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- will** indicates that something is certain or expected to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document
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In addition:

is (or any other verb in the indicative mood) indicates a statement of fact

is not (or any other negative verb in the indicative mood) indicates a statement of fact

The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies the stage 3 protocol and data model for the Ntsctsf Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the TSCTSF.

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [19].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [4] and 3GPP TS 29.501 [5].

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] OpenAPI: "OpenAPI Specification Version 3.0.0", <https://spec.openapis.org/oas/v3.0.0>.
- [7] 3GPP TR 21.900: "Technical Specification Group working methods".
- [8] 3GPP TS 33.501: "Security architecture and procedures for 5G system".
- [9] IETF RFC 6749: "The OAuth 2.0 Authorization Framework".
- [10] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".
- [11] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".
- [12] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".
- [13] IETF RFC 7807: "Problem Details for HTTP APIs".
- [14] 3GPP TS 29.534: "5G System; Access and Mobility Policy Authorization Service; Stage 3".
- [15] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".
- [16] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".
- [17] 3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".
- [18] IEEE Std 802.1Q-2018: "IEEE Standard for Local and metropolitan area networks--Bridges and Bridged Networks".
- [19] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

- [20] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".
- [21] 3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".
- [22] IETF RFC 7396: "JSON Merge Patch".
- [23] 3GPP TS 29.521: "5G System; Binding Support Management Service; Stage 3".
- [24] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".
- [25] IEEE Std 1588-2019: "IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control".
- [26] IEEE Std 802.1AS-2020: "IEEE Standard for Local and metropolitan area networks--Timing and Synchronization for Time-Sensitive Applications".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

Void

3.2 Symbols

For the purposes of the present document, the following symbols apply:

Void

3.3 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].

| | |
|--------|--|
| ASTI | Access Stratum Time distribution |
| DS-TT | Device-side TSN translator |
| NW-TT | Network-side TSN translator |
| PTP | Precision Time Protocol |
| TSC | Time Sensitive Communication |
| TSCAI | TSC Assistance Information |
| TSCTSF | Time Sensitive Communication and Time Synchronization function |

4 Overview

4.1 Introduction

The Ntsctsf services are offered by the TSCTSF to support the Time Sensitive Communications and Time Synchronization.

The following services are specified:

- Ntsctsf_TimeSynchronization service;

- Ntsctsf_QoSandTSCAssistance service.
- Ntsctsf_ASTI service.

4.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2].

The known NF service consumers of the Ntsctsf services are the Application Function (AF) within the operator's trust domain and the Network Exposure Function (NEF).

The Ntsctsf services are provided by the TSCTSFS and consumed by the NF service consumers (e.g. AF, NEF), as shown in figure 4.2-1 for the SBI representation model and in figure 4.2-2 for the reference point representation model.

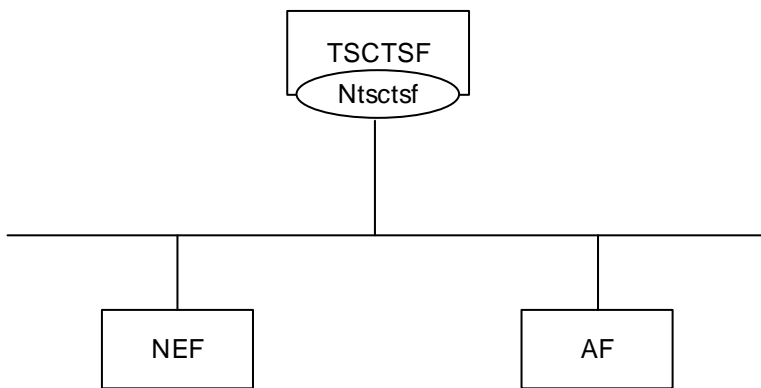


Figure 4.2-1: Ntsctsf services architecture, SBI representation

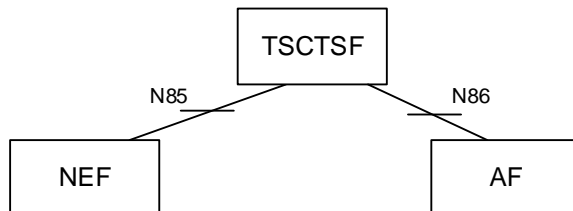


Figure 4.2-2: Ntsctsf services architecture, reference point representation

5 Services offered by the TSCTSFS

5.1 Introduction

Table 5.1-1 summarizes the corresponding APIs defined for this specification.

Table 5.1-1: API Descriptions

| Service Name | Clause | Description | OpenAPI Specification File | apiName | Annex |
|--------------|--------|-------------|----------------------------|---------|-------|
|--------------|--------|-------------|----------------------------|---------|-------|

| | | | | | |
|---------------------------------|-----|--|--|-----------------------|-----|
| Ntsctsf_TimeSynchroniz ation | 6.1 | Provides the support to subscribe/unsubscribe to the notification about time synchronization capabilities and to activate and deactivate the time synchronization configuration. | TS29565_Ntsctsf_TimeSynchronizati on.yaml | ntsctsf-time- sync | A.2 |
| Ntsctsf_QoSandTSCAssi stance | 6.2 | Provides the support to request specific QoS and provide assistance for handling traffic characterized by TSC QoS parameters. | TS29565_Ntsctsf_QoSandTSCAssistan ce.yaml | ntsctsf-qos- tscai | A.3 |
| Ntsctsf_ASTI | 6.3 | Provides support for time synchronization service based on 5G access stratum time distribution method. | TS29565_Ntsctsf_ASTI.yaml | ntsctsf-asti | A.4 |

5.2 Ntsctsf_TimeSynchronization Service

5.2.1 Service Description

5.2.1.1 Overview

This service provides:

- Authorization of NF Service Consumer requests for the subscription to the notification of the capability of time synchronization service.
- Authorization of NF Service Consumer requests to create and update time synchronization configuration, and to activate and deactivate the time synchronization service as described in clause 5.27.1.8 of TS 23.501 [2].

NOTE: The AF can use either the procedure specified in bullet2) for configuring the (g)PTP instance in 5GS or the procedure specified in clause 5.4.2.2 for controlling the 5G access stratum time distribution for a particular UE. The procedures are not intended to be used in conjunction with each other by the AF. However, the (g)PTP instance activation, modification, and deactivation can influence the 5G access stratum time distribution for the UEs that are part of the impacted PTP instance.

5.2.1.2 Network Functions

5.2.1.2.1 TSCTSF

The TSCTSF supports to:

- receive the request to create/update the subscription to the notification of the capability of time synchronization service from the NEF or AF and interact with the related PCF;

- receive the request to delete the subscription to the notification of the capability of time synchronization service from the NEF or AF and remove the information from the related PCF;
- receive the notification of the availability of the user plane node information from the PCF and subscribe the notification of user plane node related events at the PCF;
- determine the capability of time synchronization service based on the capability information received from the DS-TT(s) and NW-TT and notify the NEF or AF of the capability;
- receive the request to create or modify the time synchronization configuration from the NEF or AF, configure and initialize the PTP instance(s) by constructing a PMIC to each DS-TT/UE to activate the time synchronization service in DS-TT and PMIC(s) and UMIC to NW-TT to activate the time synchronization service in NW-TT and provision them to the PCF;
- Notify the NEF or AF of the current state of the time synchronization service configuration;
- receive the request of time synchronization deactivation from the NEF or AF and disable the corresponding PTP instance(s) in the DS-TT(s) and NW-TT.

5.2.1.2.2 NF Service Consumers

The NF service consumer supports to:

- send the request to create/update and delete the subscription to the notification of the capability of time synchronization service to TSCTSF;
- receive the notification of the capability of time synchronization service;
- send the request to create, modify and delete the time synchronization configuration to the TSCTSF;

5.2.2 Service Operations

5.2.2.1 Introduction

Service operations defined for the Ntsctsf_TimeSynchronization service are shown in table 5.2.2.1-1.

Table 5.2.2.1-1: Ntsctsf_TimeSynchronization Service Operations

| Service Operation Name | Description | Initiated by |
|--|--|------------------------------------|
| Ntsctsf_TimeSynchronization_CapsSubscribe | Allows the NF service consumer to create or modify a subscription to the notification about the capability of time synchronization service for a list of UEs a group of UEs or any UE using a DNN/S-NSSAI combination. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_TimeSynchronization_CapsUnsubscribe | Allows the NF service consumer to delete the subscription to the notification about capability of time synchronization service for a list of UEs, a group of UEs or any UE using a DNN/S-NSSAI combination. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_TimeSynchronization_CapsNotify | Allows the TSCTSF to notify the NF service consumer of the capability of time synchronization service. | TSCTSF |
| Ntsctsf_TimeSynchronization_ConfigCreate | Allows the NF service consumer to create a time synchronization configuration. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_TimeSynchronization_ConfigUpdate | Allows the NF service consumers to update the time synchronization configuration. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_TimeSynchronization_ConfigDelete | Allows the NF service consumer to delete the time synchronization configuration. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_TimeSynchronization_ConfigUpdateNotify | Allows the TSCTSF to notify the NF service consumer of the state of time synchronization configuration. | TSCTSF |

NOTE: The NEF and the AF use the Ntsctsf_TimeSynchronization service in the same way.

5.2.2.2 Ntsctsf_TimeSynchronization_CapsSubscribe

5.2.2.2.1 General

This service operation is used by an NF service consumer to subscribe to notification of capability of time synchronization service for a list of UEs, a group of UEs or any UE using a DNN/S-NSSAI combination.

The following procedures using the Ntsctsf_TimeSynchronization_CapsSubscribe service operation are supported:

- creating a new subscription;
- modifying an existing subscription.

5.2.2.2.2 Creating a new subscription

Figure 5.2.2.2.2-1 illustrates the creation of a subscription.

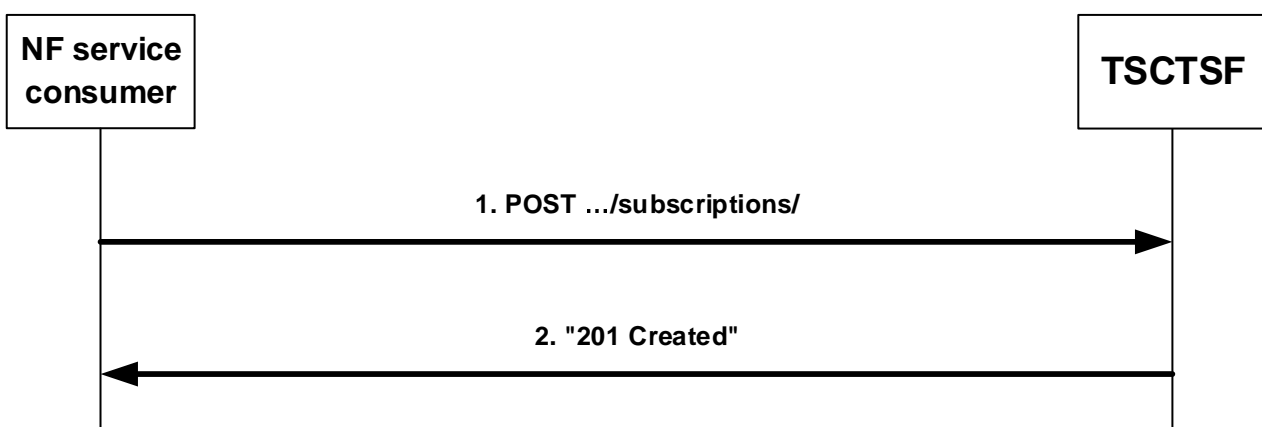


Figure 5.2.2.2.2-1: Creation of a subscription

To subscribe the notification of the capability of time synchronization service, the NF service consumer shall send an HTTP POST message to the TSCTSF to the URI "{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions". The HTTP POST message shall include the TimeSyncExposureSubsc data structure as request body. The TimeSyncExposureSubsc data structure shall include:

- the indication of the UEs to which the time synchronization capabilities is requested via:
 - identification of a list of individual UEs within a "supis" attribute;
 - identification of a list of individual UEs within a "gpsis" attribute;
 - indication of any UE within the "anyUeInd" attribute; or
 - identification of a group of UE(s) within the "interGroupId" attribute; or
 - identification of a group of UE(s) within the "exterGroupId" attribute.
- subscription to event(s) notification as "subscribedEvents" attribute;
- notification URI within the "subsNotifUri" attribute;
- notification correlation Id within the "subsNotifId" attribute;
- DNN with the "dnn" attribute; and
- S-NSSAI with the "snssai" attribute;

and may include:

- the conditions to match for notifying the event within the "eventFilters" attribute;

- notification methods within the "notifMethods" attribute
- maximum number of reports within the "maxReportNbr" attribute;
- expiry time within the "expiry" attribute; and
- report period within the "repPeriod" attribute.

Upon receipt of the HTTP request from the NF service consumer, if the request is authorized, the TSCTSF shall:

- create a new subscription;
- assign a subscription correlation ID;
- select an expiry time that is equal to or less than the expiry time potentially received in the request;
- store the subscription;
- if the "interGroupId" attribute or "exterGroupId" attribute is received from the NF service consumer, interact with the UDM to retrieve the SUPI list that belong to the group using the Nudm_SDM service as defined in 3GPP TS 29.503 [24];
- if the "gpsi" attribute is received from the NF service consumer, interact with the UDM to retrieve the SUPI that corresponds to the GPSI using the Nudm_SDM service as defined in 3GPP TS 29.503 [24];
- use the parameters received from the NF service consumer (i.e. DNN, S-NSSAI and, if available, the list of UEs or UEs that belong to the group of UEs) to determine the matching AF-session(s) and for any such AF-session interact with the PCF by triggering Npcf_PolicyAuthorization_Create/Update request message as defined in 3GPP TS 29.514 [20].

NOTE 1: If the PCF determines an existing PDU Session is potentially impacted by time synchronization service (based on local configuration or SM Policy Association), the PCF invokes Npcf_PolicyAuthorization_Notify service operation to the TSCTSF as defined in clause 4.2.5.16 of 3GPP TS 29.514 [20] to send the received TSC User Plane Node information. At that time, the TSCTSF retrieves from the BSF the PCF binding information (including the UE Identities for the notified PDU session), as specified in 3GPP TS 29.521 [23], and can create the AF-session by sending to the PCF the Npcf_PolicyAuthorization_Create service operation.

- send an HTTP "201 Created" response with TimeSyncExposureSubsc data structure as response body and a Location header field containing the URI of the created individual subscription resource, i.e. "{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}".

The TSCTSF shall handle the AF session(s) associated with the "Individual Time Synchronization Exposure Subscription" resource as follows:

- For the association of AF sessions to "Individual Time Synchronization Exposure Subscription" resources:
 - Upon PDU Session establishment, i.e. when the TSCTSF receives the Npcf_PolicyAuthorization_Notify service operation for the establishment of a new PDU session, the TSCTSF shall retrieve from the BSF, as specified in 3GPP TS 29.521 [23], the PCF binding information to complete the necessary AF-Session information and triggers the Npcf_PolicyAuthorization_Create request message to the PCF to create an AF-session to subscribe to TSC user plane node related events. The TSCTSF, shall use the parameters of existing "Individual Time Synchronization Exposure Subscription" resources to determine whether they shall be associated to this newly created AF session. The TSCTSF associates the new AF session to the "Individual Time Synchronization Exposure Subscription" resources for which these parameters match. The TSCTSF shall read time synchronization capabilities from the DS-TT and NW-TT, if not available in the AF session, from the PCF by triggering Npcf_PolicyAuthorization_Update request message as defined in 3GPP TS 29.514 [20] and determine the (g)PTP capabilities from the DS-TT and the NW-TT as described in clause K.2.1 of 3GPP TS 23.501 [2]. The TSCTSF shall update the time synchronization service capability for this new DS-TT as defined in clause 5.2.2.4.2.
 - Upon "Individual Time Synchronization Exposure Subscription" resource creation, the TSCTSF uses the parameters of the created resource to determine which existing AF sessions it matches. The TSCTSF associates the new "Individual Time Synchronization Exposure Subscription" resource to the AF sessions for which these parameters match.

- To remove an AF session from the associated ones to the "Individual Time Synchronization Exposure Subscription" resource, when the TSCTSF receives the Npcf_PolicyAuthorization_Notify service operation indicating the termination of an existing PDU session, the TSCTSF triggers the Npcf_PolicyAuthorization_Delete request message to the PCF and determines if the corresponding AF session is associated with the "Individual Time Synchronization Exposure Subscription" resource. If it is so, the TSCTSF shall remove the AF session from the list of AF session(s) associated with the "Individual Time Synchronization Exposure Subscription" resource. The TSCTSF shall update the time synchronization service capability for this removed DS-TT as defined in clause 5.2.2.4.2.

NOTE 2: After the TSCTSF retrieves from the BSF the PCF binding information (including the UE Identities for the notified PDU session), as specified in 3GPP TS 29.521 [23], the TSCTSF can store internally the information required to invoke Npcf_PolicyAuthorization_Create service operation and delay the Npcf_PolicyAuthorization_Create service operation (the creation of the AF session) till the subscription to notification of the capability of time synchronization service is received for the concerned UE. In this case, when the TSCTSF receives the subscription request, the TSCTSF interacts with the PCF by triggering Npcf_PolicyAuthorization_Create message as defined in 3GPP TS 29.514 [20].

NOTE 3: When the TSCTSF receives the Npcf_PolicyAuthorization_Notify service operation indicating the termination of an existing PDU session associated to an AF session that it is not associated with any "Individual Time Synchronization Exposure Subscription" resource, the TSCTSF removes the AF-session and triggers the Npcf_PolicyAuthorization_Delete request message to the PCF.

If the TSCTSF cannot successfully fulfil the received HTTP POST request due to the internal TSCTSF error or due to the error in the HTTP POST request, the TSCTSF shall send the HTTP error response as specified in clause 6.1.7.

5.2.2.2.3 Modifying an existing subscription

Figure 5.2.2.2.3-1 illustrates the modification of a subscription.

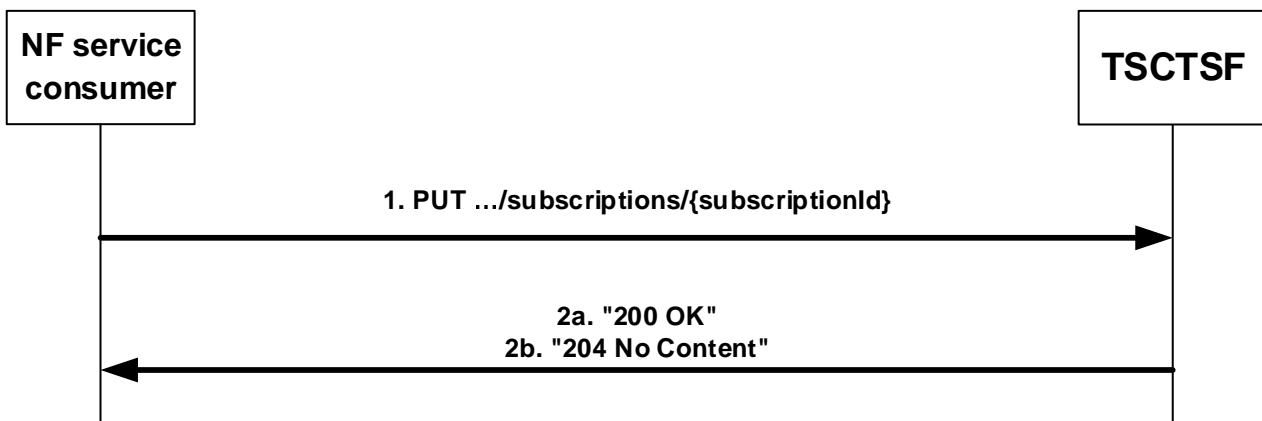


Figure 5.2.2.2.3-1: Modification of a subscription

To modify the subscription to the notification of the capability of time synchronization service, the NF service consumer shall send an HTTP PUT message to the TSCTSF to the URI "{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}" representing an existing "Individual Time Synchronization Exposure Subscription" resource, as shown in figure 5.2.2.2.3-1, step 1. The HTTP PUT message shall include the TimeSyncExposureSubsc data structure as request body. The TimeSyncExposureSubsc data structure shall include the parameters as defined in clause 5.2.2.2.2.

Upon receipt of the HTTP request from the NF service consumer, if the request is authorized, the TSCTSF shall:

- update the existing "Individual Time Synchronization Exposure Subscription" resource;
- identify the affected AF session(s) based on the parameters received from the NF service consumer and interact with the PCF by triggering Npcf_PolicyAuthorization_Update request message as defined in 3GPP TS 29.514 [20] for the new added UE(s), by triggering Npcf_PolicyAuthorization_Delete request message as defined in 3GPP TS 29.514 [20] for the removed UE(s) or by triggering Npcf_PolicyAuthorization_Update request message as defined in 3GPP TS 29.514 [20] for the existing UE(s) if necessary.

NOTE 1: If the PCF determines an existing PDU Session is potentially impacted by time synchronization service (based on local configuration or SM Policy Association), the PCF invokes Npcf_PolicyAuthorization_Notify service operation to the TSCTSF as defined in clause 4.2.5.16 of 3GPP TS 29.514 [20] to send the received TSC User Plane Node information. At that time, the TSCTSF retrieves from the BSF the PCF binding information (including the UE Identities for the notified PDU session), as specified in 3GPP TS 29.521 [23], and can create the AF-session by sending to the PCF the Npcf_PolicyAuthorization_Create service operation.

