative Service Requirement(s) for an AF session.

**Inputs, Required:** Transaction Reference ID.

**Inputs, Optional:** Flow description, QoS reference, time period, traffic volume, Alternative Service Requirements (containing one or more QoS reference parameters in a prioritized order), QoS parameter(s) to be measured, Reporting frequency, Target of reporting as described in clause 6.1.3.21 of TS 23.503 [20], 5GS delay, TSC Burst Size, a Guaranteed Flow Bit Rate, a Time Domain and Traffic Pattern Parameters.

**Outputs, Required:** Result.

**Output (optional):** Assigned TSC Parameter Values.

*Third Change*

#### 5.2.5.3 Npcf\_PolicyAuthorization Service

##### 5.2.5.3.1 General

**Service description:** This service is to authorise an AF request and to create policies as requested by the authorized AF for the PDU Session to which the AF session is bound. Additionally this service allows an AF/NEF to exchange Ethernet port management information with DS-TT and NW-TT. This service allows the NF consumer to subscribe/unsubscribe the notification of events, which are defined in clause 6.1.3.18 of TS 23.503 [20].

##### 5.2.5.3.2 Npcf\_PolicyAuthorization\_Create service operation

**Service operation name:** Npcf\_PolicyAuthorization\_Create

**Description:** Authorize the request, and optionally determines and installs SM Policy Control Data according to the information provided by the NF Consumer or provides Ethernet Port Management Information Container for Ethernet ports on DS-TT or NW-TT.

**Inputs, Required:** UE (IP or MAC) address, identification of the application session context.

**Inputs, Optional:** UE identity if available, DNN if available, S-NSSAI if available, Media type, Media format, bandwidth requirements, sponsored data connectivity if applicable, flow description, Application Identifier, AF Communication Service Identifier, AF Record Identifier, Flow status, Priority indicator, emergency indicator, Application service provider, resource allocation outcome, AF Application Event Identifier, a list of DNAI(s) and corresponding routing profile ID(s) or N6 traffic routing information, AF Transaction Id, Early and/or late notifications about UP path management events, temporal validity condition and spatial validity condition as described in clause 5.6.7 in 23.501 [2], Background Data Transfer Reference ID, priority sharing indicator as described in clause 6.1.3.15 in TS 23.503 [20], pre-emption control information as described in clause 6.1.3.15 in TS 23.503 [20], Port Management Information Container and related port number, TSN AF parameters provided by the TSN AF to the PCF as described in clause 6.1.2.23 of TS 23.503 [20], QoS parameter(s) to be measured, Reporting frequency, Target of reporting as described in clause 6.1.3.21 of TS 23.503 [20], Alternative Service Requirements (containing one or more QoS reference parameters in a prioritized order).

**Outputs, Required:** Success or Failure (reason for failure, e.g. as defined in TS 23.503 [20] clause 6.1.3.16, clause 6.1.3.10).

**Outputs, Optional:** The service information that can be accepted by the PCF, Assigned TSC Parameter Values.

##### 5.2.5.3.3 Npcf\_PolicyAuthorization\_Update service operation

**Service operation name:** Npcf\_PolicyAuthorization\_Update

**Description:** Provides updated information to the PCF.

**Inputs, Required:** Identification of the application session context.

**Inputs, Optional:** Media type, Media format, bandwidth requirements, sponsored data connectivity if applicable, flow description, Application Identifier, AF Communication Service Identifier, AF Record Identifier, Flow status, Priority indicator, Application service provider, resource allocation outcome, AF Application Event Identifier, a list of DNAI(s) and corresponding routing profile ID(s) or N6 traffic routing information, AF Transaction Id, Early and/or late notifications about UP path management events, temporal validity condition and spatial validity condition as described in clause 5.6.7 in 23.501 [2], Background Data Transfer Reference ID, priority sharing indicator as described in clause 6.1.3.15 in TS 23.503 [20], pre-emption control information as described in clause 6.1.3.15 in TS 23.503 [20], Port Management Information Container and related port number, TSN AF parameters provided by the TSN AF to the PCF as described in clause 6.1.2.23 of TS 23.503 [20], QoS parameter(s) to be measured, Reporting frequency, Target of reporting as described in clause 6.1.3.21 of TS 23.503 [20].

**Outputs, Required:** Success or Failure (reason for failure, e.g. as defined in TS 23.503 [20] clause 6.1.3.16).

**Outputs, Optional:** The service information that can be accepted by the PCF, Assigned TSC Parameter Values.

Provides updated application level information and communicates with Npcf\_SMPolicyControl service to determine and install the policy according to the information provided by the NF Consumer. Updates an application context in the PCF.