NOTE 2: After the TSCTSF retrieves from the BSF the PCF binding information (including the UE Identities for the notified PDU session), as specified in 3GPP TS 29.521 [23], the TSCTSF can store internally the information required to invoke Npcf_PolicyAuthorization_Create service operation and delay the Npcf_PolicyAuthorization_Create service operation (the creation of the AF-session) till the subscription to notification of the capability of time synchronization service is received for the concerned UE. In this case, when the TSCTSF receives the subscription request, the TSCTSF interacts with the PCF by triggering Npcf_PolicyAuthorization_Create message as defined in in 3GPP TS 29.514 [20].

- update the list of AF sessions that are associated to the "Individual Time Synchronization Exposure Subscription" resource (i.e. add or remove AF sessions as associated to this resource) based on if the parameters of the AF sessions match the updated parameters of the "Individual Time Synchronization Exposure Subscription" resource.
- send a HTTP response including "200 OK" status code with TimeSyncExposureSubsc data structure or "204 No Content" status code, as shown in figure 5.2.2.3-1, step 2.

If the HTTP PUT request from the NF service consumer is not accepted, the TSCTSF shall indicate in the response to HTTP PUT request the cause for the rejection as specified in clause 6.1.7.

If the TSCTSF determines the received HTTP PUT request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.2.2.3 Ntsctsf_TimeSynchronization_CapsUnsubscribe service operation

5.2.2.3.1 General

This service operation is used by an NF service consumer to unsubscribe from the notifications.

The following procedure using the Ntsctsf_TimeSynchronization_CapsUnsubscribe service operation is supported:

- unsubscription from capability notifications.

5.2.2.3.2 Unsubscription from capability notifications

Figure 5.2.2.3.2-1 illustrates the unsubscription from event notifications.

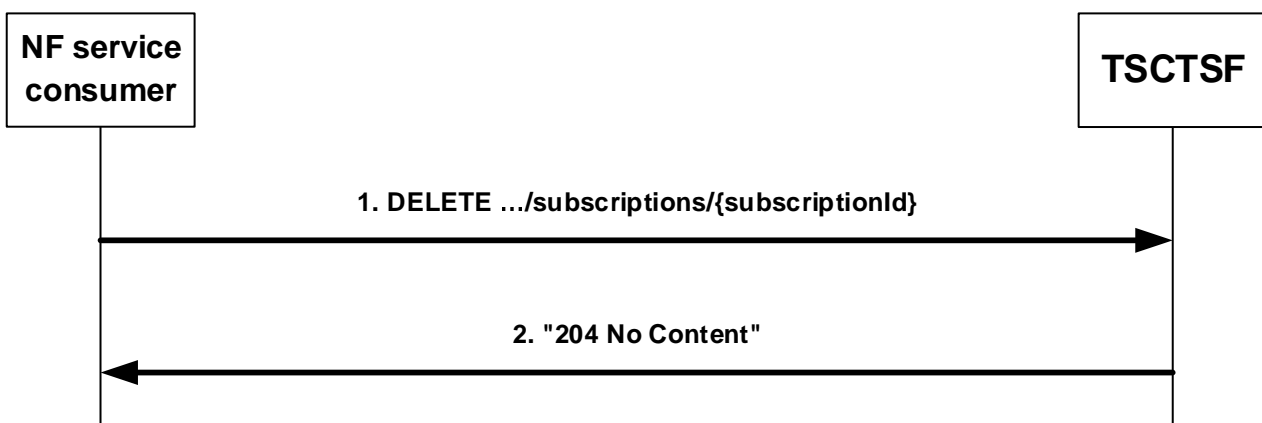


Figure 5.2.2.3.2-1: Unsubscription from capability notifications

To unsubscribe from event notifications, the NF service consumer shall send an HTTP DELETE request with: "{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI, where "{subscriptionId}" is the subscription correlation ID of the existing subscription that is to be deleted.

Upon the reception of the HTTP DELETE request, if the received HTTP request is successfully processed and accepted, the TSCTSF shall:

- remove the corresponding subscription;
- identify the affected AF session(s) and, for each AF session, interact with the PCF by triggering Npcf_PolicyAuthorization_Delete request message as defined in 3GPP TS 29.514 [20]; and
- send an HTTP "204 No Content" response.

If the HTTP DELETE request from the NF service consumer is not accepted, the TSCTSF shall indicate in the response to HTTP DELETE request the cause for the rejection as specified in clause 6.1.7.

If the TSCTSF determines the received HTTP DELETE request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.2.2.4 Ntsctsf_TimeSynchronization_CapsNotify service operation

5.2.2.4.1 General

This service operation is used by the TSCTSF to send notifications to NF service consumers upon the detection of the capability of the time synchronization service for a list of UEs.

The following procedure using the Ntsctsf_TimeSynchronization_CapsNotify service operation is supported:

- notification about the capability of time synchronization service.

5.2.2.4.2 Notification about the capability of time synchronization service

Figure 5.2.2.4.2-1 illustrates the notification about the capability of time synchronization service.

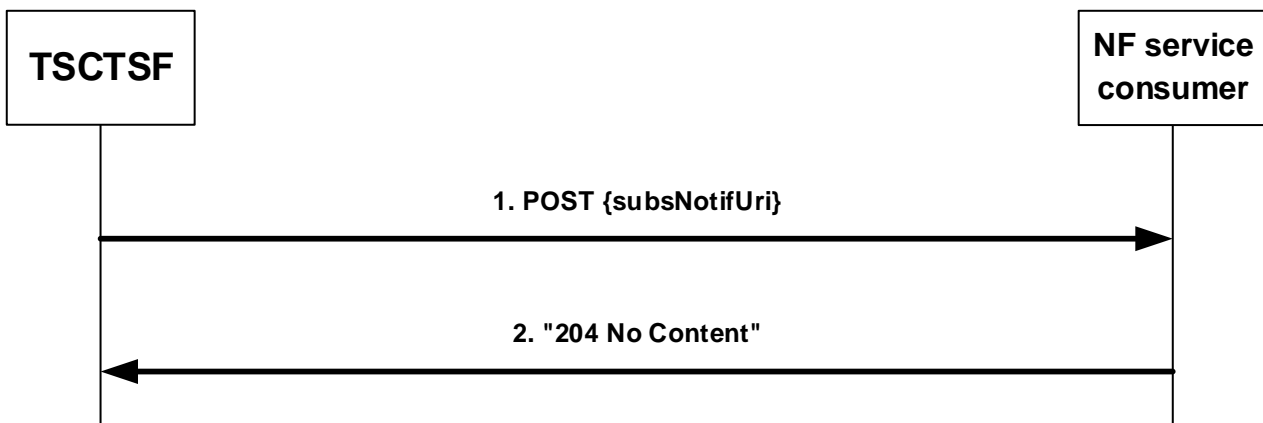


Figure 5.2.2.4.2-1: Notification about the capability of time synchronization service

The TSCTSF maintains the association between the AF session(s) and the Individual Time Synchronization Exposure Subscription resource as defined in clause 5.2.2.2.2 and detects the capability of time synchronization service (for a list of UEs, a group of UEs or any UE in a DNN and S-NSSAI), by composing the time synchronization capabilities (for a list of DS-TT/UE(s) connected to the NW-TT based on the capability information received from the DS-TT(s) and NW-TT via the PCF. If the NF service consumer includes an Event Filter with one or more of the requested PTP instance type, requested transport protocol for PTP, or requested PTP Profile, the TSCTSF considers only the DS-TT(s) and NW-TT(s) with these capabilities as part of the time synchronization capability set that is reported to the NF service consumer. If necessary, when the list of AF session(s) associated to the Individual Time Synchronization Exposure Subscription resource changes, e.g. upon PDU Session establishment or termination, the TSCTSF may notify the update of the capability of time synchronization service for the DS-TT/UE(s) connected to the NW-TT(s). In order to send the capability of time synchronization service to the NF service consumer, the TSCTSF shall send an HTTP POST request

with "{subsNotifUri}", as previously provided by the NF service consumer within the corresponding subscription, as request URI and TimeSyncExposureSubsNotif data structure as request body that shall include:

- Notification correlation ID provided by the NF service consumer during the subscription within "subsNotifId" attribute; and
- information about the observed event(s) within the "eventNotifs" attribute that shall contain for each observed event an "SubsEventNotification" data structure that shall include:
 1. the detected event within the "event" attribute;
 - 2. when the event is "AVAILABILITY_FOR_TIME_SYNC_SERVICE", the capabilities of time synchronization service for one or more user plane nodes with the "timeSyncCapas" attribute. Within each instance of TimeSyncCapability data structure, the TSCTSF shall include the identifier of the applicable NW-TT within the "upNodeId" attribute, the "gmCapables" attribute indicating if the user plane node supports acting as a gPTP and/or PTP grandmaster, the supported 5G clock quality within the "asTimeRes" attribute, if applicable, and the PTP capabilities for each UE within the "ptpCapForUes" attribute, when the UEs are identified with a SUPI, or within "ptpCapForGpsis" attribute, when the UEs are identified with a GPSI.

Upon the reception of an HTTP POST, the NF service consumer shall send an HTTP "204 No Content" response for a successful processing.

If the HTTP POST request from the TSCTSF is not accepted, the NF service consumer shall indicate in the response to HTTP POST request the cause for the rejection as specified in clause 6.1.7.

If the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.2.2.5 Ntsctsf_TimeSynchronization_ConfigCreate

5.2.2.5.1 General

This service operation is used by an NF service consumer to create a time synchronization configuration and activate the time synchronization service with the configuration.

The following procedures using the Ntsctsf_TimeSynchronization_ConfigCreate service operation are supported:

- creating a new configuration.

5.2.2.5.2 Creating a new configuration

Figure 5.2.2.5.2-1 illustrates the creation of a configuration.

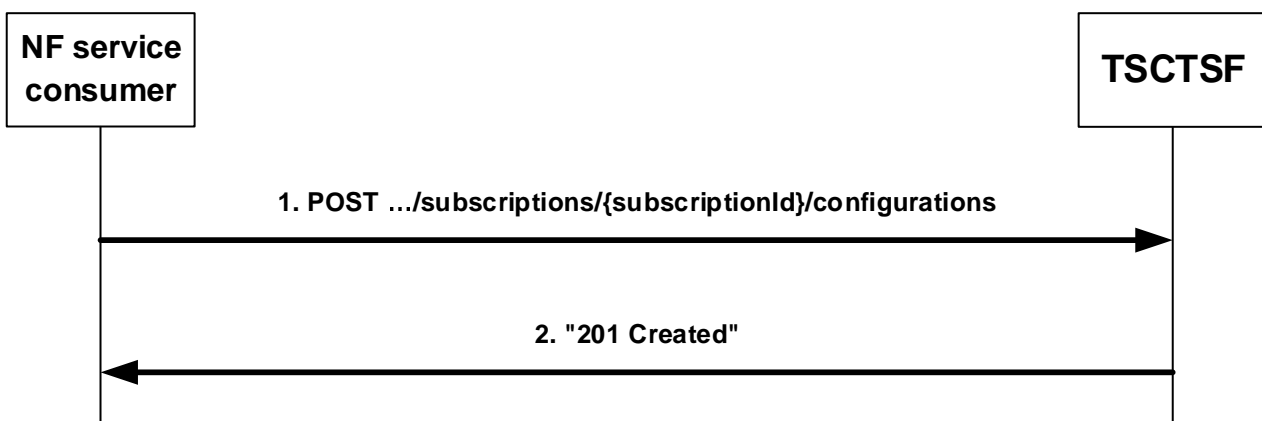


Figure 5.2.2.5.2-1: Creation of a configuration

To create a configuration, the NF service consumer shall send an HTTP POST message to the TSCTSF to the URI "{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}/configurations". The HTTP POST message

shall include the TimeSyncExposureConfig data structure as request body, as shown in figure 5.2.2.5.2-1, step 1. The TimeSyncExposureConfig data structure shall include:

- the user plane node Id within the "upNodeId" attribute;
- the requested PTP instance within the "reqPtpIns" attribute;
- the time domain within the "timeDom" attribute;
- the notification URI within the "configNotifUri" attribute;
- the notification correlation Id within the "configNotifId" attribute;

and may include:

- the "gmEnable" attribute set to true if the AF requests 5GS to act as a grandmaster for PTP or gPTP;
- the time synchronization error budget within the "timeSyncErrBdgt" attribute;
- the grandmaster priority with the "gmPrio" attribute; and
- the temporal validity condition within the "tempValidity" attribute.

Upon receipt of the HTTP request from the NF service consumer, if the request is authorized, the TSCTSF shall:

- create a new resource, which represents a new "Individual Time Synchronization Exposure Configuration" instance, addressed by a URI as defined in clause 6.1.3.5 and containing a TSCTSF created resource identifier;
- send an HTTP "201 Created" response with TimeSyncExposureConfig data structure as response body and a Location header field containing the URI of the created Individual Time Synchronization Exposure Configuration resource, i.e. "{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}/configuration/{configurationId}", as shown in figure 5.2.2.5.2-1, step 2;
- use the {subscriptionId} within the requested URI and user plane node ID within the "upNodeId" attribute in the request to determine the target UEs and corresponding AF sessions, then use the parameters (e.g. requested PTP instance type, transport protocol, and PTP profile) in the request to determine suitable DS-TT(s) and AF session(s) among all AF session and contact with the each corresponding PCF for the PDU session to configure and initialize the PTP instance in the DS-TT(s) and NW-TT as defined in 3GPP TS 23.502 [3], clause 4.15.9.3.2, step 5-6;
- calculate the Uu time synchronization error budget as specified in clause 5.27.1.9 of 3GPP TS 23.501 [2], subscribe to event notifications of newly registered PCF for the UE for the affected UEs by invoking Nbsf_Management_Subscribe Service Operation as defined in clause 4.2.6 of 3GPP TS 29.521 [23] if not yet done, and send a request to the PCF for the UE for AM policy authorization by invoking Npcf_AMPolicyAuthorization_Create service operation as defined in clause 4.2.2 of 3GPP TS 29.534 [14] providing the appropriate values in the "asTimeDisParam" attribute in order to activate the access stratum time distribution and provide the calculated Uu time synchronization error budget.

If the temporal validity condition is provided and if the start-time is in the future, the TSCTSF shall maintain the time synchronization configuration and then proceed as described above when the start-time is reached; otherwise, if the start-time is in the past, the TSCTSF shall proceed as described above immediately. When the stop-time is reached for active time synchronization service configuration, the TSCTSF shall proceed as Ntsctsf_TimeSynchronization_ConfigDelete was received as described in clause 5.2.2.7.2 without interacting with the AF.

The TSCTSF shall associate the affected AF session to the "Individual Time Synchronization Exposure Configuration". When receiving the Npcf_PolicyAuthorization_Notify service operation indicating the termination of an existing PDU session and the corresponding AF session is associated with the "Individual Time Synchronization Exposure Configuration" resource, the TSCTSF shall remove the AF session from the list of AF sessions associated with the "Individual Time Synchronization Exposure Configuration" resource and invoke Npcf_AMPolicyAuthorization_Delete service operation as defined in clause 4.2.4 of 3GPP TS 29.534 [14] to remove the access stratum time distribution parameters for the UE if they were provided.

If the HTTP POST request from the NF service consumer is not accepted, the TSCTSF shall indicate in the response to HTTP POST request the cause for the rejection as specified in clause 6.1.7.

If the TSCTSF determines the received HTTP POST request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.2.2.6 Ntsctsf_TimeSynchronization_ConfigUpdate

5.2.2.6.1 General

This service operation is used by an NF service consumer to update a time synchronization configuration.

The following procedures using the Ntsctsf_TimeSynchronization_ConfigUpdate service operation are supported:

- Updating an existing configuration.

5.2.2.6.2 Updating an existing configuration

Figure 5.2.2.6.2-1 illustrates the updating of an existing configuration.

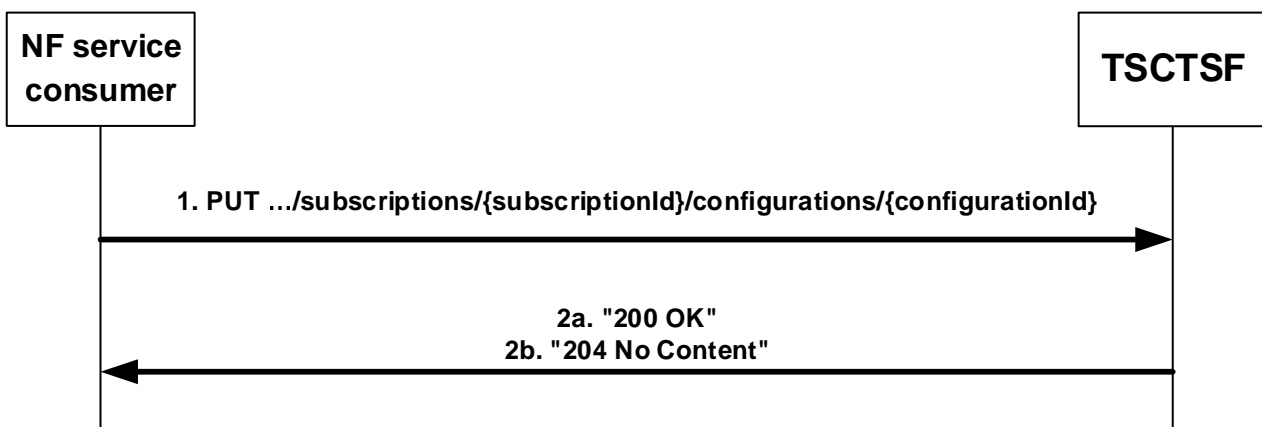


Figure 5.2.2.6.2-1: Update of a configuration

To update a configuration, the NF service consumer shall send an HTTP PUT request to the resource "{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}/configurations/{configurationId}" representing an existing "Individual Time Synchronization Exposure Configuration" resource, as shown in figure 5.2.2.6.2-1, step 1, to modify the configuration.

The TimeSyncExposureConfig data structure provided in the request body shall include:

- the user plane node Id within the "upNodeId" attribute;

NOTE 1: The user plane node Id cannot be changed during the modification.

- the requested PTP instance within the "reqPtpIns" attribute;
- the time domain within the "timeDom" attribute;

NOTE 2: The user plane node Id, the requested PTP instance and the time domain cannot be changed during the modification.

- the notification URI within the "configNotifUri" attribute;
- the notification correlation Id within the "configNotifId" attribute;

NOTE 2: If the notification URI or notification correlation Id is not changed the previously value is included.

and may include:

- the "gmEnable" attribute set to true if the AF requests 5GS to act as a grandmaster for PTP or gPTP;
- the time synchronization error budget within the "timeSyncErrBdgt" attribute;

- the gandmaster priority with the "gmPrio" attribute; and
- the temporal validity condition within the "tempValidity" attribute.

Upon receipt of the corresponding HTTP PUT message, if the request is authorized, the TSCTSFS shall:

- update the existing "Individual Time Synchronization Exposure Configuration" resource;
- send a HTTP response including "200 OK" status code with TimeSyncExposureConfig data structure or "204 No Content" status code, as shown in figure 5.2.2.6.2-1, step 2;
- use the {subscriptionId} within the requested URI and user plane node ID within the "upNodeId" attribute in the request to determine the target UEs and corresponding AF-sessions, then use the updated parameters (e.g. requested PTP instance type, transport protocol, and PTP profile) in the request to determine suitable DS-TT(s) and AF session(s) among all AF session and contact with the each corresponding PCF for the PDU session to configure and initialize the PTP instance in the DS-TT(s) and NW-TT as defined in 3GPP TS 23.502 [3], clause 4.15.9.3.3, step 5-6. The TSCTSFS associates the new affected AF session(s) with the "Individual Time Synchronization Exposure Configuration" resource.
- If the time synchronization error budget is provided, updated, or removed, calculate the Uu time synchronization error budget as specified in clause 5.27.1.9 of 3GPP TS 23.501 [2] and send a request to the PCF for the UE for AM policy authorization by invoking Npcf_AMPolicyAuthorization_Update service operation as defined in clause 4.2.3 of 3GPP TS 29.534 [14] in order to update the Uu time synchronization error budget.

If the temporal validity condition was provided but it is removed during the update of time synchronization configuration, the TSCTSFS shall perform the time synchronization configuration as described above without considering the temporal validity condition.

If the temporal validity condition was not provided and the temporal validity condition is provided during the update of configuration, the TSCTSFS shall perform as follows:

- if the start-time is in the future, the TSCTSFS shall maintain the time synchronization configuration and then proceeds as described above when the start-time is reached; otherwise, if the start-time is in the past, the TSCTSFS shall proceed as described above immediately;
- When the stop-time is reached for active time synchronization service configuration, the TSCTSFS shall proceed as Ntsctsf_TimeSynchronization_ConfigDelete was received as described in clause 5.2.2.7.2 without interacting with the AF.

If the temporal validity condition was provided and the temporal validity condition is updated during the update of configuration, the TSCTSFS shall perform as follows:

- if the previously provided time configuration is being applied but the new start-time is in the future, the TSCTSFS shall proceed as Ntsctsf_TimeSynchronization_ConfigDelete was received as described in clause 5.2.2.7.2 without interacting with the AF firstly and then proceeds as described above when the new start-time is reached; otherwise if the time synchronization configuration has been created but the new start-time is in the past, the TSCTSFS keep the existing configuration;
- when the new stop-time is reached for active time synchronization service configuration, the TSCTSFS shall proceed as Ntsctsf_TimeSynchronization_ConfigDelete was received as described in clause 5.2.2.7.2 without interacting with the AF;
- if the previously provided time configuration is not being applied because the previously provided start-time is in the future, the TSCTSFS shall perform as the case that the temporal validity condition was not provided previously.

The TSCTSFS shall associate the affected AF session to the "Individual Time Synchronization Exposure Configuration". When receiving the Npcf_PolicyAuthorization_Notify service operation indicating the termination of an existing PDU session and the corresponding AF session is associated with the "Individual Time Synchronization Exposure Configuration" resource, the TSCTSFS shall remove the AF session from the list of AF sessions associated with the "Individual Time Synchronization Exposure Configuration" resource and invoke Npcf_AMPolicyAuthorization_Delete service operation as defined in clause 4.2.4 of 3GPP TS 29.534 [14] to remove the access stratum time distribution parameters for the UE if they were provided.

If the HTTP PUT request from the NF service consumer is not accepted, the TSCTSF shall indicate in the response to HTTP PUT request the cause for the rejection as specified in clause 6.1.7.

If the TSCTSF determines the received HTTP PUT request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.2.2.7 Ntsctsf_TimeSynchronization_ConfigDelete

5.2.2.7.1 General

This service operation is used by an NF service consumer to delete a time synchronization configuration.

The following procedures using the Ntsctsf_TimeSynchronization_ConfigDelete service operation are supported:

- Deleting an existing configuration.

5.2.2.7.2 Deleting an existing configuration

Figure 5.2.2.7.2-1 illustrates the deleting of an existing configuration.

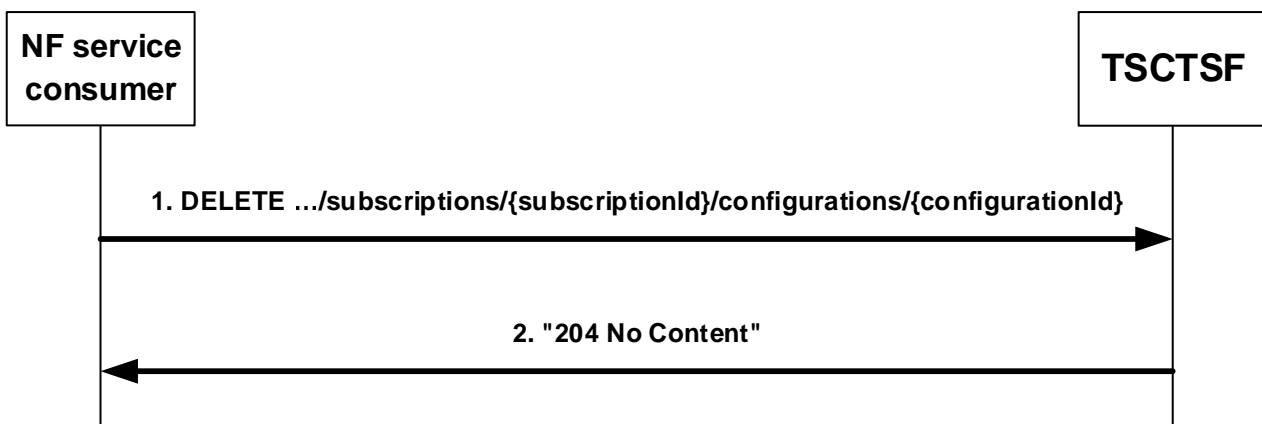


Figure 5.2.2.7.2-1: Deletion of a configuration

To delete a configuration, the NF service consumer shall send an HTTP DELETE request to the resource "{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}/configurations/{configurationId}" representing an existing "Individual Time Synchronization Exposure Configuration" resource, as shown in figure 5.2.2.7.2-1, step 1, to delete the configuration.

Upon the reception of an HTTP DELETE request and if the HTTP DELETE request is accepted by the TSCTSF, the TSCTSF shall:

- remove the corresponding configuration and respond with "204 No Content" as shown in figure 5.2.2.7.2-1, step 2;
- use the {configurationId} within the requested URI to identify the time synchronization service configuration and the corresponding AF sessions, and then interact with:
 - the PCF(s) for the PDU Session to disable the corresponding PTP instance(s) in the DS-TT(s) and NW-TT as defined in 3GPP TS 23.502 [3], clause 4.15.9.3.4, step 5-6.
 - the PCF(s) for the UE to remove the time synchronization error budget by invoking the Npcf_AMPolicyAuthorization_Delete service operation as defined in clause 4.2.4 of 3GPP TS 29.534 [14].

If the HTTP DELETE request from the NF service consumer is not accepted, the TSCTSF shall indicate in the response to HTTP DELETE request the cause for the rejection as specified in clause 6.1.7.

If the TSCTSF determines the received HTTP DELETE request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.2.2.8 Ntsctsf_TimeSynchronization_ConfigUpdateNotify

5.2.2.8.1 General

This service operation is used by an TSCTSF to notify the NF Service Consumer of the current state of the time synchronization configuration.

The following procedures using the Ntsctsf_TimeSynchronization_ConfigUpdateNotify service operation are supported:

- notification about the current state of the time synchronization configuration.

5.2.2.8.2 Notifying the current state of an existing configuration

Figure 5.2.2.8.2-1 illustrates the notification about the current state of the time synchronization configuration.

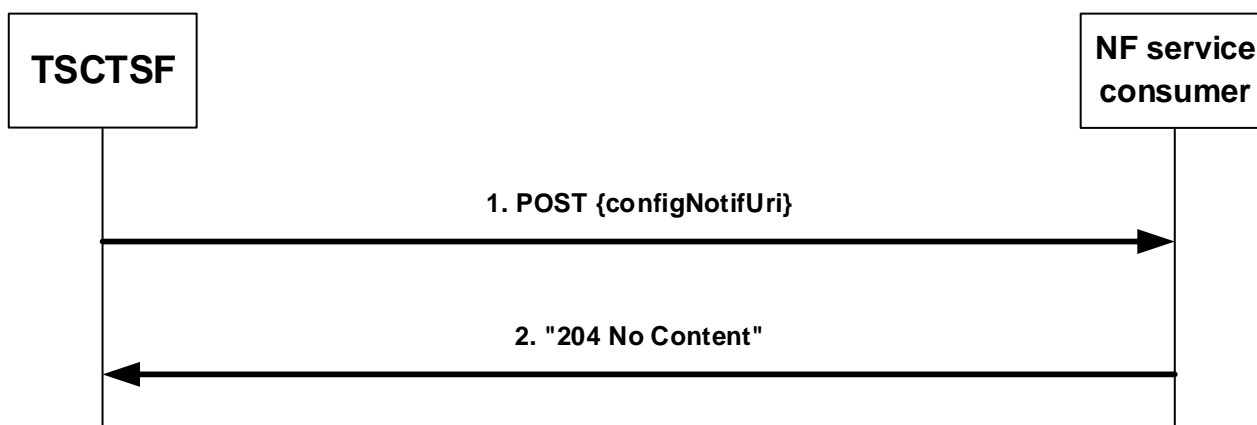


Figure 5.2.2.8.2-1: Notification about the current state of the time synchronization configuration

When the TSCTSF receives the notification of the change in the PTP instance for each DS-TT and/or NW-TT from the PCF as defined in clause 4.2.5.13 of 3GPP TS 29.514 [20], the TSCTSF shall determine the current state of the time synchronization configuration and sends an HTTP POST request with "{configNotifUri}", as previously provided by the NF service consumer within the corresponding configuration, as URI and the TimeSyncExposureConfigNotif data structure as request body, as shown in figure 5.2.2.8.2-1, step 1.

The TimeSyncExposureConfigNotif data structure as request body that shall include:

- Notification correlation ID provided by the NF service consumer during the configuration within the "configNotifId" attribute;
- current states of the time synchronization configuration for the DS-TT port(s) and/or NW-TT port within the "stateOfConfig" attribute.

If the HTTP POST request from the TSCTSF is not accepted, the NF service consumer shall indicate in the response to HTTP POST request the cause for the rejection as specified in clause 6.1.7.

If the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.3 Ntsctsf_TSCQoSandAssistance Service

5.3.1 Service Description

5.3.1.1 Overview

This service provides:

- Authorization of NF Service Consumer requests for the resource reservation for TSC.
- NF Service Consumer request to reserve or update resources for handling traffic characterized by TSC QoS parameters as described in clause 6.1.3.22 of TS 23.503 [19].

5.3.1.2 Network Functions

5.3.1.2.1 TSCTSF

The TSCTSF supports to:

- receive the request to reserve or update a specific QoS or a specific QoS with additional Alternative QoS for an AF session;
- receive the request to delete the AF session with requested QoS or the AF session with requested QoS including Alternative Service Requirements
- receive the request to subscribe or unsubscribe to the event(s) about the AF session with requested QoS or the AF session with requested QoS including Alternative Service Requirements;
- determine the requested PDB and construct the TSC Assistance Container; and
- Notify the NF service consumer of the event(s).

5.3.1.2.2 NF Service Consumers.

The NF service consumer supports to:

- send the request to reserve or update a specific QoS or a specific QoS with additional Alternative QoS for an AF session;
- send the request to delete the AF session with requested QoS or the AF session with requested QoS including Alternative Service Requirements
- send the request to subscribe or unsubscribe to the event(s); and
- receive the notification of the event(s).

5.3.2 Service Operations

5.3.2.1 Introduction

Service operations defined for the Ntsctsf_QoSandTSCAssistance service are shown in table 6.3.2.1-1.

Table 5.3.2.1-1: Ntsctsf_TimeSynchronization Service Operations

| Service Operation Name | Description | Initiated by |
|---|--|------------------------------------|
| Ntsctsf_QoSandTSCAssistance_Create | Allows the NF service consumer to request the network to provide a specific QoS or a specific QoS with additional Alternative QoS for an AF session. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_QoSandTSCAssistance_Update | Allows the NF service consumer to request the network to update the QoS or the QoS with additional Alternative QoS for an AF session | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_QoSandTSCAssistance_Delete | Allows the NF service consumer to request the network to delete the AF session with requested QoS or the AF session with requested QoS including Alternative Service Requirements. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_QoSandTSCAssistance_Notify | Allows the TSCTSF to report the QoS Flow level event(s) to the NF service consumer. | TSCTSF |
| Ntsctsf_QoSandTSCAssistance_Subscribe | Allows the NF service consumer to subscribe to the event(s). | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_QoSandTSCAssistance_Unsubscribe | Allows the NF service consumer to unsubscribe to the event(s). | NF service consumer (e.g. AF, NEF) |

NOTE: The NEF and the AF use the Ntsctsf_QoSandTSCAssistance service in the same way.

5.3.2.2 Ntsctsf_QoSandTSCAssistance_Create

5.3.2.2.1 General

This service operation is used by an NF service consumer to request the network to provide a specific QoS for an AF session.

The following procedures using the Ntsctsf_QoSandTSCAssistance_Create service operation are supported:

- Initial provisioning of TSC related service information.
- Subscriptions to Service Data Flow QoS notification control.
- Subscription to Service Data Flow Deactivation
- Subscription to resources allocation outcome
- Subscriptions to Service Data Flow QoS Monitoring Information.
- Initial provisioning of sponsored connectivity information.

5.3.2.2.2 Initial provisioning of TSC related service information

This procedure is used to set up a TSC AF application session context for the service as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [19].

Figure 5.3.2.2.2-1 illustrates the initial provisioning of TSC related service information.

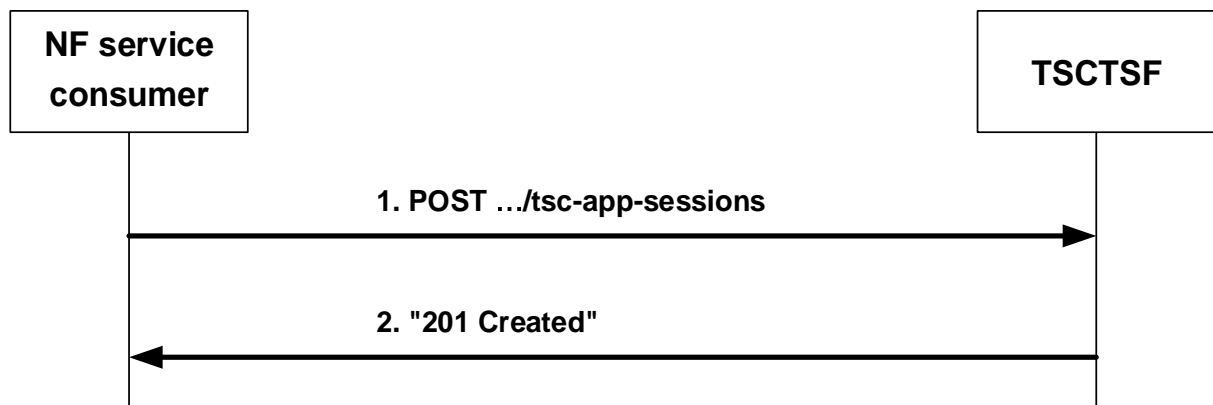


Figure 5.3.2.2.2-1: Initial provisioning of TSC related service information

When a new TSC AF application session context needs to be established, the NF service consumer shall invoke the `Ntsctsf_QoSandTSCAssistance_Create` service operation by sending the HTTP POST request to the resource URI representing the "TSC Application Sessions" collection resource of the TSCTSF, as shown in figure 5.3.2.2.2-1, step 1.

The NF service consumer shall include the "TscAppSessionContextData" data type in the payload body of the HTTP POST request in order to request the creation of the "Individual TSC Application Session Context" resource. The "Individual TSC Application Session Context" resource and the "Events Subscription" sub-resource are created as described below.

The NF service consumer shall include in the "TscAppSessionContextData" data structure:

- the AF identifier within the "afId" attribute;
- either the IP address (IPv4 or IPv6) of the PDU session within the "ueIpAddr" attribute for IP type PDU session or the MAC address of the DS-TT port within the "ueMac" attribute for Ethernet type PDU sessions;
- either the Application Id within the "appId" attribute or the flow information within:
 - a. for IP flows, the "flowInfo" attribute; or
 - b. for Ethernet flows, either the "ethFlowInfo" attribute or, if the Ethernet_UL/DL_Flows feature is supported, the "enEthFlowInfo" attribute;
- the QoS reference within the "qosReference" attribute or the individual QoS parameter set (i.e. requested GBR, requested MBR, requested maximum burst size, requested priority if received and requested 5GS delay if received) within the "tscQosReq" attribute;
- the input information to construct the TSC Assistance Container within the "tscaiInputUI" attribute and/or "tscaiInputDI" attribute of the "tscQosReq" attribute; and
- the URI where the TSCTSF can request to the NF service consumer to delete the "Individual TSC Application Session Context" resource within the "notifUri" attribute;

and may include:

- the DNN within the "dnn" attribute;
- the S-NSSAI within the "snssai" attribute;
- the domain identity in the "ipDomain" attribute;
- an ordered list of alternative QoS references within the "altQosReferences" attribute if the QoS reference is provided or an ordered list of requested alternative QoS parameters set(s) within the "altQosReqs" attribute if the individual QoS parameter set is provided; and
- the request of the notification of certain user plane events within the "evSubsc" attribute. Within the EventsSubscReqData data structure, the NF service consumer shall include:

- a) the URI where the TSCTSF sends the event notification to the NF service consumer within the "notifUri" attribute;
- b) a Notification Correlation Identifier for the requested notifications within the "notifCorreId" attribute;
- c) the subscribed events within the "events" attribute;
- d) the usage threshold within the "usgThres" attribute if the "USAGE_REPORT" event is subscribed; and
- e) QoS monitoring information within the "qosMon" attribute if the "QOS_MONITORING" event is subscribed.

Upon the reception of this HTTP POST request, the TSCTSF shall:

- construct the TSC Assistance Container based on information provided by the NF service consumer;
- if the Requested 5GS delay including the requested 5GS delay within the individual QoS parameter set or within the requested alternative QoS parameters set(s) is received from NF service consumer, calculate a Requested PDB by subtracting the UE-DS-TT residence time either provided by the PCF or pre-configured at TSCTSF from the Requested 5GS delay;
- if the time domain information is not received with the Burst Arrival Time or Periodicity within the "tscQosReq" attribute from the NF service consumer, the TSCTSF may indicate Time Domain = "5GS" within the "tscaiTimeDom" attribute within the "tscQosReq" attribute to indicate that the NF service consumer does not provide the time domain information;

NOTE 1: 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 and the provided TSCAI input information will be used without adjustments.

- interact with the PCF for the received UE address:
 - a) if the TSCTSF has an AF-session with the PCF for the received UE address, the TSCTSF shall interact with the PCF by triggering a Npcf_PolicyAuthorization_Update request to provision the related parameters to the PCF as defined in 3GPP TS 29.514 [20]; or
 - b) if the TSCTSF does not have an AF-Session with the PCF for the received UE address, the TSCTSF shall discover the PCF for the PDU session as specified in 3GPP TS 29.521 [23], and shall interact with the PCF by triggering a Npcf_PolicyAuthorization_Create to provision the related parameters to the PCF as defined in 3GPP TS 29.514 [20]; and

NOTE 2: If the PCF determines an existing PDU Session is related with TSC traffic (based on local configuration or SM Policy Association), the PCF invokes Npcf_PolicyAuthorization_Notify service operation to the TSCTSF as defined in clause 4.2.5.16 of 3GPP TS 29.514 [20] to send the received TSC User Plane Node information. At that time, the TSCTSF retrieves from the BSF the PCF binding information, as specified in 3GPP TS 29.521 [23], and can create the AF-session by sending to the PCF the Npcf_PolicyAuthorization_Create service operation, if TSC related information, as e.g. QoS requirements, and/or subscription to PMIC(s)/UMIC updates need to be provided to the PCF.

NOTE 3: After the TSCTSF retrieves from the BSF the PCF binding information (including the UE Identities for the notified PDU session), as specified in 3GPP TS 29.521 [23], the TSCTSF can store internally the received information and delay the Npcf_PolicyAuthorization_Create service operation (the creation of the AF-session). In this case, when the TSCTSF receives the QoS request, the TSCTSF interacts with the PCF by triggering a Npcf_PolicyAuthorization_Create request to provision the related parameters to the PCF as defined in 3GPP TS 29.514 [20].

- if receiving a successful response from the PCF, the TSCSTF shall create an "Individual TSC Application Session Context" resource and send to the NF service consumer a "201 Created" response to the HTTP POST request, as shown in figure 5.3.2.2.2-1, step 2. If the "evSubsc" attribute is received, the "Events Subscription" sub-resource shall be created within the "Individual TSC Application Session Context" resource. The TSCTSF shall include in the "201 Created" response:
 - a) a Location header field; and
 - b) a "TscAppSessionContextData" data type in the payload body.

The Location header field shall contain the URI of the created "Individual TSC Application Session Context" i.e. "{apiRoot}/ntsctsf-qos-tscai/v1/tsc-app-sessions/{appSessionId}".

When "Events Subscription" sub-resource is created in this procedure, the NF service consumer shall build the sub-resource URI by adding the path segment "/events-subscription" at the end of the URI path received in the Location header field.

If the TSCTSF cannot successfully fulfil the received HTTP POST request due to the internal TSCTSF error or due to the error in the HTTP POST request, the TSCTSF shall send the HTTP error response as specified in clause 6.2.7.

5.3.2.2.3 Subscriptions to Service Data Flow QoS notification control

The NF service consumer shall use the "EventsSubscReqData" data type as described in clause 5.3.2.2.2 and shall include in the HTTP POST request message an event within the "evSubsc" attribute with the "event" attribute set to "QOS_GUARANTEED" and an event within the "evSubsc" attribute with the "event" attribute set to "QOS_NOT_GUARANTEED".

The PCF shall reply to the NF service consumer as described in clause 5.3.2.2.2.

As result of this action, the TSCTSF shall set the appropriate subscription to QoS notification control as described in in 3GPP TS 29.514 [20].

5.3.2.2.4 Subscription to Service Data Flow Deactivation

The NF service consumer shall use the "EventsSubscReqData" data type as described in clause 5.3.2.2.2 and shall include in the HTTP POST request message an event entry within the "evSubsc" attribute with the "event" attribute set to "FAILED_RESOURCES_ALLOCATION".

The PCF shall reply to the NF service consumer as described in clause 5.3.2.2.2.

As result of this action, the PCF shall set the appropriate subscription to service data flow deactivation as described in in 3GPP TS 29.514 [20].

5.3.2.2.5 Subscription to resources allocation outcome

The NF service consumer shall use the "EventsSubscReqData" data type as described in clause 5.3.2.2.2 and shall include in the HTTP POST request message:

- if the NF service consumer requests the TSCTSF to provide a notification when the resources associated to the service information have been allocated, an event entry within the "events" attribute with the "event" attribute set to "SUCCESSFUL_RESOURCES_ALLOCATION"; and/or
- if the NF service consumer requests the TSCTSF to provide a notification when the resources associated to the service information cannot be allocated, an event entry within the "events" attribute with the "event" attribute set to "FAILED_RESOURCES_ALLOCATION".

The TSCTSF shall reply to the NF service consumer as described in clause 5.3.2.2.2.

As result of this action, the TSCTSF shall set the appropriate subscription to notification of resources allocation outcome as described in in 3GPP TS 29.514 [20].

5.3.2.2.6 Subscriptions to Service Data Flow QoS Monitoring Information

The NF service consumer shall use the "EventsSubscReqData" data type as described in clause 5.3.2.2.2 and shall include in the HTTP POST request message an event within the "evSubsc" attribute with the "event" attribute set to "QOS_MONITORING" and include the QoS monitoring information with the "qosMon" attribute. Within the QosMonitoringInformation data structure, the AF shall include:

- one or more requested QoS Monitoring Parameter(s) within the "reqQosMonParams"; and
- one or more report frequency within the "repFreqs" attribute; and
- when the "repFreqs" attribute includes the value "PERIODIC", the reporting period within the "repPeriod" attribute; and

- when the "repFreqs" attribute includes the value "EVENT_TRIGGERED", the AF shall include:
 - the delay threshold for downlink with the "repThreshDI" attribute;
 - the delay threshold for uplink with the "repThreshUI" attribute; and/or
 - the delay threshold for round trip with the "repThreshRp" attribute; and
 - the minimum waiting time between subsequent reports within the "waitTime" attribute.