##### 5.2.5.3.4 Npcf\_PolicyAuthorization\_Delete service operation

**Service operation name:** Npcf\_PolicyAuthorization\_Delete

**Description:** Provides means for the NF Consumer to delete the context of application level session information.

**Inputs, Required:** Identification of the application session context.

**Inputs, Optional:** None.

**Outputs, Required:** None.

**Outputs, Optional:** None.

##### 5.2.5.3.5 Npcf\_PolicyAuthorization\_Notify service operation

**Service operation name:** Npcf\_PolicyAuthorization\_Notify

**Description:** provided by the PCF to notify NF consumers of the subscribed events.

**Inputs, Required:** Event ID.

The events that can be subscribed are defined in clause 6.1.3.18 of TS 23.503 [20].

**Inputs, Optional:** Event information (defined on a per Event ID basis) are defined in clause 6.1.3.18 of TS 23.503 [20], Notification Correlation Information (information to identify the application session).

Notification Correlation Information is mandatory except in the case of the Manageable Ethernet Port detected event if no AF session exists between the PCF and the AF.

**Outputs, Required:** Operation execution result indication.

**Outputs, Optional:** Port Management Information Container, MAC address and related port number, information of the detected bridge, information of the detected port(s) in a bridge.

##### 5.2.5.3.6 Npcf\_PolicyAuthorization\_Subscribe service operation

**Service operation name:** Npcf\_PolicyAuthorization\_Subscribe

**Description:** provided by the PCF for NF consumers to explicitly subscribe the notification of events.

**Inputs, Required:** (Set of) Event ID(s) as specified in Npcf\_PolicyAuthorization\_Notify service operation, target of PCF event reporting (defined below), NF ID, Event Reporting Information defined in Table 4.15.1-1 (only the Event Reporting mode and the inmediate reporting flag when applicable), Notification Target Address (+ Notification Correlation ID).

The target of PCF event reporting the subscription for an individual AF session: An UE IP address (IPv4 address or IPv6 prefix) optionally together with a (DNN, S-NSSAI) or with a UE ID (SUPI or GPSI).

**Inputs, Optional:** Event Filter, Subscription Correlation ID (in the case of modification of the event subscription).

**Outputs, Required:** When the subscription is accepted: Subscription Correlation ID.

**Outputs, Optional:** None*.*

##### 5.2.5.3.7 Npcf\_PolicyAuthorization\_Unsubscribe service operation

**Service operation name:** Npcf\_PolicyAuthorization\_Unsubscribe

**Description:** Enable NF consumers to explicitly unsubscribe the notification of PCF events related to Npcf\_PolicyAuthorization\_Subscribe operation.

**Inputs, Required:** Subscription Correlation.

**Inputs, Optional:** None.

**Outputs, Required:** Success or Failure.

**Outputs, Optional:** None*.*

*Fourth Change*

Annex G (informative):
Information flows for TSC QoS

This annex defines the procedures for 5GS QoS.

# G.1 AF Request for TSC QoS

This procedure is used by the AF to request TSC QoS, including setup of Hold and Forward Buffers in the UE/DS-TT (for downlink follows) or UPF/NW-TT (for uplink flows) and configuration of TSCAI.



Figure G.1-1: AF Request for TSC QoS

1. PDU Session Establishment is performed as specified in clause 4.3.2.2.1. If the AF is located inside the operator's domain, the PCF exposes the UE-DS-TT residence time to the AF as defined in TS 23.502 [3] and the AF is configured with the UE to UPF/NW-TT delay per Type of Service.

2. If the AF is located outside the operator's domain, the NEF exposes Deterministic QoS Capability to AF when it sends a query to the NEF as shown in clause xxxx. If the NEF learns the UE-DS-TT residence time from the PCF and the NEF is configured with the UE to UPF/NW-TT delay, the NEF computes 5GS delay per Type of Service.

Editor’s Note: Clause xxxx refers to the “TSC Capability Exposure towards external AF” procedure in TR23.700-20 Solution 5 Figure 6.5.3-2, which needs to be added to 23.502.

3. Setting up an AF session with required QoS procedure specified in clause 4.15.6.6. is executed. The NEF formulates a Port Management Information Container containing Gate Control Information used to configure Hold and Forward Buffers at the UE/DS-TT or UPF/NW-TT and sends traffic pattern parameters and TSC QoS information to the PCF.

4. The PCF creates the PCC rule and provides it to the SMF. The PCF also includes the TSC traffic pattern parameters from the NEF/AF and the Port Management Information Container.

5. The SMF may calculate the TSCAI similar to TS 23.501 [2] clause 5.27.2. The SMF assigns the TSCAI with the Time Domain as received from the PCF to a QoS Flow. If the SMF receives clock drift information from UPF for that Time Domain (i.e. clock drift between 5G timing and AF supplied Time Domain), then SMF may adjust the TSCAI information of the QoS Flow so that it reflects the 5GS Clock.

6. The SMF configures the U-plane and sends the N2 message with TSCAI to NG-RAN. The SMF sends the Port Management Information Container containing Gate Control Information for Hold and Forward Buffering to the UE or UPF.

Annex H (informative):
Change history

*End of CHANGEs*