The PCF shall reply to the NF service consumer as described in clause 5.3.2.2.2.

As result of this action, the TSCTSF shall set the appropriate subscription to service data flow QoS monitoring information as described in in 3GPP TS 29.514 [20].

5.3.2.2.7 Initial provisioning of sponsored connectivity information

The NF service consumer may include in the HTTP POST request message described in clause 5.3.2.2.2 an application service provider identity and a sponsor identity within the "aspId" attribute and "sponId" attribute. Additionally, the NF service consumer may provide an indication to the TSCTSF of sponsored data connectivity not enabled by including the "sponStatus" attribute set to "SPONSOR_DISABLED".

To support the usage monitoring of sponsored data connectivity, the NF service consumer may subscribe with the TSCTSF to the notification of usage threshold reached. The NF service consumer may also include the "evSubsc" attribute with:

- the usage thresholds to apply in the "usgThres" attribute; and
- an entry of the "events" attribute set to "USAGE_REPORT".

The PCF shall reply to the NF service consumer as described in clause 5.3.2.2.2.

As result of this action, the TSCTSF shall provision the sponsored data connectivity information to the PCF as described in in 3GPP TS 29.514 [20].

5.3.2.3 Ntsctsf_QoSandTSCAssistance_Update

5.3.2.3.1 General

This service operation is used by an NF service consumer to request the network to update the QoS and/or additional Alternative QoS for an AF session.

The following procedures using the Ntsctsf_QoSandTSCAssistance_Update service operation are supported:

- Modification of TSC related service information.
- Modification of Subscription to Service Data Flow QoS notification control.
- Modification of Subscription to Service Data Flow Deactivation.
- Modification of subscription to resources allocation outcome.
- Modification of Subscription to Service Data Flow QoS Monitoring Information.
- Modification of sponsored connectivity information.

5.3.2.3.2 Modification of TSC related service information

This procedure is used to modify an existing TSC application session context as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [19].

Figure 5.3.2.3.2-1 illustrates the modification of TSC related service information using HTTP PATCH method.

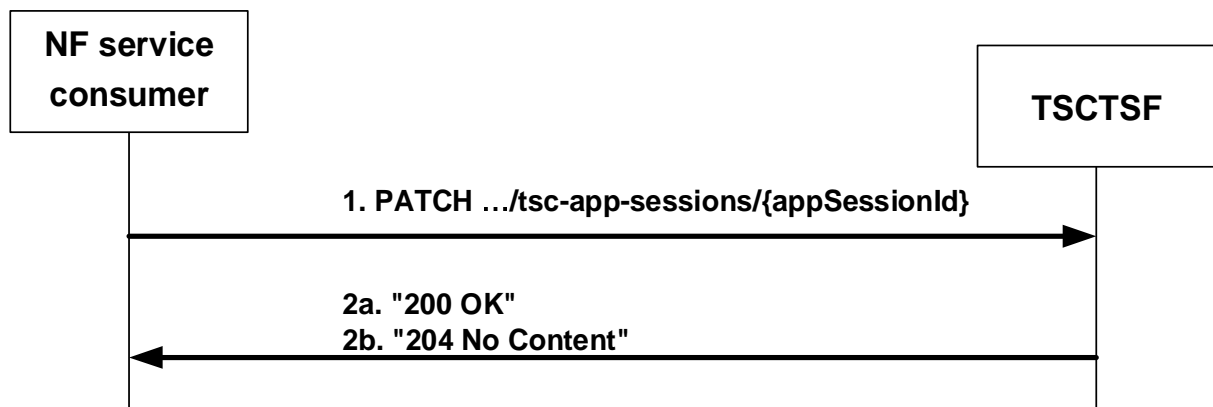


Figure 5.3.2.3.2-1: Modification of TSC related service information using HTTP PATCH

The NF service consumer may modify the TSC application session context information at any time and invoke the `Ntsctsf_QoSandTSCAssistance_Update` service operation by sending the HTTP PATCH request message to the resource URI representing the "Individual TSC Application Session Context" resource, as shown in figure 5.3.2.3.2-1, step 1, with the modifications to apply.

The JSON body within the PATCH request shall include the "TscAppSessionContextUpdateData" data type and shall be encoded according to "JSON Merge Patch", as defined in IETF RFC 7396 [22].

The NF service consumer may include in the "TscAppSessionContextUpdateData" data structure:

- the updated flow information within the "flowInfo" attribute for IP flows or, either the "ethFlowInfo" or, if the Ethernet_UL/DL_Flows feature is supported, the "enEthFlowInfo" attribute for Ethernet flows;
- the updated application Id within the "appId" attribute;
- the updated QoS reference within the "qosReference" attribute or the updated individual QoS parameter set within the "tscQosReq" attribute;
- the updated input information to construct the TSC Assistance Container within the "tscaiInputUI" attribute and/or "tscaiInputDI" attribute of the "tscQosReq" attribute;
- the updated URI where the TSCTSF can request to the NF service consumer to delete the "Individual TSC Application Session Context" resource within the "notifUri".
- the updated ordered list of alternative QoS references within the "altQosReferences" attribute or updated ordered list of requested alternative QoS parameters set(s) within the "altQosReqs" attribute; and
- the updated event subscription information within the "evSubsc" attribute. Within the EventsSubscReqDataRm data structure, the NF service consumer shall include:
 - the new complete list of subscribed events within the "events" attribute;
 - when the NF service consumer requests to update the additional information related to an event (e.g. the NF service consumer needs to provide new thresholds to the TSCTSF in the "usgThres" attribute related to the "USAGE_REPORT" event), the additional information within the corresponding attribute(s).

NOTE 1: Note that when the NF service consumer requests to remove an event, this event is not included in the "events" attribute.

NOTE 2: When an event is included in the "events" attribute and its related additional information is set to null, the PCF considers the subscription to this event is active, but the related procedures stop applying.

NOTE 3: When an event is removed from the "events" attribute but its related information is not set to null, the PCF considers the subscription to this event is terminated, the related additional information is removed, and the related procedures stop applying.

The NF service consumer shall remove existing event subscription information by setting to null the "evSubsc" attribute included in "TscAppSessionContextUpdateData".

NOTE 4: The "notifUri" attribute within the EventsSubscReqData data structure can be modified to request that subsequent notifications are sent to a new NF service consumer.

Upon the reception of this HTTP PATCH request, the TSCTSF shall

- if the updated Requested 5GS delay including the requested 5GS delay within the individual QoS parameter set or within the requested alternative QoS parameters set(s) is received from NF service consumer, re-calculate a Requested PDB by subtracting the UE-DS-TT residence time provided by the PCF or pre-configured in the TSCTSF from the Requested 5GS delay;
- update the TSC Assistance Container based on updated information provided by the NF service consumer;
- if the time domain information is not received with the Burst Arrival Time or Periodicity within the "tscQosReq" attribute from the NF service consumer, the TSCTSF may indicate Time Domain = "5GS" within the "tscaiTimeDom" attribute within the "tscQosReq" attribute to indicate that the NF service consumer does not provide the time domain information;

NOTE 5: 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 and the provided TSCAI input information will be used without adjustments.

- interact with the PCF by triggering a Npcf_PolicyAuthorization_Update request to provision the related parameters to the PCF as defined in 3GPP TS 29.514 [20];
- if receiving a successful response from the PCF, the TSCTSF shall update the "Individual TSC Application Session Context" resource and send a "200 OK" or "204 No Content" response to the HTTP POST request to the NF service consumer, as shown in figure 5.3.2.3.2-1, step 2.

If the TSCTSF cannot successfully fulfil the received HTTP PATCH request due to the internal TSCTSF error or due to the error in the HTTP PATCH request, the TSCTSF shall send the HTTP error response as specified in clause 6.2.7.

If the TSCTSF determines the received HTTP PATCH request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.3.2.3.3 Modification of Subscription to Service Data Flow QoS notification control

The NF service consumer shall use the HTTP PATCH method to update the "Events Subscription" sub-resource together with the modifications to the "Individual TSC Application Sessions" resource.

The NF service consumer shall include in the HTTP PATCH request message described in clause 5.3.2.3.2, the updated event subscription information within the "evSubsc" attribute. Within the EventsSubscReqDataRm data type, the NF service consumer shall include the "events" attribute with the "QOS_GUARANTEED" and "QOS_NOT_GUARANTEED" values to indicate the subscription to QoS notification control or include the "events" but without the "QOS_GUARANTEED" and "QOS_NOT_GUARANTEED" values to indicate the termination of the subscription to QoS notification control.

As result of this action, the TSCTSF shall set the appropriate subscription to QoS notification control as described in 3GPP TS 29.514 [20].

The PCF shall reply to the NF service consumer as described in clause 5.3.2.3.2.

5.3.2.3.4 Modification of Subscription to Service Data Flow Deactivation

The NF service consumer shall use the HTTP PATCH method to update the "Events Subscription" sub-resource together with the modifications to the "Individual TSC Application Sessions" resource.

The NF service consumer shall include in the HTTP PATCH request message described in clause 5.3.2.3.2, the updated event subscription information within the "evSubsc" attribute. Within the EventsSubscReqDataRm data type, the NF service consumer shall include the "events" attribute with the "FAILED_RESOURCES_ALLOCATION" values to the subscription to service data flow deactivation or include the "events" but without

"FAILED_RESOURCES_ALLOCATION" value to indicate the termination of the subscription to Service Data Flow Deactivation.

As result of this action, the TSCTSF shall set the appropriate subscription to QoS notification control as described in 3GPP TS 29.514 [20].

The PCF shall reply to the NF service consumer as described in clause 5.3.2.3.2.

5.3.2.3.5 Modification of subscription to resources allocation outcome

The NF service consumer shall use the HTTP PATCH method to modify the "Events Subscription" sub-resource together with the modifications to the "Individual TSC Application Sessions" resource.

The NF service consumer shall include in the HTTP PATCH request message described in clause 5.3.2.3.2, the updated event subscription information within the "evSubsc" attribute. Within the EventsSubscReqDataRm data type, the NF service consumer shall include the "events" attribute with the "SUCCESSFUL_RESOURCES_ALLOCATION" value for the successful resource allocation and/or "FAILED_RESOURCES_ALLOCATION" value for the unsuccessful resource allocation to the subscription to resources allocation outcome or include the "events" but without "SUCCESSFUL_RESOURCES_ALLOCATION" and/or "FAILED_RESOURCES_ALLOCATION" value to indicate the termination of the subscription to resources allocation outcome.

As result of this action, the TSCTSF shall set the appropriate subscription to resources allocation outcome as described in 3GPP TS 29.514 [20].

The TSCTSF shall reply to the NF service consumer as described in clause 5.3.2.3.2.

5.3.2.3.6 Modification of Subscription to Service Data Flow QoS Monitoring Information

The NF service consumer shall use the HTTP PATCH method to update the "Events Subscription" sub-resource together with the modifications to the "Individual TSC Application Sessions" resource.

The NF service consumer shall include in the HTTP PATCH request message described in clause 5.3.2.3.2, the updated event subscription information within the "evSubsc" attribute. Within the EventsSubscReqDataRm data type, the NF service consumer shall perform as follows:

- to create a subscription to QoS monitoring information:
 - a) include the "events" attribute with the "QOS_MONITORING" value; and
 - b) include the updated QoS monitoring information within the "qosMon" attribute as defined in clause 5.3.2.2.6;
- to remove a subscription to QoS monitoring information:
 - a) include the "events" attribute without "QOS_MONITORING".

As result of this action, the TSCTSF shall set the appropriate subscription to Service Data Flow QoS Monitoring Information as described in 3GPP TS 29.514 [20].

The PCF shall reply to the NF service consumer as described in clause 5.3.2.3.2.

5.3.2.3.3 Modification of sponsored connectivity information

The NF service consumer shall use the HTTP PATCH method to modify the sponsored connectivity information.

The NF service consumer shall include in the HTTP PATCH request message described in clause 5.3.2.3.2, an application service provider identity and a sponsor identity within the "aspId" attribute and "sponId" attribute, and optionally an indication of whether to enable or disable sponsored data connectivity within the "sponStatus" attribute set to the applicable value to provide sponsored connectivity information or to update existing sponsored connectivity information.

If the NF service consumer requests to enable sponsored data connectivity the NF service consumer shall change the "sponStatus" attribute value to "SPONSOR_ENABLED".

If the NF service consumer requests to disable sponsored data connectivity the NF service consumer shall provide an indication to disable sponsored data connectivity to the TSCTSF by setting the "sponStatus" attribute to "SPONSOR_DISABLED".

To support the usage monitoring of sponsored data connectivity, the NF service consumer may also include in the HTTP PATCH a new or modified "evSubsc" attribute with:

- the usage thresholds to apply in the "usgThres" attribute; and
- an entry of the "events" attribute set to "USAGE_REPORT".

The PCF shall reply to the NF service consumer as described in clause 5.3.2.3.2.

As result of this action, the TSCTSF shall provision the updated sponsored data connectivity information to the PCF as described in in 3GPP TS 29.514 [20].

5.3.2.4 Ntsctsf_QoSandTSCAssistance_Delete

5.3.2.4.1 General

This service operation is used by an NF service consumer to request the network to delete the AF session with requested QoS or the AF session with requested QoS including Alternative Service Requirements.

The following procedures using the Ntsctsf_QoSandTSCAssistance_Delete service operation are supported:

- TSC AF application session context termination.
- Reporting usage for sponsored data connectivity

5.3.2.4.2 TSC AF application session context termination

This procedure is used to terminate an AF application session context for the service as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [19].

Figure 5.3.2.4.2-1 illustrates the application session context termination.

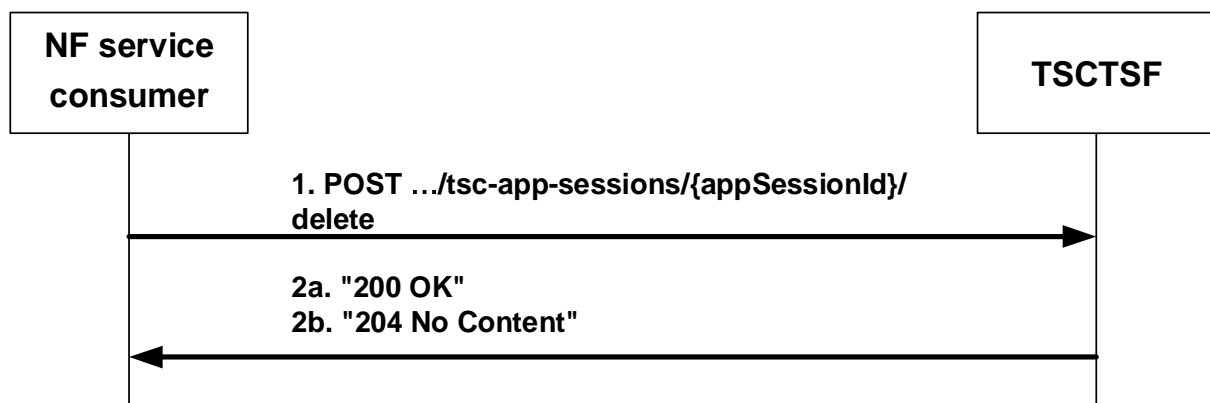


Figure 5.3.2.4.2-1: Application session context termination

When a TSC AF session is terminated, and if the TSC AF application session context was created as described in clause 5.3.2.2, the NF service consumer shall invoke the Ntsctsf_QoSandTSCAssistance_Delete service operation to the TSCTSF using an HTTP POST request, as shown in figure 5.3.2.4.2-1, step 1.

The NF service consumer shall set the request URI to "{apiRoot}/ntsctsf-qos-tscai/v1/tsc-app-sessions/{appSessionId}/delete".

The NF service consumer may include in the body of the HTTP POST the "EventsSubscReqData" data type with the "evSubsc" attribute indicating the corresponding list of events to subscribe to.

When the TSCTSF receives the HTTP POST request from the NF service consumer, indicating the termination of the TSC AF application session context information, the TSCTSF shall acknowledge that request by sending an HTTP response message with the corresponding status code.

If the HTTP POST request from the NF service consumer is accepted, the TSCTSF shall send to the NF service consumer:

- a) if event information is reported, TSCTSF shall defer sending the response to the NF service consumer and shall immediately interact with the PCF to terminate the AF session with the event report, as specified in 3GPP TS 29.514 [20]. After receiving the event information from the PCF, the TSCTSF shall send a "200 OK" response to HTTP POST request, as shown in figure 5.3.2.4.2-1, step 2a, including in the "EventsNotification" to report to the NF service consumer;
- b) otherwise, the TSCTSF shall send to the NF service consumer a "204 No Content".

If the TSCTSF cannot successfully fulfil the received HTTP POST request due to the internal TSCTSF error or due to the error in the HTTP POST request, the TSCTSF shall send the HTTP error response as specified in clause 6.2.7.

If the TSCTSF determines the received HTTP POST request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.3.2.4.3 Reporting usage for sponsored data connectivity

When The NF service consumer indicated to enable sponsored data connectivity and the NF service consumer provided usage thresholds for such sponsor to the TSCTSF, the TSCTSF shall report accumulated usage to the NF service consumer using the response of the Ntsctsf_QoSandTSCAssistance_Delete service operation.

This procedure is initiated when:

- the "Individual TSC Application Session" is deleted by the NF service consumer; or
- the TSCTSF requests the deletion of the "Individual TSC Application Session" to the NF service consumer, as described in clause 5.2.2.5.3, due to PDU session termination, the termination of all the service data flows of the Individual TSC Application Session.

To report the accumulated usage, the TSCTSF shall immediately configure the PCF to retrieve the accumulated usage as specified in 3GPP TS 29.514 [20]. When the TSCTSF receives the usage information from the PCF, the TSCTSF shall notify the NF service consumer by including the "EventsNotification" data type in the response of the HTTP POST request as described in clause 5.3.2.4.2.

The TSCTSF shall within an instance of "events" attribute include:

- "USAGE_REPORT" within the "event" attribute;
- accumulated usage within the "usgRep" attribute.

5.3.2.5 Ntsctsf_QoSandTSCAssistance_Notify

5.3.2.5.1 General

The Ntsctsf_QoSandTSCAssistance_Notify service operation enables notification to NF service consumers that the previously subscribed event for the existing TSC application session context occurred or that the TSC application session context is no longer valid.

The following procedures using the Ntsctsf_QoSandTSCAssistance_Notify service operation are supported:

- Notification about TSC application session context event.
- Notification about TSC application session context termination.
- Notification about Service Data Flow QoS notification control.
- Notification about Service Data Flow Deactivation
- Notification about resources allocation outcome.

- Notification about Service Data Flow QoS Monitoring control.
- Reporting usage for sponsored data connectivity.

5.3.2.5.2 Notification about TSC application session context event

This procedure is invoked by the TSCTSF to notify the NF service consumer when a certain, previously subscribed, application session context event occurs, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [19].

Figure 5.3.2.5.2-1 illustrates the notification about TSC application session context event.

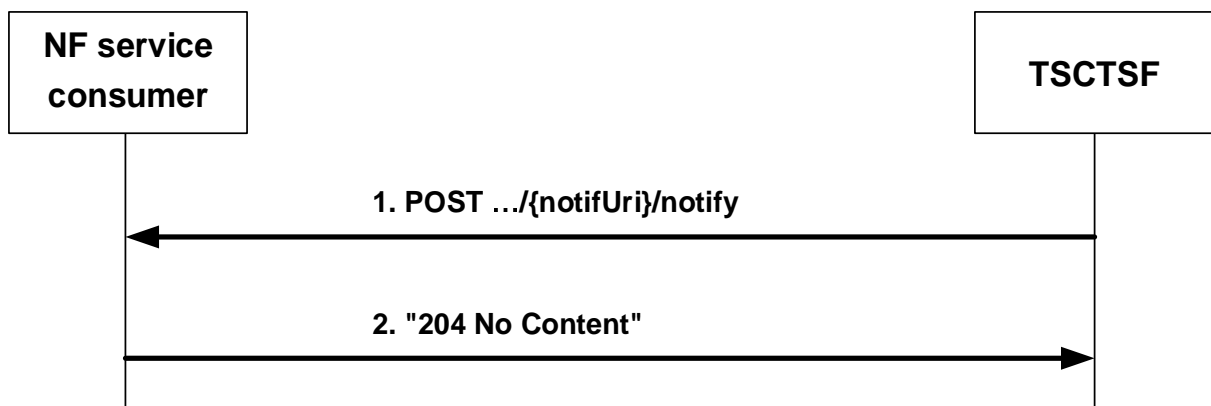


Figure 5.3.2.5.2-1: Notification about application session context event

When the TSCTSF determines that the event for the existing TSC AF application session context, to which the NF service consumer has subscribed to, occurred e.g. upon reception of an event notification for a PDU session from the PCF as described in 3GPP TS 29.514 [20], the TSCTSF shall invoke the `Ntsctsf_QoSandTSCAssistance_Notify` service operation by sending the HTTP POST request (as shown in figure 5.3.2.5.2-1, step 1) to the NF service consumer using the notification URI received in the subscription creation (or modification), as specified in clause 5.3.2.2.2, 5.3.2.3.2, and 5.3.2.6, and appending the "notify" segment path at the end of the URI. The TSCTSF shall provide in the body of the HTTP POST request the "EventsNotification" data type including:

- the notification correlation Id within the "notifCorrelId"; and
- the list of the reported events in the "events" attribute.

The NF service consumer notification of other specific events using the `Ntsctsf_QoSandTSCAssistance_Notify` request is described in the related clauses.

Upon the reception of the HTTP POST request from the TSCTSF indicating that the PDU session and/or service related event occurred, the NF service consumer shall acknowledge that request by sending an HTTP response message with the corresponding status code.

If the HTTP POST request from the TSCTSF is accepted, the NF service consumer shall acknowledge the receipt of the event notification with a "204 No Content" response to HTTP POST request, as shown in figure 5.3.2.5.2-1, step 2.

If the HTTP POST request from the TSCTSF is not accepted, the NF service consumer shall indicate in the response to HTTP POST request the cause for the rejection as specified in clause 6.2.7.

If the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [5].

5.2.2.5.3 Notification about TSC application session context termination

This procedure is invoked by the TSCTSF to notify the NF service consumer that the TSC application session context is no longer valid, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [19].

Figure 5.2.2.5.3-1 illustrates the notification about application session context termination.

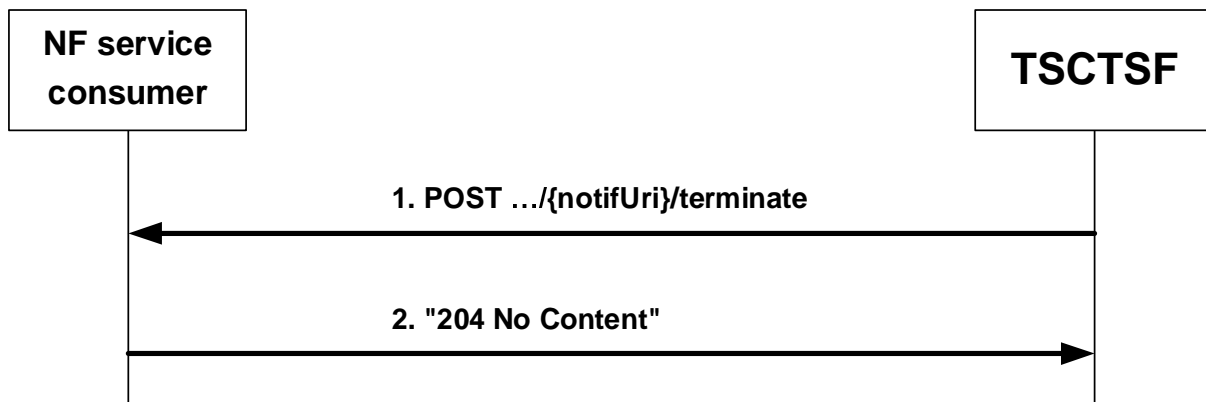


Figure 5.2.2.5.3-1: Notification about TSC application session context termination

When the TSCTSF determines that the TSC application session context is no longer valid, the TSCTSF shall invoke the `Ntsctsf_QoSandTSCAssistance_Notify` service operation by sending the HTTP POST request (as shown in figure 5.2.2.5.3-1, step 1) using the notification URI received in the "Individual TSC Application Session Context" context creation, as specified in clause 5.3.2.2, and appending the "terminate" segment path at the end of the URI, to trigger the NF service consumer to request the TSC application session context termination (see clause 5.3.2.4.2). The TSCTSF shall provide in the body of the HTTP POST request the "TerminationInfo" data type including:

- the Individual TSC Application Session Context resource identifier related to the termination notification in the "resUri" attribute; and
- the TSC application session context termination cause in the "termCause" attribute.

Upon the reception of the HTTP POST request from the TSCTSF requesting the TSC application session context termination, the NF service consumer shall acknowledge that request by sending an HTTP response message with the corresponding status code.

If the HTTP POST request from the TSCTSF is accepted, the NF service consumer shall acknowledge the receipt of the TSC application session context termination request with a "204 No Content" response to HTTP POST request (as shown in figure 5.2.2.5.3-1, step 2) and shall invoke the `Ntsctsf_QoSandTSCAssistance_Delete` service operation to the TSCTSF as described in clause 5.3.2.4.

If the HTTP POST request from the TSCTSF is not accepted, the NF service consumer shall indicate in the response to HTTP POST request the cause for the rejection as specified in clause 6.2.7.

If the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [5].

5.3.2.5.4 Notification about Service Data Flow QoS notification control

When the TSCTSF receives the notification about Service Data Flow QoS notification control from the PCF as described in 3GPP TS 29.514 [20], the TSCTSF shall inform the NF service consumer accordingly if the NF service consumer has previously subscribed as described in clauses 5.3.2.2.3 and 5.3.2.3.3.

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 clause 5.3.2.5.2.

The TSCTSF shall within an instance of "events" attribute include:

- "QOS_GUARANTEED" or "QOS_NOT_GUARANTEED" within the "event" attribute;

- the identification of the affected service flows (if not all the flows are affected) encoded in the "flowIds" attribute if applicable; and
- the reference to the Alternative Service Requirement corresponding alternative QoS parameter set if received from the PCF within the "appliedQosRef" attribute. When the "appliedQosRef" attribute is omitted and the "event" attribute is NOT_GUARANTEED, it indicates that the lowest priority alternative QoS profile could not be fulfilled.

5.3.2.5.5 Notification about Service Data Flow Deactivation

When the TSCTSF receives the notification about service data flow deactivation from the PCF as described in 3GPP TS 29.514 [20], the TSCTSF shall inform the NF service consumer accordingly if the NF service consumer has previously subscribed as described in clauses 5.3.2.2.4 and 5.3.2.3.4.

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 clause 5.3.2.5.2.

The TSCTSF shall within an instance of "events" attribute include:

- "FAILED_RESOURCES_ALLOCATION" within the "event" attribute;
- the identification of the affected service flows (if not all the flows are affected) encoded in the "flowIds" attribute if applicable.

5.3.2.5.6 Notification about resources allocation outcome

When the TSCTSF receives the notification about resources allocation outcome from the PCF as described in 3GPP TS 29.514 [20], the TSCTSF shall inform the NF service consumer accordingly if the NF service consumer has previously subscribed as described in clauses 5.3.2.2.5 and 5.3.2.3.5.

The TSCTSF shall notify the NF service consumer by including the "EventsNotification" data type in the body of the HTTP POST request as described in clause 5.3.2.5.2.

The TSCTSF shall within an instance of "events" attribute include:

- "SUCCESSFUL_RESOURCES_ALLOCATION" within the "event" attribute if the "SUCCESSFUL_RESOURCES_ALLOCATION" event is received from the PCF or "FAILED_RESOURCES_ALLOCATION" within the "event" attribute if the "FAILED_RESOURCES_ALLOCATION" event is received from the PCF;
- the identification of the affected service flows (if not all the flows are affected) encoded in the "flowIds" attribute if applicable.
- the reference to the Alternative Service Requirement corresponding alternative QoS parameter set if received from the PCF within the "appliedQosRef" attribute.

5.3.2.5.7 Notification about Service Data Flow QoS Monitoring control

When the TSCTSF receives the notification about Service Data Flow QoS Monitoring control from the PCF as described in 3GPP TS 29.514 [20], the TSCTSF shall inform the NF service consumer accordingly if the NF service consumer has previously subscribed as described in clauses 5.3.2.2.6 and 5.3.2.3.6.

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 clause 5.3.2.5.2.

The TSCTSF shall within an instance of "events" attribute include:

- "QOS_MONITORING" within the "event" attribute;
- the identification of the affected service flows (if not all the flows are affected) encoded in the "flowIds" attribute if applicable; and
- the "qosMonReports" array with:
 - a) one or two uplink packet delays within the "ulDelays" attribute;

- c) one or two downlink packet delays within the "dlDelays" attribute; and/or
- d) one or two round trip packet delays within the "rtDelays" attribute.

5.3.2.5.8 Reporting usage for sponsored data connectivity

When the NF service consumer enabled sponsored data connectivity and the NF service consumer provided usage thresholds for such sponsor to the TSCTSF, the TSCTSF shall report accumulated usage to the NF service consumer using the Npcf_PolicyAuthorization_Notify service operation when:

- the TSCTSF detects that the usage threshold provided by the NF service consumer has been reached; or
- the NF service consumer disables the sponsored data connectivity.

The TSCTSF shall notify the NF service consumer of the accumulated usage by including the "EventsNotification" data type in the body of the HTTP POST request as described in clause 5.3.2.5.2.

The TSCTSF shall within an instance of "events" attribute include:

- "USAGE_REPORT" within the "event" attribute;
- accumulated usage within the "usgRep" attribute.

When the NF service consumer receives the HTTP POST request, it shall acknowledge the request by sending a "204 No Content" response to the TSCTSF. The NF service consumer may terminate the Individual Application Session Context sending an HTTP POST as described in clause 5.3.2.4.2 or update the Individual Application Session Context information by providing a new usage threshold sending an HTTP PATCH request to the TSCTSF as described in clause 5.3.2.3.2 or an HTTP PUT request to the TSCTSF as described in clause 5.3.2.6.2.

5.3.2.6 Ntsctsf_QoSandTSCAssistance_Subscribe

5.3.2.6.1 General

The Ntsctsf_QoSandTSCAssistance_Subscribe service operation enables NF service consumers handling of subscription to events for the existing TSC application session context. Subscription to events shall be created:

- within the application session context establishment procedure by invoking the Ntsctsf_QoSandTSCAssistance_Subscribe service operation, as described in clause 5.3.2.2; or
- within the TSC application session context modification procedure by invoking the Ntsctsf_QoSandTSCAssistance_Subscribe service operation, as described in clause 5.3.2.3; or
- by invoking the Ntsctsf_QoSandTSCAssistance_Subscribe service operation for the existing TSC application session context, as described in clause 5.3.2.6.2.

The following procedures using the Ntsctsf_QoSandTSCAssistance_Subscribe service operation is supported:

- Handling of subscription to events for the existing TSC application session context.
- Subscription to Service Data Flow QoS Monitoring Information.
- Subscription to Usage Monitoring of Sponsored Data Connectivity.

5.3.2.6.2 Handling of subscription to events for the existing TSC application session context

This procedure is used to create a subscription to events for the existing TSC AF application session context bound to the corresponding PDU session or to modify an existing subscription, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [19].

Figure 5.3.2.6.2-1 illustrates the creation of events subscription information using HTTP PUT method.

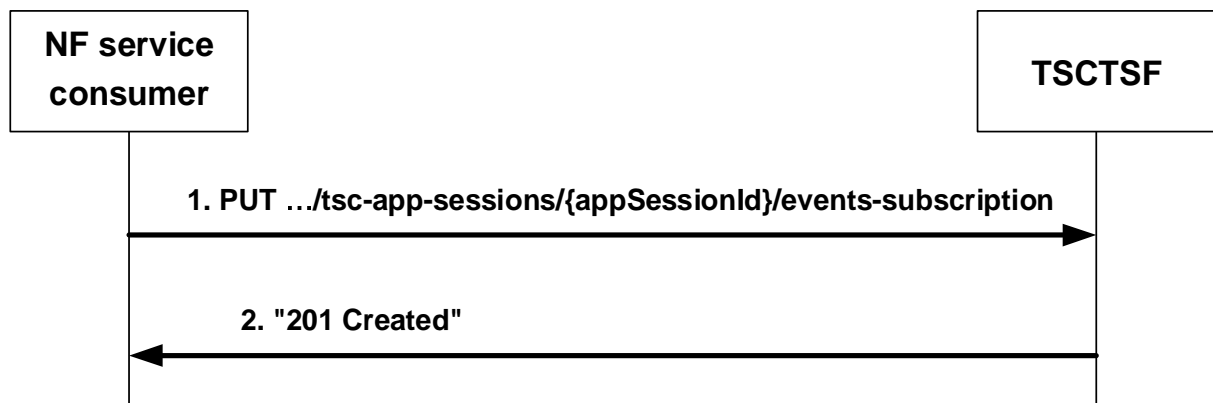


Figure 5.3.2.6.2-1: Creation of events subscription information using HTTP PUT

Figure 5.3.2.6.2-2 illustrates the modification of events subscription information using HTTP PUT method.

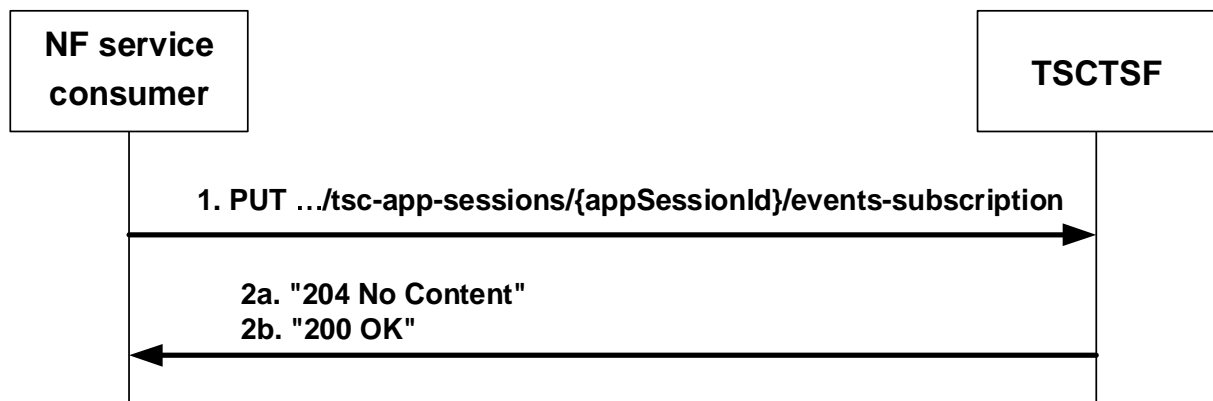


Figure 5.3.2.6.2-2: Modification of events subscription information using HTTP PUT

When the NF service consumer decides to create a subscription to one or more events for the existing TSC application session context or to modify an existing subscription previously created by itself at the TSCTSF, the NF service consumer shall invoke the `Ntsctsf_QoSandTSCAssistance_Subscribe` service operation by sending the HTTP PUT request to the resource URI representing the "Events Subscription" sub-resource in the TSCTSF, as shown in figure 5.3.2.6.2-1, step 1 and figure 5.3.2.6.2-2, step 1. The NF service consumer shall provide in the "EventsSubscReqData" data type of the body of the HTTP PUT request:

- the "events" attribute with the list of events to be subscribed;
- the "notifUri" attribute that includes the Notification URI to indicate to the TSCTSF where to send the notification of the subscribed events;
- the notification correlation Id within the "notifCorreId" attribute; and
- the specific event information related to the subscribed event, e.g. QoS monitoring information within the "qosMon" attribute if the "QOS_MONITORING" event is subscribed.

NOTE: The "notifUri" attribute within the EventsSubscReqData data structure can be modified to request that subsequent notifications are sent to a new NF service consumer.

Upon the reception of the HTTP PUT request from the NF service consumer, the TSCTSF shall decide whether the received HTTP PUT request is accepted.

If the TSCTSF accepted the HTTP PUT request to create a subscription to events, the TSCTSF shall create the "Events Subscription" sub-resource and shall send the HTTP response message to the NF service consumer as shown in figure 5.3.2.6.2-1, step 2. The TSCTSF shall include in the "201 Created" response:

- a Location header field that shall contain the URI of the created "Events Subscription" sub-resource i.e. "{apiRoot}/ntsctsf-qos-tscai/v1/tsc-app-sessions/{appSessionId}/events-subscription"; and
- a response body with the "EventsSubscReqData" data type representing the created "Events Subscription" sub-resource.

If the TSCTSF accepted the HTTP PUT request to modify the events subscription, the TSCTSF shall modify the "Events Subscription" sub-resource and shall send to the NF service consumer:

- the HTTP "204 No Content" response (as shown in figure 5.3.2.6.2-2, step 2a); or
- the HTTP "200 OK" response (as shown in figure 5.3.2.6.2-2, step 2b) including in the "EventsSubscReqData" data type the updated representation of the "Events Subscription" sub-resource.

If the HTTP POST request from the NF service consumer is not accepted, the TSCTSF shall indicate in the response to HTTP POST request the cause for the rejection as specified in clause 6.2.7.

If the TSCTSF determines the received HTTP POST request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.3.2.6.3 Subscription to Service Data Flow QoS Monitoring Information

This procedure is used by NF service consumer to subscribe and/or modify the subscription for notification about service data flow QoS monitoring information.

The NF service consumer shall include in the HTTP PUT request message the "EventsSubscReqData" data type, which shall contain:

- to create a subscription to QoS monitoring information:
 - the "events" attribute with an entry containing the value "QOS_MONITORING" to create a subscription to notification about service data flow QoS monitoring information;
 - include the updated QoS monitoring information within the "qosMon" attribute as defined in clause 5.3.2.2.6
- to remove a subscription to QoS monitoring information:
 - the "events" attribute containing an array that omits the values "QOS_MONITORING".

The NF service consumer shall include other events related information as described in clause 5.3.2.6.1.

As result of this action, the TSCTSF shall set the appropriate subscription to service data flow QoS monitoring information as described in in 3GPP TS 29.514 [20].

The TSCTSF shall reply to the NF service consumer as described in clause 5.3.2.6.1.

5.3.2.6.4 Subscription to Usage Monitoring of Sponsored Data Connectivity

This procedure is used by NF service consumer to subscribe and/or modify the subscription for notification about usage monitoring of sponsored data connectivity.

The NF service consumer shall include in the HTTP PUT request message the "EventsSubscReqData" data type, which shall contain:

- to create a subscription to usage monitoring of sponsored data connectivity:
 - the "events" attribute with an entry containing the value "USAGE_REPORT" to create a subscription to notification about usage monitoring of sponsored data connectivity;
 - include the usage thresholds to apply in the "usgThres" attribute.
- to remove a subscription to usage monitoring of sponsored data connectivity:

- the "events" attribute containing an array that omits the values "USAGE_REPORT".

The NF service consumer shall include other events related information as described in clause 5.3.2.6.1.

As result of this action, the TSCTSF shall set the appropriate subscription to usage monitoring of sponsored data connectivity as described in in 3GPP TS 29.514 [20].

The TSCTSF shall reply to the NF service consumer as described in clause 5.3.2.6.1.

5.3.2.7 Ntsctsf_QoSandTSCAssistance_Unsubscribe

5.3.2.7.1 General

The Ntsctsf_QoSandTSCAssistance_Unsubscribe service operation enables NF service consumers to remove subscription to all subscribed events for the existing TSC application session context. Subscription to events shall be removed:

- by invoking the Ntsctsf_QoSandTSCAssistance_Unsubscribe service operation for the existing application session context, as described in clause 5.3.2.7.2; or
- within the application session context modification procedure by invoking the Ntsctsf_QoSandTSCAssistance_Update service operation, as described in clause 5.3.2.3; or
- within the TSC application session context termination procedure by invoking the Ntsctsf_QoSandTSCAssistance_Delete service operation, as described in clause 5.3.2.4.

The following procedure using the Ntsctsf_QoSandTSCAssistance_Unsubscribe service operation is supported:

- Unsubscription to events.

5.3.2.7.2 Unsubscription to events

This procedure is used to unsubscribe to all subscribed events for the existing TSC AF application session context, as defined in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.503 [19].

Figure 5.3.2.7.2-1 illustrates the unsubscription to events using the HTTP DELETE method.

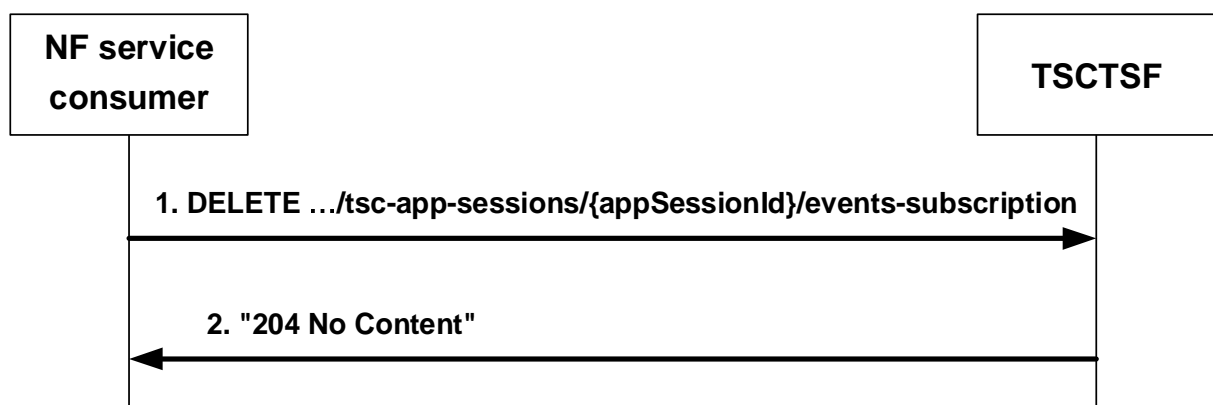


Figure 5.3.2.7.2-1: Removal of events subscription information using HTTP DELETE

When the NF service consumer decides to unsubscribe to all subscribed events for the existing TSC application session context, the NF service consumer shall invoke the Ntsctsf_QoSandTSCAssistance_Unsubscribe service operation by sending the HTTP DELETE request message to the resource URI representing the "Events Subscription" sub-resource in the TSCTSF, as shown in figure 5.3.2.7.2-1, step 1.

Upon the reception of the HTTP DELETE request message from the NF service consumer, the TSCTSF shall decide whether the received HTTP request message is accepted.

If the HTTP DELETE request message from the NF service consumer is accepted, the TSCTSF shall delete "Events Subscription" sub-resource and shall send to the NF service consumer a HTTP "204 No Content" response message. The TSCTSF may delete the existing subscription to event notifications for the related PDU session from the PCF as described in 3GPP TS 29.514 [20].

If the HTTP DELETE request from the NF service consumer is not accepted, the TSCTSF shall indicate in the response to HTTP DELETE request the cause for the rejection as specified in clause 6.2.7.

If the TSCTSF determines the received HTTP DELETE request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.4 Ntsctsf_ASTI Service

5.4.1 Service Description

5.4.1.1 Overview

This service provides authorization of NF Service Consumer requests for the activation, update, and deactivation of the 5G access stratum time distribution.

NOTE: The AF can use either the procedure specified in bullet 1) and 2) of clause 5.2.1.1 for configuring the (g)PTP instance in 5GS or the procedure specified in Ntsctsf_ASTI service for controlling the 5G access stratum time distribution for a particular UE. The procedures are not intended to be used in conjunction.

5.4.1.2 Network Functions

5.4.1.2.1 TSCTSF

The TSCTSF supports to:

- receive the request to activate or update the 5G access stratum time distribution configuration from the NEF or AF and provide it for the target UE(s) to the PCF;
- receive the request to delete the 5G access stratum time distribution configuration from the NEF or AF and provide it for the target UE(s) to the PCF;
- receive the request to query the status of the access stratum time distribution from the NEF or AF and respond to the NEF or AF with the status of the access stratum time distribution.

5.4.1.2.2 NF Service Consumers

The NF service consumer supports to:

- send the request to create, modify and delete the 5G access stratum time distribution configuration to the TSCTSF; and
- query the status of the access stratum time distribution configuration.

5.4.2 Service Operations

5.4.2.1 Introduction

Service operations defined for the Ntsctsf_ASTI service are shown in table 5.4.2.1-1.

Table 5.4.2.1-1: Ntsctsf_ASTI Service Operations

| Service Operation Name | Description | Initiated by |
|------------------------|--|------------------------------------|
| Ntsctsf_ASTI_Create | Allows the NF service consumer to create a 5G access stratum time distribution configuration. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_ASTI_Update | Allows the NF service consumer to update a 5G access stratum time distribution configuration. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_ASTI_Delete | Allows the NF service consumer to delete a 5G access stratum time distribution configuration. | NF service consumer (e.g. AF, NEF) |
| Ntsctsf_ASTI_Get | Allows the NF service consumer to query the status of the 5G access stratum time distribution configuration. | NF service consumer (e.g. AF, NEF) |

NOTE: The NEF and the AF use the Ntsctsf_ASTI service in the same way.

5.4.2.2 Ntsctsf_ASTI_Create

5.4.2.2.1 General

This service operation is used by an NF service consumer to create a 5G access stratum time distribution configuration.

The following procedures using the Ntsctsf_ASTI_Create service operation are supported:

- creating a new configuration..

5.4.2.2.2 Creating a new configuration

Figure 5.4.2.2.2-1 illustrates the creation of a configuration.

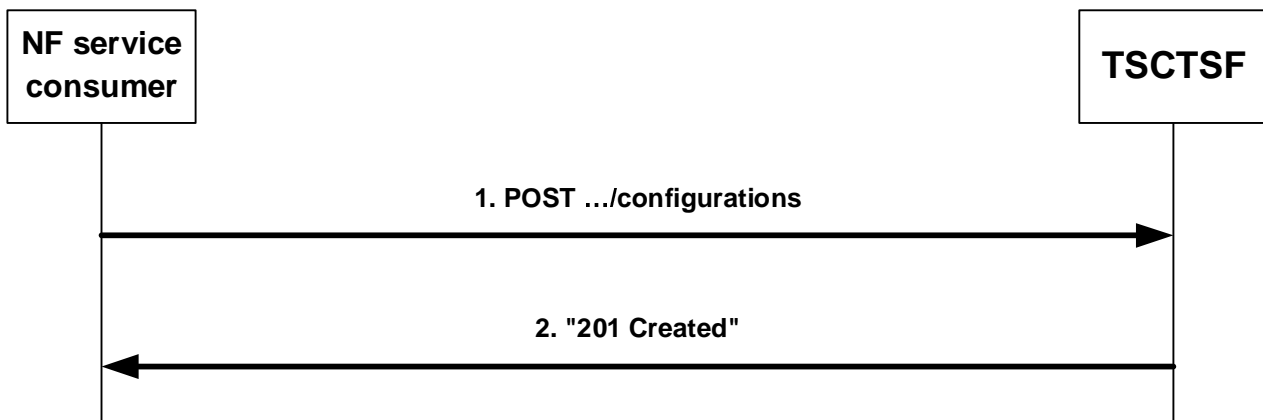


Figure 5.4.2.2.2-1: Creation of a configuration

To create a configuration, the NF service consumer shall send an HTTP POST message to the TSCTSF to the URI "{apiRoot}/ntsctsf-asti/<apiVersion>/configurations". The HTTP POST message shall include the AccessTimeDistributionData data structure as request body, as shown in figure 5.4.2.2.2-1, step 1. The AccessTimeDistributionData data structure shall include:

- one of the indication of the UEs to which the 5G access stratum time distribution configuration is requested via:
 - identification of a list of individual UEs within the "supis" attribute; or
 - identification of a group of UE(s) within the "interGrpId" attribute;
 - identification of a list of individual UEs within the "gpsis" attribute;
 - identification of a group of UE(s) within the "exterGrpId" attribute; and

- 5G access stratum time distribution parameters within the "asTimeDisParam" attribute;

Within the "asTimeDisParam" attribute inside the AccessTimeDistributionData data structure, the NF service consumer:

- shall include the "asTimeDisEnabled" attribute set to true if the access stratum time distribution via Uu reference point should be activated (otherwise, if the access stratum time distribution via Uu reference point should be inactive, the "asTimeDisEnabled" attribute may either be omitted or included and set to "false");
- may include the time synchronization error budget within the "timeSyncErrBdgt" attribute;
- may include the temporal validity condition within the "tempValidity" attribute.

Upon receipt of the HTTP request from the NF service consumer, if the request is authorized, the TSCTSF shall:

- if the 5G access stratum time distribution configuration applies to an internal group of UEs indicated in the "interGrpId" attribute or to an external group of UEs indicated in the "exterGrpId" attribute, interact with the UDM to retrieve the list of individual UEs that belong to the group using the Nudm_SDM service as defined in 3GPP TS 29.503 [24];
- if the 5G access stratum time distribution configuration applies to a list of individual UEs within the "gpsis" attribute, interact with the UDM to retrieve the SUPI(s) that corresponds to each of the GPSI(s) using the Nudm_SDM service as defined in 3GPP TS 29.503 [24];
- subscribe to event notifications of newly registered PCF for the UE by invoking Nbsf_Management_Subscribe Service Operation as defined in 3GPP TS 29.521 [23], if not yet subscribed;
- If the access stratum time distribution via Uu reference point is being activated (i.e. the "asTimeDisEnabled" attribute within the "asTimeDisParam" attribute was received and set to true), calculate the Uu time synchronization error budget as specified in clause 5.27.1.9 of 3GPP TS 23.501 [2];
- interact with the PCF for a UE to provide the configuration information for each target UE using the Npcf_AMPolicyAuthorization_Create service operation as defined in 3GPP TS 29.534 [14];
- create a new resource, which represents a new "Individual ASTI Configuration" instance, addressed by a URI as defined in clause 6.1.3.7 and containing a TSCTSF created resource identifier; and
- send an HTTP "201 Created" response with AccessTimeDistributionData data structure as response body and a Location header field containing the URI of the created Individual ASTI Configuration resource, i.e. "{apiRoot}/ntsctsf-asti/<apiVersion>/configurations/{configId}", as shown in figure 5.4.2.2.2-1, step 2.

If the TSCTSF cannot successfully fulfil the received HTTP POST request due to the internal TSCTSF error or due to the error in the HTTP POST request, the TSCTSF shall send the HTTP error response as specified in clause 6.3.7.

5.4.2.3 Ntsctsf_ASTI_Update

5.4.2.3.1 General

This service operation is used by an NF service consumer to update a 5G access stratum time distribution configuration.

The following procedures using the Ntsctsf_ASTI_Update service operation are supported:

- Updating an existing configuration.

5.4.2.3.2 Updating an existing configuration

Figure 5.4.2.3.2-1 illustrates the updating of an existing configuration.

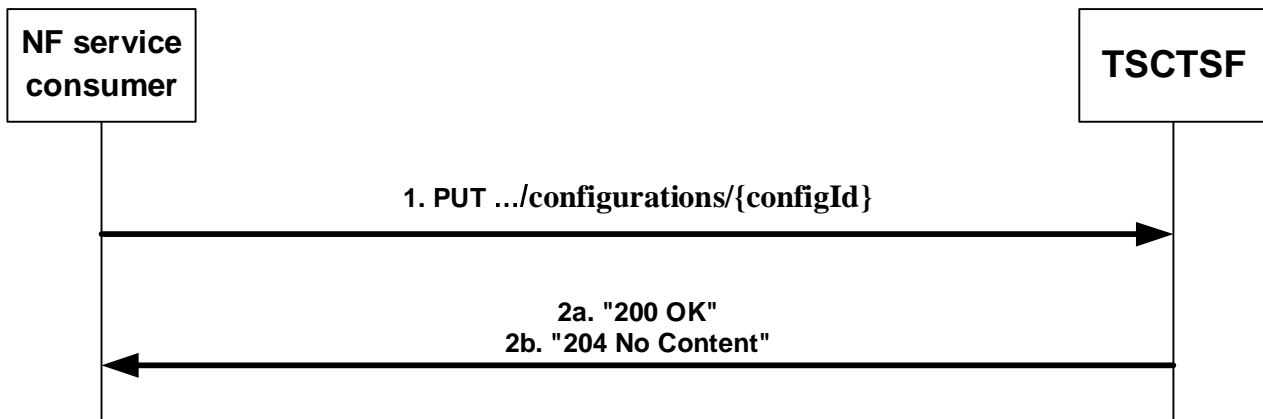


Figure 5.4.2.3.2-1: Update of a configuration

To update a configuration, the NF service consumer shall send an HTTP PUT request to the resource "{apiRoot}/ntsctsf-asti/<apiVersion>/configurations/{configId}" representing an existing "Individual ASTI Configuration" resource, as shown in figure 5.4.2.3.2-1, step 1, to modify the configuration.

The AccessTimeDistributionData data structure provided in the request body shall include an updated representation of the "Individual ASTI Configuration" resource with the updated 5G access stratum time distribution configuration information as defined in clause 5.4.2.2.2.

Upon receipt of the corresponding HTTP PUT message, if the request is authorized, the TSCTSF shall:

- if the access stratum time distribution via Uu reference point is being activated (i.e. the "asTimeDisEnabled" attribute within the "asTimeDisParam" attribute was received and set to true) or a time synchronization error budget for an active access stratum time distribution is provided or updated by the AF, calculate the Uu time synchronization error budget as specified in clause 5.27.1.9 of 3GPP TS 23.501 [2];
- interact with the PCF for a UE to provide the updated configuration information using the Npcf_AMPolicyAuthorization_Update service operation as defined in 3GPP TS 29.534 [14]; and
- update the existing "Individual ASTI Configuration" resource. Then the TSCTSF shall send a HTTP response including "200 OK" status code with AccessTimeDistributionData data structure or "204 No Content" status code, as shown in figure 5.4.2.3.2-1, step 2.

If the TSCTSF cannot successfully fulfil the received HTTP PUT request due to the internal TSCTSF error or due to the error in the HTTP PUT request, the TSCTSF shall send the HTTP error response as specified in clause 6.3.7.

If the TSCTSF determines the received HTTP PUT request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.4.2.4 Ntsctsf_ASTI_Delete

5.4.2.4.1 General

This service operation is used by an NF service consumer to delete a 5G access stratum time distribution configuration.

The following procedures using the Ntsctsf_ASTI_Delete service operation are supported:

- Delete an existing configuration.

5.4.2.4.2 Delete an existing configuration

Figure 5.4.2.4.2-1 illustrates the deleting of an existing configuration.

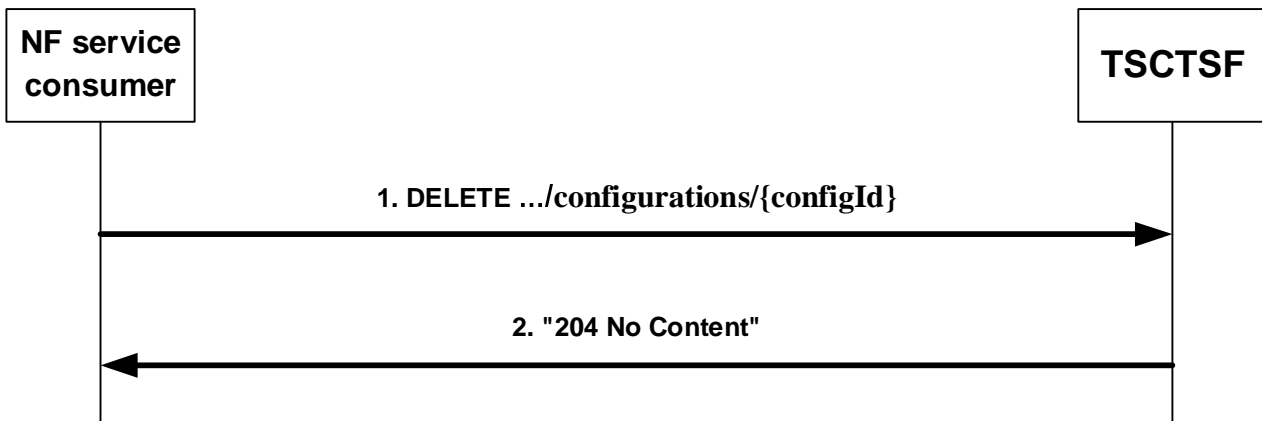


Figure 5.4.2.4.2-1: Deletion of a configuration

To delete a configuration, the NF service consumer shall send an HTTP DELETE request to the resource "{apiRoot}/ntsctsf-asti/<apiVersion>/configurations/{configId}" representing an existing "Individual ASTI Configuration" resource, as shown in figure 5.4.2.4.2-1, step 1, to delete the configuration.

Upon the reception of an HTTP DELETE request from the NF service consumer, if the HTTP DELETE request is authorized, the TSCTSF shall:

- interact with the PCF for a UE to remove the configuration information in the PCF by using the Npcf_AMPolicyAuthorization_Delete service operation as defined in 3GPP TS 29.534 [14].
- remove the corresponding configuration and respond with "204 No Content" as shown in figure 5.4.2.4.2-1, step 2.

If the TSCTSF cannot successfully fulfil the received HTTP DELETE request due to the internal TSCTSF error or due to the error in the HTTP DELETE request, the TSCTSF shall send the HTTP error response as specified in clause 6.3.7.

If the TSCTSF determines the received HTTP DELETE request needs to be redirected, the TSCTSF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

5.4.2.5 Ntsctsf_ASTI_Get

5.4.2.5.1 General

This service operation is used by an NF service consumer to retrieve the status of the access stratum time distribution for a list of UEs.

The following procedures using the Ntsctsf_ASTI_Get service operation are supported:

- Retrieve the status of access stratum time distribution.

5.4.2.5.2 Retrieve the status of access stratum time distribution

Figure 5.4.2.5.2-1 illustrates the retrieval of the status of access stratum time distribution.

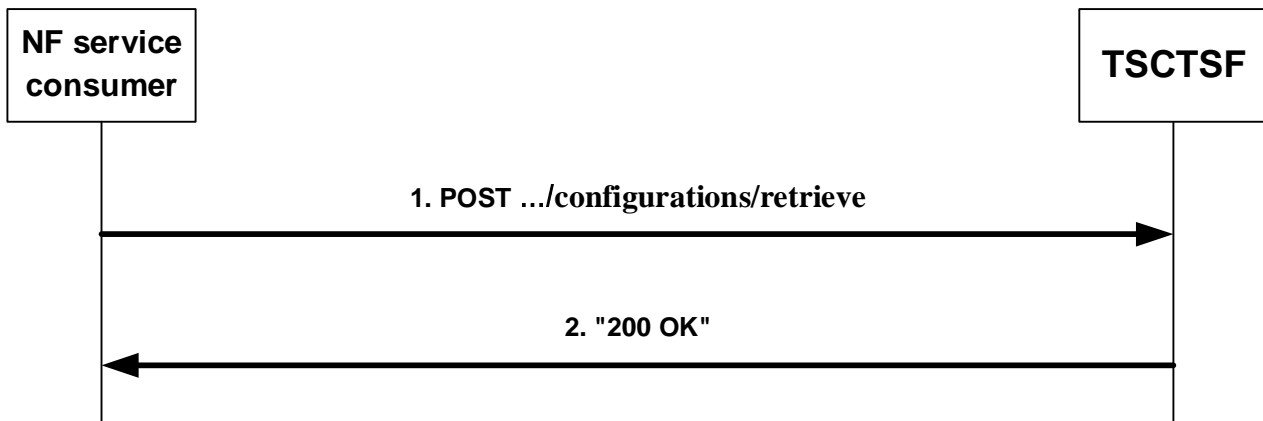


Figure 5.4.2.5.2-1: Retrieval of the status of access stratum time distribution

To retrieve the status of access stratum time distribution, the NF service consumer shall send an HTTP POST request to the resource "{apiRoot}/ntsctsf-asti/<apiVersion>/configurations/retrieve". The HTTP POST message shall include the StatusRequestData data structure as request body, as shown in figure 5.4.2.5.2-1, step 1. The StatusRequestData data structure shall include:

- identification of a list of individual UEs within the "supis" attribute;

Upon the reception of an HTTP POST request and if the HTTP POST request is accepted by the TSCTSF, the TSCTSF determines the status of the access stratum time distribution is active for a UE if there is a 5G access stratum time distribution configuration applicable to the UE, i.e., it applies according to the temporal validity, if present, and the access time distribution via Uu reference point is activated; otherwise, the status of the access stratum time distribution is inactive for the UE.

The TSCTSF shall send an HTTP "200 OK" response with the StatusResponseData data structure as response body, as shown in figure 5.4.2.5.2-1, step 2 to notify of the status.

Within the StatusResponseData data structure, TSCTSF may include:

- a list of UE identifier(s) whose status of the access stratum time distribution is inactive within the "inactiveUes" attribute;
- the "activeUes" attribute containing one or more the ActiveUe instances which includes the UE identifier whose status of the access stratum time distribution is active within the "supi" attribute and the requested time synchronization error budget, if available, within the "timeSyncErrBdgt" attribute.

If the TSCTSF cannot successfully fulfil the received HTTP POST request due to the internal TSCTSF error or due to the error in the HTTP POST request, the TSCTSF shall send the HTTP error response as specified in clause 6.3.7.

6 API Definitions

6.1 Ntsctsf_TimeSynchronization Service API

6.1.1 Introduction

The Ntsctsf_TimeSynchronization service shall use the Ntsctsf_TimeSynchronization API.

The API URI of the Ntsctsf_TimeSynchronization API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "ntsctsf-time-sync".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.1.3.

6.1.2 Usage of HTTP

6.1.2.1 General

HTTP/2, IETF RFC 7540 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Ntsctsf_TimeSynchronization API is contained in Annex A.

6.1.2.2 HTTP standard headers

6.1.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

6.1.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [13].

6.1.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be supported, and the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4] may be supported.

In this Release of the specification, no specific custom headers are defined for the Ntsctsf_TimeSynchronization API.

6.1.3 Resources

6.1.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 6.1.3.1-1 depicts the resource URIs structure for the Ntsctsf_TimeSynchronization API.

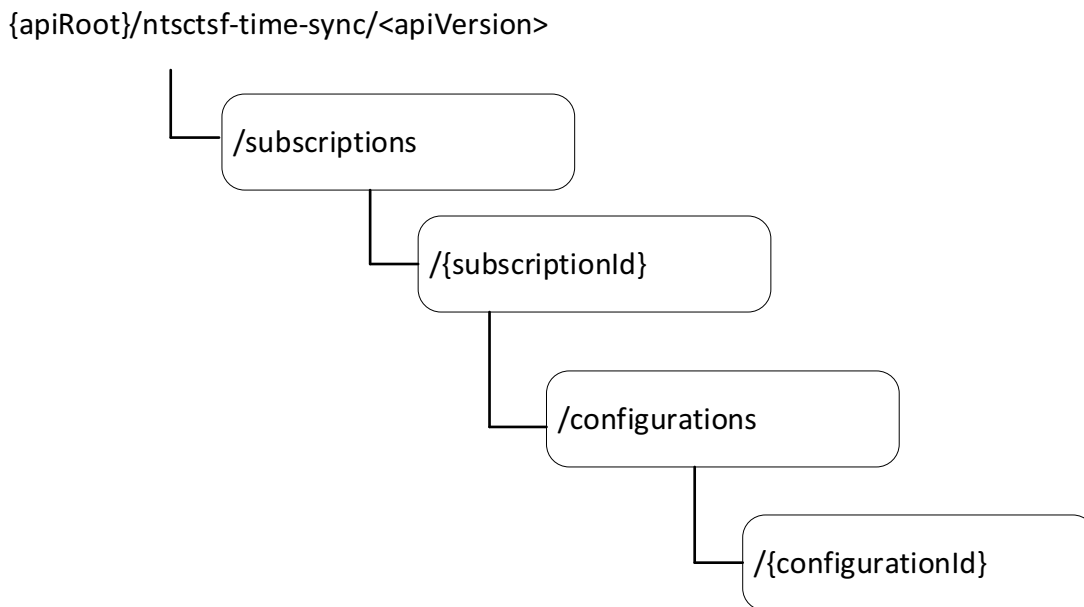


Figure 6.1.3.1-1: Resource URI structure of the Ntsctsf_TimeSynchronization API

Table 6.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.1.3.1-1: Resources and methods overview

| Resource name | Resource URI | HTTP method or custom operation | Description |
|--|--|---------------------------------|---|
| Time Synchronization Exposure | /subscriptions | POST | Create a new subscription to notification of capability of time synchronization service. |
| Individual Time Synchronization Exposure Subscription | /subscriptions/{subscriptionId} | GET | Read a subscription to notification of capability of time synchronization service. |
| | | PUT | Modify a subscription to notification of capability of time synchronization service. |
| | | DELETE | Delete a subscription to notification of capability of time synchronization service. |
| Time Synchronization Exposure Configurations | /subscriptions/{subscriptionId}/configurations | POST | Create a new configuration to time synchronization exposure. |
| Individual Time Synchronization Exposure Configuration | /subscriptions/{subscriptionId}/configurations/{configurationId} | GET | Read a configuration to time synchronization exposure. |
| | | PUT | Modify all of the properties of an existing configuration to time synchronization exposure. |
| | | DELETE | Delete a configuration to time synchronization exposure. |

6.1.3.2 Resource: Time Synchronization Exposure Subscriptions

6.1.3.2.1 Description

This resource allows a NF service consumer to create a new subscription to notification of the capability for time synchronization service.

6.1.3.2.2 Resource Definition

Resource URI: {apiRoot}/ntsetsf-time-sync/<apiVersion>/subscriptions

This resource shall support the resource URI variables defined in table 6.1.3.2.2-1.

Table 6.1.3.2.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|---------|-----------|------------------|
| apiRoot | string | See clause 6.1.1 |

6.1.3.2.3 Resource Standard Methods

6.1.3.2.3.1 POST

The POST method creates a new subscription resource to time synchronization exposure subscription. The NF service consumer shall initiate the HTTP POST request message and the TSCTSF shall respond to the message. The TSCTSF shall construct the URI of the created resource.

This method shall support the URI query parameters specified in table 6.1.3.2.3.1-1.

Table 6.1.3.2.3.1-1: URI query parameters supported by the POST method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.1.3.2.3.1-2 and the response data structures and response codes specified in table 6.1.3.2.3.1-3.

Table 6.1.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------------------|---|-------------|--|
| TimeSyncExposureSubsc | M | "1" | Parameters to request a subscription to notification of the capability for time synchronization service. |

Table 6.1.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|--|---|-------------|----------------|--|
| TimeSyncExposureSubsc | M | 1 | 201 Created | The subscription was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header. |
| NOTE: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.1.3.2.3.1-4: Headers supported by the 201 response code on this resource

| Name | Data type | P | Cardinality | Description |
|----------|-----------|---|-------------|---|
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/ntsctsf-time-sync/{apiVersion}/subscriptions/{subscriptionId} |

6.1.3.2.4 Resource Custom Operations

None.

6.1.3.3 Resource: Individual Time Synchronization Exposure Subscription

6.1.3.3.1 Description

This resource allows a NF service consumer to read, modify or delete an existing subscription to notification of the capability for time synchronization service.

6.1.3.3.2 Resource Definition

Resource URI: {apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}

This resource shall support the resource URI variables defined in table 6.1.3.3.2-1.

Table 6.1.3.3.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|----------------|-----------|---|
| apiRoot | string | See clause 6.1.1 |
| subscriptionId | string | Represents a specific subscription. It is the identifier of the Individual Time Synchronization Exposure Subscription resource. |

6.1.3.3.3 Resource Standard Methods

6.1.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.3.3.1-1.

Table 6.1.3.3.3.1-1: URI query parameters supported by the GET method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.1.3.3.3.1-2 and the response data structures and response codes specified in table 6.1.3.3.3.1-3.

Table 6.1.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a | | | |

Table 6.1.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|-----------------------|---|-------------|------------------------|--|
| TimeSyncExposureSubsc | M | 1 | 200 OK | An Individual Time Synchronization Exposure Subscription resource is returned successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during an Individual Time Synchronization Exposure Subscription resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during an Individual Time Synchronization Exposure Subscription resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |

NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.

Table 6.1.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.1.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.1.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 6.1.3.3.3.2-1.

Table 6.1.3.3.3.2-1: URI query parameters supported by the DELETE method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.1.3.3.3.2-2 and the response data structures and response codes specified in table 6.1.3.3.3.2-3.

Table 6.1.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a | | | |

Table 6.1.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|------------------|---|-------------|------------------------|--|
| n/a | | | 204 No Content | The subscription was deleted successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual Time Synchronization Exposure Subscription resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual Time Synchronization Exposure Subscription resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |

NOTE: The mandatory HTTP error status code for the DELETE method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.

Table 6.1.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.1.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.1.3.3.3.3 PUT

This method shall support the URI query parameters specified in table 6.1.3.3.3.3-1.

Table 6.1.3.3.3.3-1: URI query parameters supported by the PUT method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.1.3.3.3.3-2 and the response data structures and response codes specified in table 6.1.3.3.3.3-3.

Table 6.1.3.3.3.3-2: Data structures supported by the PUT Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------------------|---|-------------|--|
| TimeSyncExposureSubsc | M | 1 | Modify an existing Time Synchronization Exposure Subscription. |

Table 6.1.3.3.3-3: Data structures supported by the PUT Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|--|
| TimeSyncExposureSubsc | M | 1 | 200 OK | The subscription was updated successfully. |
| n/a | | | 204 No Content | The subscription was deleted successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual Time Synchronization Exposure Subscription resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual Time Synchronization Exposure Subscription resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: The mandatory HTTP error status code for the PUT method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.1.3.3.3-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.1.3.3.3-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.1.3.3.4 Resource Custom Operations

None.

6.1.3.4 Resource: Time Synchronization Exposure Configurations

6.1.3.4.1 Description

This resource allows a NF service consumer to create a new subscription to notification of the capability for time synchronization service.

6.1.3.4.2 Resource Definition

Resource URI: {apiRoot}/ntctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}/configurations

This resource shall support the resource URI variables defined in table 6.1.3.4.2-1.

Table 6.1.3.4.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|----------------|-----------|---|
| apiRoot | string | See clause 6.1.1 |
| subscriptionId | string | Represents a specific subscription. It is the identifier of the Individual Time Synchronization Exposure Subscription resource. |

6.1.3.4.3 Resource Standard Methods

6.1.3.4.3.1 POST

The POST method creates a new configuration resource to activate time synchronization service. The NF service consumer shall initiate the HTTP POST request message and the TSCTSF shall respond to the message. The TSCTSF shall construct the URI of the created resource.

This method shall support the URI query parameters specified in table 6.1.3.4.3.1-1.

Table 6.1.3.4.3.1-1: URI query parameters supported by the POST method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.1.3.4.3.1-2 and the response data structures and response codes specified in table 6.1.3.4.3.1-3.

Table 6.1.3.4.3.1-2: Data structures supported by the POST Request Body on this resource

| Data type | P | Cardinality | Description |
|------------------------|---|-------------|--|
| TimeSyncExposureConfig | M | 1 | Parameters to create a configuration to activate time synchronization service. |

Table 6.1.3.4.3.1-3: Data structures supported by the POST Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|--|---|-------------|---------------------------|---|
| TimeSyncExposureConfig | M | 1 | 201 Created | The configuration was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual Time Synchronization Exposure Configuration resource creation. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual Time Synchronization Exposure Configuration resource creation. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.1.3.4.3.1-4: Headers supported by the 201 response code on this resource

| Name | Data type | P | Cardinality | Description |
|----------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/ntsctsf-time-sync/{apiVersion}/subscriptions/{subscriptionId}/configuration/{configurationId} |

Table 6.1.3.4.3.1-5: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.1.3.4.3.1-6: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.1.3.4.4 Resource Custom Operations

None.

6.1.3.5 Resource: Individual Time Synchronization Exposure Configuration

6.1.3.5.1 Description

This resource allows a NF service consumer to modify/cancel a configuration to modify/deactivate Time Synchronization service with the TSCTSF

6.1.3.5.2 Resource Definition

Resource URI: **{apiRoot}/ntsctsf-time-sync/<apiVersion>/subscriptions/{subscriptionId}/configurations/{configurationId}**

This resource shall support the resource URI variables defined in table 6.1.3.5.2-1.

Table 6.1.3.5.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|-----------------|-----------|---|
| apiRoot | string | See clause 6.1.1 |
| subscriptionId | string | Represents a specific subscription. It is the identifier of the Individual Time Synchronization Exposure Subscription resource. |
| configurationId | string | Represents a specific configuration. It is the identifier of the Individual Time Synchronization Exposure Configuration resource. |

6.1.3.5.3 Resource Standard Methods

6.1.3.5.3.1 GET

This method shall support the URI query parameters specified in table 6.1.3.5.3.1-1.

Table 6.1.3.5.3.1-1: URI query parameters supported by the GET method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.1.3.5.3.1-2 and the response data structures and response codes specified in table 6.1.3.5.3.1-3.

Table 6.1.3.5.3.1-2: Data structures supported by the GET Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a | | | |

Table 6.1.3.5.3.1-3: Data structures supported by the GET Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|--|
| TimeSyncExposureConfig | M | 1 | 200 OK | The configuration information in the request URI are returned. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual Time Synchronization Exposure Configuration resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual Time Synchronization Exposure Configuration resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.1.3.4.3.1-5: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.1.3.4.3.1-6: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.1.3.5.3.2 PUT

This method shall support the URI query parameters specified in table 6.1.3.5.3.2-1.

Table 6.1.3.5.3.2-1: URI query parameters supported by the PUT method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.1.3.5.3.2-2 and the response data structures and response codes specified in table 6.1.3.5.3.2-3.

Table 6.1.3.5.3.2-2: Data structures supported by the PUT Request Body on this resource

| Data type | P | Cardinality | Description |
|------------------------|---|-------------|---|
| TimeSyncExposureConfig | M | 1 | Modify an existing Time Synchronization Exposure Configuration. |

Table 6.1.3.5.3.2-3: Data structures supported by the PUT Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|---|
| TimeSyncExposureConfig | M | 1 | 200 OK | The subscription was updated successfully. |
| n/a | | | 204 No Content | The subscription was updated successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual Time Synchronization Exposure Configuration resource update. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual Time Synchronization Exposure Configuration resource update. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.1.3.5.3.2-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.1.3.5.3.2-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.1.3.5.3.3 DELETE

This method shall support the URI query parameters specified in table 6.1.3.5.3.3-1.

Table 6.1.3.5.3.3-1: URI query parameters supported by the DELETE method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.1.3.5.3.3-2 and the response data structures and response codes specified in table 6.1.3.5.3.3-3.

Table 6.1.3.5.3.3-2: Data structures supported by the DELETE Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a | | | |

Table 6.1.3.5.3.3-3: Data structures supported by the DELETE Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|------------------|---|-------------|------------------------|---|
| n/a | | | 204 No Content | The configuration was deleted successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual Time Synchronization Exposure Configuration resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual Time Synchronization Exposure Configuration resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |

NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.

Table 6.1.3.5.3.3-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.1.3.5.3.3-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.1.3.5.4 Resource Custom Operations

None.

6.1.4 Custom Operations without associated resources

Void

6.1.5 Notifications

6.1.5.1 General

Notifications shall comply to clause 6.2 of 3GPP TS 29.500 [4] and clause 4.6.2.3 of 3GPP TS 29.501 [5].

Table 6.1.5.1-1: Notifications overview

| Notification | Callback URI | HTTP method or custom operation | Description (service operation) |
|---|------------------|---------------------------------|---|
| Time Synchronization Capability Notification | {subsNotifUri} | POST | Time Synchronization Capability Notification for a list of UEs. |
| Time Synchronization Configuration Notification | {configNotifUri} | POST | Current state of Time Synchronization Service configuration Notification. |

6.1.5.2 Time Synchronization Capability Notification

6.1.5.2.1 Description

The Time Synchronization Capability Notification is used by the NF service producer to report the capability of the time synchronization service for a list of UEs to a NF service consumer that has subscribed to such Notifications.

6.1.5.2.2 Target URI

The Callback URI "{subsNotifUri}" shall be used with the callback URI variables defined in table 6.1.5.2.2-1.

Table 6.1.5.2.2-1: Callback URI variables

| Name | Definition |
|--------------|---|
| subsNotifUri | String formatted as URI with the Callback Uri. The Callback Uri is assigned within the Time Synchronization Capability Notification and described within the TimeSyncExposureSubsc type (see table 6.1.6.2.2-1). |

6.1.5.2.3 Standard Methods

6.1.5.2.3.1 POST

This method shall support the request data structures specified in table 6.1.5.2.3.1-1 and the response data structures and response codes specified in table 6.1.5.2.3.1-1.

Table 6.1.5.2.3.1-2: Data structures supported by the POST Request Body

| Data type | P | Cardinality | Description |
|---------------------------|---|-------------|---|
| TimeSyncExposureSubsNotif | M | 1 | Provides the time synchronization capabilities of a list of UEs by the TSCTSF to the NF service consumer. |

Table 6.1.5.2.3.1-3: Data structures supported by the POST Response Body

| Data type | P | Cardinality | Response codes | Description |
|------------------|---|-------------|------------------------|---|
| n/a | | | 204 No Content | The event notification is received successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |

NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.

Table 6.1.5.2.3.1-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

Table 6.1.5.2.3.1-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

6.1.5.3 Time Synchronization Configuration Notification

6.1.5.3.1 Description

The Time Synchronization Configuration Notification is used by the NF service producer to report the current state of configuration of the time synchronization service.

6.1.5.3.2 Target URI

The Callback URI "{configNotifUri}" shall be used with the callback URI variables defined in table 6.1.5.3.2-1.

Table 6.1.5.3.2-1: Callback URI variables

| Name | Definition |
|----------------|---|
| configNotifUri | String formatted as URI with the Callback Uri. The Callback Uri is assigned within the Time Synchronization Configuration Notification and described within the TimeSyncExposureConfig type (see table 6.1.6.2.9-1). |

6.1.5.3.3 Standard Methods

6.1.5.3.3.1 POST

This method shall support the request data structures specified in table 6.1.5.3.3.1-1 and the response data structures and response codes specified in table 6.1.5.3.3.1-1.

Table 6.1.5.3.3.1-2: Data structures supported by the POST Request Body

| Data type | P | Cardinality | Description |
|-----------------------------|---|-------------|--|
| TimeSyncExposureConfigNotif | M | 1 | Provides the current state of time synchronization configuration by the TSCTSF to the NF service consumer. |

Table 6.1.5.3.3.1-3: Data structures supported by the POST Response Body

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|---|
| n/a | | | 204 No Content | The event notification is received successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.1.5.3.3.1-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

Table 6.1.5.3.3.1-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

6.1.6 Data Model

6.1.6.1 General

This clause specifies the application data model supported by the API.

Table 6.1.6.1-1 specifies the data types defined for the Ntsctsf_TimeSynchronization service based interface protocol.

Table 6.1.6.1-1: Ntsctsf_TimeSynchronization specific Data Types

| Data type | Clause defined | Description | Applicability |
|-----------------------------|----------------|--|---------------|
| ConfigForPort | 6.1.6.2.11 | Contains the configuration for a port. | |
| PtpCapabilitiesPerUe | 6.1.6.2.6 | Contains the PTP capabilities supported by a UE. | |
| PtpInstance | 6.1.6.2.10 | Contains the PTP Instance. | |
| TimeSyncExposureSubsc | 6.1.6.2.2 | Contains the parameters for the subscription to notification of capability of time synchronization service | |
| TimeSyncCapability | 6.1.6.2.5 | Contains the capability of time synchronization service | |
| TimeSyncExposureConfig | 6.1.6.2.9 | Contains the configuration of time synchronization service | |
| TimeSyncExposureConfigNotif | 6.1.6.2.7 | Contains the notification of configuration of time synchronization service. | |
| TimeSyncExposureSubsNotif | 6.1.6.2.3 | Contains the notification of time synchronization service. | |
| StateOfConfiguration | 6.1.6.2.8 | Indicates the PTP port states for a NW-TT and DS-TTs. | |
| StateOfDstt | 6.1.6.2.12 | Contains the PTP port state of a DS-TT | |
| SubsEventNotification | 6.1.6.2.4 | Contains the notification of capability of time synchronization for a list of UEs. | |

Table 6.1.6.1-2 specifies data types re-used by the Ntsctsf_TimeSynchronization service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Ntsctsf_TimeSynchronization service based interface.

Table 6.1.6.1-2: Ntsctsf_TimeSynchronization re-used Data Types

| Data type | Reference | Comments | Applicability |
|------------------------|---------------------|--|---------------|
| AsTimeResource | 3GPP TS 29.522 [17] | Indicates the supported 5G clock quality. | |
| DateTime | 3GPP TS 29.571 [15] | String with format "date-time" as defined in OpenAPI Specification [6]. | |
| DistributionMethod | 3GPP TS 29.522 [17] | Identifies the time synchronization distribution methods supported by 5GS. | |
| Dnn | 3GPP TS 29.571 [15] | The DNN the user is connected to. | |
| DurationSec | 3GPP TS 29.571 [15] | Identifies a period of time in units of seconds. | |
| EventFilter | 3GPP TS 29.522 [17] | Contains the conditions to match for notifying the event. | |
| ExternalGroupId | 3GPP TS 29.571 [15] | Identifies a External Group. | |
| GmCapable | 3GPP TS 29.522 [17] | Indicates separately whether 5GS supports acting as a gPTP or PTP grandmaster. | |
| Gpsi | 3GPP TS 29.571 [15] | The external identification of the user (i.e., an External Id or an MSISDN). | |
| GroupId | 3GPP TS 29.571 [15] | Identifies a group of internal globally unique ID. | |
| Snsai | 3GPP TS 29.571 [15] | Identifies the S-NSSAI. | |
| SubscribedEvent | 3GPP TS 29.522 [17] | Indicates the subscribed event. | |
| Supi | 3GPP TS 29.571 [15] | The identification of the user (i.e. IMSI, NAI). | |
| SupportedFeatures | 3GPP TS 29.571 [15] | Used to negotiate the applicability of the optional features defined in table 5.8-1. | |
| TimeSyncExposureConfig | 3GPP TS 29.522 [17] | Contains the parameters of time synchronization configuration. | |
| UInteger | 3GPP TS 29.571 [15] | Unsigned integer. | |
| Uint64 | 3GPP TS 29.571 [15] | | |
| Uri | 3GPP TS 29.571 [15] | Identifies a referenced resource. | |

6.1.6.2 Structured data types

6.1.6.2.1 Introduction

This clause defines the structures to be used in resource representations.

6.1.6.2.2 Type: TimeSyncExposureSubsc

Table 6.1.6.2.2-1: Definition of type TimeSyncExposureSubsc

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|------------------|-----------------------|---|-------------|--|---------------|
| supis | array(Supi) | C | 1..N | Subscription Permanent Identifier. (NOTE) | |
| gpsis | array(Gpsi) | C | 1..N | Public user identifier. (NOTE) | |
| interGrpld | GroupId | C | 0..1 | The internal Group Id(s). (NOTE) | |
| exterGrpld | ExternalGroupId | C | 0..1 | The external Group Id. (NOTE) | |
| anyUeInd | boolean | C | 0..1 | Identifies whether the AF request applies to any UE (i.e. all UEs). This attribute shall set to "true" if applicable for any UE, otherwise, set to "false". (NOTE) | |
| notifMethod | NotificationMethod | O | 0..1 | If "notifMethod" is not supplied, the default value "ON_EVENT_DETECTION" applies. | |
| dnn | Dnn | M | 1 | Identifies a DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. | |
| snsai | Snsai | M | 1 | Identifies an S-NSSAI. | |
| subscribedEvents | array(SubscribeEvent) | M | 1..N | Identifies the requirement to be notified of the event(s). | |
| eventFilters | array(EventFilter) | O | 1..N | Contains the filter conditions to match for notifying the event(s) of time synchronization capabilities for a list of UE(s). | |
| subsNotifUri | Uri | M | 1 | Notification URI for time sensitive capability reporting. | |
| subsNotifId | string | M | 1 | Notification Correlation ID assigned by the NF service consumer. | |
| maxReportNbr | UInteger | O | 0..1 | If omitted, there is no limit. | |
| expiry | DateTime | C | 0..1 | This attribute indicates the expiry time of the subscription, after which the NEF shall not send any event notifications and the subscription becomes invalid. It may be included in an event subscription request and may be included in an event subscription response based on operator policies. If an expiry time was included in the request, then the expiry time returned in the response should be less than or equal to that value. If the expiry time is not included in the response, the NF service consumer shall not associate an expiry time for the subscription. | |
| repPeriod | DurationSec | C | 0..1 | Is supplied for notification Method "periodic". | |

| | | | | | |
|--|-------------------|---|------|---|--|
| suppFeat | SupportedFeatures | C | 0..1 | Represents the features supported by the NF service consumer. This parameter shall be supplied by the NF service consumer in the POST request and the response that requested the creation of an Individual Time Synchronization Subscription resource. | |
| NOTE: Only one of the properties "supis", "gpsis", "anyUeInd", "exterGrpld" or "interGrpld" shall be included. | | | | | |

6.1.6.2.3 Type: TimeSyncExposureSubsNotif

Table 6.1.6.2.3-1: Definition of type TimeSyncExposureSubsNotify

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|------------------------------|---|-------------|--|---------------|
| subsNotifId | string | M | 1 | Notification Correlation ID assigned by the NF service consumer. | |
| eventNotifs | array(SubsEventNotification) | M | 1..N | Notifications about Individual Events | |

6.1.6.2.4 Type SubsEventNotification

Table 6.1.6.2.4-1: Definition of type SubsEventNotification

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|---------------------------|---|-------------|---|---------------|
| event | SubscribedEvent | M | 1 | Subscribed events | |
| timeSyncCapas | array(TimeSyncCapability) | C | 1..N | Contains a list of time synchronization capabilities for the List of User-Plane Node IDs. It shall be provided if the reported event is "AVAILABILITY_FOR_TIME_SYNC_SERVICE". | |

6.1.6.2.5 Type: TimeSyncCapability

Table 6.1.6.2.5-1: Definition of type TimeSyncCapability

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---------------------------|---|-------------|--|---------------|
| upNodeId | Uint64 | M | 1 | Identifies the applicable NW-TT. Contains a TSC user plane node Id. If integrated with TSN, the user plane node Id is a bridge Id defined in IEEE Std 802.1Q-2018 [18] clause 14.2.5. | |
| gmCapables | array(GmCapable) | C | 1..N | Indicates whether user plane node supports acting as a gPTP and/or PTP grandmaster. (NOTE) | |
| asTimeRes | AsTimeResource | C | 0..1 | Indicates the supported 5G clock quality (i.e. the source of time used by the 5GS). (NOTE) | |
| ptpCapForUes | map(PtpCapabilitiesPerUe) | C | 1..N | Contains the PTP capabilities supported by the list of UE(s). The key of the map is the SUPI. Shall be present if the "gmCapables" attribute is included and the PTP Capabilities are reported per SUPI. | |
| ptpCapForGpsis | map(PtpCapabilitiesPerUe) | C | 1..N | Contains the PTP capabilities supported by the list of UE(s). The key of the map is the GPSI. Shall be present if the "gmCapables" attribute is included and the PTP Capabilities are reported per GPSI. | |
| NOTE: At least one of the "gmCapables" attribute and "asTimeRes" attribute shall be included. | | | | | |

6.1.6.2.6 Type: PtpCapabilitiesPerUe

Table 6.1.6.2.6: Definition of type PtpCapabilitiesPerUe

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|--|--------------------|---|-------------|--|---------------|
| supi | Supi | C | 0..1 | Identifies the UE to which the reported PTP instance below apply. (NOTE) | |
| gpsi | Gpsi | C | 0..1 | Identifies the UE to which the reported PTP instance below apply. (NOTE) | |
| ptpCaps | array(EventFilter) | M | 1..N | Contains the reported PTP capabilities for the UE. | |
| NOTE: Either the "supi" or the "gpsi" attribute is included, based on whether the request contained an internal or an external identifier. | | | | | |

6.1.6.2.7 Type: TimeSyncExposureConfigNotif

Table 6.1.6.2.7-1: Definition of type TimeSyncExposureConfigNotif

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|----------------------|---|-------------|---|---------------|
| configNotifId | string | M | 1 | Notification Correlation ID assigned by the NF service consumer. | |
| stateOfConfig | StateOfConfiguration | M | 1 | Indicates the current state of time synchronization service configuration | |

6.1.6.2.8 Type: StateOfConfiguration

Table 6.1.6.2.8-1: Definition of type StateOfConfiguration

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|--------------------|---|-------------|--|---------------|
| stateOfNwtt | boolean | O | 0..1 | When the PTP port state is Leader, Follower or Passive, it is included and set to true to indicate the state of configuration for NW-TT port is active; when PTP port state is in any other case, it is included and set to false to indicate the state of configuration for NW-TT port is inactive. Default value is false. | |
| stateOfDstts | array(StateOfDstt) | O | 1..N | Contains the PTP port states of the DS-TT(s). | |

6.1.6.2.9 Type: TimeSyncExposureConfig

Table 6.1.6.2.9-1: Definition of type TimeSyncExposureConfig

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|-----------------|------------------|---|-------------|---|---------------|
| upNodeId | Uint64 | M | 1 | Identifies the applicable NW-TT. Contains a TSC user plane node Id. If integrated with TSN, the user plane node Id is a bridge Id defined in IEEE 802.1Q [41] clause 14.2.5. | |
| reqPtPlns | PtpInstance | M | 1 | Identifies the PtP instance configuration and activation requested by the AF. | |
| gmEnable | boolean | O | 0..1 | Indicates that the AF requests 5GS to act as a grandmaster for PTP or gPTP if it is included and set to true. The default value "false" shall apply, if the attribute is not present. | |
| gmPrio | UInteger | O | 0..1 | Indicates a priority used as defaultDS.priority1 when generating Announce message when 5GS acts as (g)PTP GM. It may be present if the "gmEnable" is set to true. | |
| timeDom | UInteger | M | 1 | Indicate the (g)PTP domain that the (TSN)AF is located in. | |
| timeSyncErrBdgt | UInteger | O | 0..1 | Indicates the time synchronization budget for the time synchronization service in units of nanoseconds. Minimum = 1. | |
| tempValidity | TemporalValidity | O | 0..1 | Indicates the time period when the time synchronization service for a PTP instance is active. | |
| configNotifUri | Uri | M | 1 | Notification URI for configuration state reporting. | |
| configNotifId | string | M | 1 | Notification Correlation ID assigned by the NF service consumer. | |

6.1.6.2.10 Type: PtpInstance

Table 6.1.6.2.10-1: Definition of type PtpInstance

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|----------------------|---|-------------|--|---------------|
| instanceType | InstanceType | M | 1 | Indicates the PTP instance type. | |
| protocol | Protocol | M | 1 | Indicates the protocol type. | |
| ptpProfile | string | M | 1 | Identifies the PTP profile. | |
| portConfigs | array(ConfigForPort) | O | 1..N | Contains the configurations for the PTP port(s) in the PTP instance. | |

6.1.6.2.11 Type: ConfigForPort

Table 6.1.6.2.11-1: Definition of type ConfigForPort

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|------------------|-----------|---|-------------|---|---------------|
| supi | Supi | C | 0..1 | Identifies the UE/DS-TT which the parameters below apply. (NOTE) | |
| gpsi | Gpsi | C | 0..1 | Identifies the UE/ DS-TT which the parameters below apply (NOTE) | |
| n6Ind | boolean | C | 0..1 | Indicates the N6 termination which the parameters below apply. (NOTE) | |
| ptpEnable | boolean | O | 0..1 | This is used to set the portDS.portEnable. If omitted, the default value as described in the PTP Profile is used | |
| logSyncInter | integer | O | 0..1 | Specifies the mean time interval between successive Sync messages. This is applicable for IEEE Std 1588-2019 [25] Boundary Clock or IEEE Std 802.1AS-2020 [26] operation. If omitted, the default value as described in the PTP Profile is used. | |
| logSyncInterInd | boolean | O | 0..1 | When set to FALSE, the value of "logSyncInter" attribute is used to set the initialLogSyncInterval as described in IEEE Std 802.1AS-2020 [26]. When set to TRUE, the value of "logSyncInter" attribute is used to set the mgtSettableLogSyncInterval as described in IEEE Std 802.1AS-2020 [26]. If omitted, the default value as described in the IEEE Std 802.1AS-2020 [26] is used. | |
| logAnnouInter | integer | O | 0..1 | Specifies the mean time interval between successive Announce messages. This is applicable for IEEE Std 1588-2019 [25] Boundary Clock or IEEE Std 802.1AS-2020 [26] operation. If omitted, the default value as described in the PTP Profile is used. | |
| logAnnouInterInd | boolean | O | 0..1 | When set to FALSE, the value of "logAnnouInter" attribute is used to set the initialLogAnnounceInterval as described in IEEE 802.1AS-2020 [26]. When set to TRUE, the value of "logAnnouInter" attribute is used to set the mgtSettableLogAnnounceInterval as described in IEEE Std 802.1AS-2020 [26]. If omitted, the default value as described in the IEEE Std 802.1AS-2020 [26] is used. | |

NOTE: Only one of "supi", "gpsi" or "n6Ind" attribute shall be included.

6.1.6.2.12 Type: StateOfDstt

Table 6.1.6.2.12-1: Definition of type StateOfDstt

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|-----------|---|-------------|--|---------------|
| supi | Supi | C | 0..1 | Identifies the UE/DS-TT which the parameters below apply. (NOTE) | |
| gpsi | Gpsi | C | 0..1 | Identifies the UE/DS-TT which the parameters below apply. (NOTE) | |
| state | boolean | M | 1 | When the PTP port state is Leader, Follower or Passive, it is included and set to true to indicate the state of configuration for DS-TT port is active; when PTP port state is in any other case, it is included and set to false to indicate the state of configuration for DS-TT port is inactive. Default value is false. | |
| NOTE: Either the "supi" or the "gpsi" attribute is included, based on whether the request contained an internal or an external identifier | | | | | |

6.1.6.3 Simple data types and enumerations

6.1.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

6.1.6.3.2 Simple data types

The simple data types defined in table 6.1.6.3.2-1 shall be supported.

Table 6.1.6.3.2-1: Simple data types

| Type Name | Type Definition | Description | Applicability |
|-----------|-----------------|-------------|---------------|
| | | | |

6.1.7 Error Handling

6.1.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [5].

For the Ntsctsf_TimeSynchronization API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Ntsctsf_TimeSynchronization API.

6.1.7.2 Protocol Errors

No specific procedures for the Ntsctsf_TimeSynchronization service are specified.

6.1.7.3 Application Errors

The application errors defined for the Ntsctsf_TimeSynchronization service are listed in Table 6.1.7.3-1.

Table 6.1.7.3-1: Application errors

| Application Error | HTTP status code | Description |
|-------------------|------------------|-------------|
| | | |

6.1.8 Feature negotiation

The optional features in table 6.1.8-1 are defined for the Ntsctsf_TimeSynchronization API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.1.8-1: Supported Features

| Feature number | Feature Name | Description |
|----------------|--------------|-------------|
| | | |

6.1.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Ntsctsf_TimeSynchronization API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Ntsctsf_TimeSynchronization API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Ntsctsf_TimeSynchronization service.

The Ntsctsf_TimeSynchronization API defines a single scope "ntsctsf-time-sync" for the entire service, and it does not define any additional scopes at resource or operation level.

6.2 Ntsctsf_QoSandTSCAssistance Service API

6.2.1 Introduction

The Ntsctsf_QoSandTSCAssistance service shall use the Ntsctsf_QoSandTSCAssistance API.

The API URI of the Ntsctsf_QoSandTSCAssistance API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [4], i.e.:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "ntsctsf-qos-tscai".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.2.3.

6.2.2 Usage of HTTP

6.2.2.1 General

HTTP/2, IETF RFC 7540 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Ntsctsf_QoSandTSCAssistance API is contained in Annex A.

6.2.2.2 HTTP standard headers

6.2.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

6.2.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

JSON object used in the HTTP PATCH request shall be encoded according to "JSON Merge Patch" and shall be signalled by the content type "application/merge-patch+json", as defined in IETF RFC 7396 [22].

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [13].

6.2.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be supported, and the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4] may be supported.

In this Release of the specification, no specific custom headers are defined for the Ntsctsf_QoSandTSCAssistance API.

6.2.3 Resources

6.2.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 6.2.3.1-1 depicts the resource URIs structure for the Ntsctsf_QoSandTSCAssistance API.

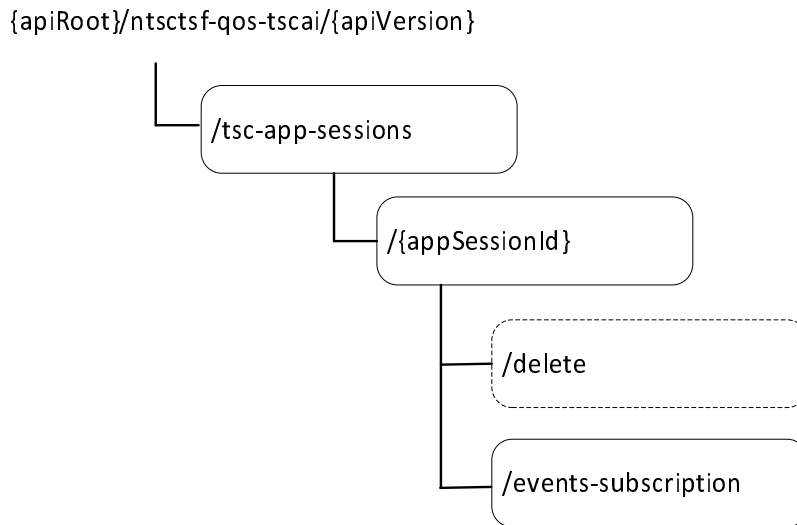


Figure 6.2.3.1-1: Resource URI structure of the Ntsctsf_QoSandTSCAssistance API

Table 6.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.2.3.1-1: Resources and methods overview

| Resource name | Resource URI | HTTP method or custom operation | Description |
|--|--|---------------------------------|--|
| TSC Application Sessions | /tsc-app-sessions | POST | Ntsctsf_QoSandTSCAssistance_Create. Creates a new Individual TSC Application Session Context resource and may create the child Events Subscription sub-resource. |
| Individual TSC Application Session Context | /tsc-app-sessions/{appSessionId} | PATCH | Ntsctsf_QoSandTSCAssistance_Update. Updates an existing Individual TSC Application Session Context resource. It can also update an Events Subscription sub-resource. |
| | | GET | Reads an existing Individual TSC Application Session Context resource. |
| | /tsc-app-sessions/{appSessionId}/delete | delete (POST) | Ntsctsf_QoSandTSCAssistance_Delete. Deletes an existing Individual TSC Application Session Context resource and the child Events Subscription sub-resource. |
| Events Subscription | /tsc-app-sessions/{appSessionId}/events-subscription | PUT | Ntsctsf_QoSandTSCAssistance_Subscribe. Creates a new Events Subscription sub-resource or modifies an existing Events Subscription sub-resource. |
| | | DELETE | Ntsctsf_QoSandTSCAssistance_Unsubscribe. Deletes an Events Subscription sub-resource. |

6.2.3.2 Resource: TSC Application Sessions

6.2.3.2.1 Description

This resource allows a NF service consumer to create a new Individual TSC Application Session Context resource and may create the child Events Subscription sub-resource.

6.2.3.2.2 Resource Definition

Resource URI: {apiRoot}/ntscsf-qos-tscai/<apiVersion>/tsc-app-sessions

This resource shall support the resource URI variables defined in table 6.2.3.2.2-1.

Table 6.2.3.2.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|---------|-----------|------------------|
| apiRoot | string | See clause 6.2.1 |

6.2.3.2.3 Resource Standard Methods

6.2.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.2.3.2.3.1-1.

Table 6.2.3.2.3.1-1: URI query parameters supported by the POST method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.2.3.2.3.1-2 and the response data structures and response codes specified in table 6.2.3.2.3.1-3.

Table 6.2.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

| Data type | P | Cardinality | Description |
|--------------------------|---|-------------|---|
| TscAppSessionContextData | M | 1 | Contains the information for the creation of a new Individual TSC Application Session Context resource. |

Table 6.2.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|--|---|-------------|----------------|--|
| TscAppSessionContextData | M | 1 | 201 Created | The subscription was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header. |
| NOTE: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.2.3.2.3.1-4: Headers supported by the 201 response code on this resource

| Name | Data type | P | Cardinality | Description |
|----------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/ntscsf-qos-tscai/<apiVersion>/tsc-app-sessions/{appSessionId} |

6.2.3.2.4 Resource Custom Operations

None.

6.2.3.3 Resource: Individual TSC Application Session Context

6.2.3.3.1 Description

This resource allows a NF service consumer to read, modify or delete an existing Individual TSC Application Session Context resource.

6.2.3.3.2 Resource Definition

Resource URI: {apiRoot}/ntsetsf-qos-tscai/<apiVersion>/tsc-app-sessions/{appSessionId}

This resource shall support the resource URI variables defined in table 6.2.3.3.2-1.

Table 6.2.3.3.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|--------------|-----------|--|
| apiRoot | string | See clause 6.2.1 |
| appSessionId | string | Identifier of an Individual TSC Application Session Context resource |

6.2.3.3.3 Resource Standard Methods

6.2.3.3.3.1 GET

This method shall support the URI query parameters specified in table 6.2.3.3.3.1-1.

Table 6.2.3.3.3.1-1: URI query parameters supported by the GET method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.2.3.3.3.1-2 and the response data structures and response codes specified in table 6.2.3.3.3.1-3.

Table 6.2.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a | | | |

Table 6.2.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|---|
| TscAppSessionContextData | M | 1 | 200 OK | An Individual TSC Application Session Context resource is returned successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during an Individual TSC Application Session Context resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during an Individual TSC Application Session Context resource retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: The mandatory HTTP error status code for the GET method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.2.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.2.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.2.3.3.3.2 PATCH

This method shall support the URI query parameters specified in table 6.2.3.3.3.2-1.

Table 6.2.3.3.3.2-1: URI query parameters supported by the PATCH method on this resource

| Name | Data type | P | Cardinality | Description |
|------|-----------|---|-------------|-------------|
| n/a | | | | |

This method shall support the request data structures specified in table 6.2.3.3.3.2-2 and the response data structures and response codes specified in table 6.2.3.3.3.2-3.

Table 6.2.3.3.3.2-2: Data structures supported by the PATCH Request Body on this resource

| Data type | P | Cardinality | Description |
|--------------------------------|---|-------------|---|
| TscAppSessionContextUpdateData | M | 1 | Contains the modification(s) to apply to the Individual TSC Application Session Context resource. |

Table 6.2.3.3.3.2-3: Data structures supported by the PATCH Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|--|
| TscAppSessionContextData | M | 1 | 200 OK | Successful case. The Individual TSC Application Session Context resource was modified and a representation of that resource is returned. |
| n/a | | | 204 No Content | Successful case. The Individual TSC Application Session Context resource was modified. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during an Individual TSC Application Session Context resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during an Individual TSC Application Session Context resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [4] for the PATCH method shall also apply. | | | | |

Table 6.2.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.2.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.2.3.3.4 Resource Custom Operations

6.2.3.3.4.1 Overview

Table 6.2.3.3.4.1-1: Custom operations

| Operation name | Custom operation URI | Mapped HTTP method | Description |
|----------------|---|--------------------|---|
| delete | /tsc-app-sessions/{appSessionId}/delete | POST | Ntsctsf_QoSandTSCAssistance_Delete. Deletes an existing Individual TSC Application Session Context resource and the child Events Subscription sub-resource. |

6.2.3.3.4.2 Operation: delete

6.2.3.3.4.2.1 Description

6.2.3.3.4.2.2 Operation Definition

This custom operation deletes an existing Individual TSC Application Session Context resource and the child Events Subscription sub-resource in the TSCTSF.

This operation shall support the request data structures specified in table 6.2.3.3.4.2.2-1 and the response data structure and response codes specified in table 6.2.3.3.4.2.2-2.

Table 6.2.3.3.4.2.2-1: Data structures supported by the POST Request Body on this resource

| Data type | P | Cardinality | Description |
|--------------------|---|-------------|--|
| EventsSubscReqData | O | 0..1 | Events subscription information to be sent by the NF service consumer to request event notification when the Individual TSC Application Session Context resource is deleted. |

Table 6.2.3.3.4.2.2-2: Data structures supported by the POST Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|--|---|-------------|------------------------|--|
| n/a | | | 204 No Content | Successful case. The Individual TSC Application Session Context resource was deleted. |
| EventsNotification | M | 1 | 200 OK | Successful case. Describes information related to the notification of events. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during an Individual TSC Application Session Context resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during an Individual TSC Application Session Context resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [4] for the POST method shall also apply. | | | | |

Table 6.2.3.3.4.2.2-3: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.2.3.3.4.2.2-4: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.2.3.4 Resource: Events Subscription (Document)

6.2.3.4.1 Description

The Events Subscription sub-resource represents a subscription to events for a TSC application session context that exists in the Ntsctsf_QoSandTSCAssistance service.

6.2.3.4.2 Resource Definition

Resource URI: **{apiRoot}/ntscsf-qos-tscai/<apiVersion>/tsc-app-sessions/{appSessionId}/events-subscription**

This resource shall support the resource URI variables defined in table 6.2.3.4.2-1.

Table 6.2.3.4.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|--------------|-----------|---|
| apiRoot | string | See clause 6.2.1 |
| appSessionId | string | Identifier of an Individual TSC Application Session Context resource. |

6.2.3.4.3 Resource Standard Methods

6.2.3.4.3.1 PUT

This method shall support the URI query parameters specified in table 6.2.3.4.3.1-1.

Table 6.2.3.4.3.1-1: URI query parameters supported by the PUT method on this resource

| Name | Data type | P | Cardinality | Description |
|------|-----------|---|-------------|-------------|
| n/a | | | | |

This method shall support the request data structures specified in table 6.2.3.4.3.1-2 and the response data structures and response codes specified in table 6.2.3.4.3.1-3.

Table 6.2.3.4.3.1-2: Data structures supported by the PUT Request Body on this resource

| Data type | P | Cardinality | Description |
|--------------------|---|-------------|--|
| EventsSubscReqData | M | 1 | Contains information for the modification of the Events Subscription sub-resource. |

Table 6.2.3.4.3.1-3: Data structures supported by the PUT Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|---|
| EventsSubscReqData | M | 1 | 201 Created | Successful case. The Events Subscription sub-resource was created. |
| EventsSubscReqData | M | 1 | 200 OK | Successful case. The Events Subscription sub-resource was modified. |
| n/a | | | 204 No Content | Successful case. The Events Subscription sub-resource was modified. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during an Events Subscription sub-resource creation. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during an Events Subscription sub-resource creation. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [4] for the PUT method shall also apply. | | | | |

Table 6.2.3.4.3.1-4: Headers supported by the 201 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|----------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/ntsctsf-qos-tscai/<apiVersion>/tsc-app-sessions/{appSessionId}/events-subscription |

Table 6.2.3.4.3.1-5: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.2.3.4.3.1-6: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.2.3.4.3.2 DELETE

This method shall support the URI query parameters specified in table 6.2.3.4.3.2-1.

Table 6.2.3.4.3.2-1: URI query parameters supported by the DELETE method on this resource

| Name | Data type | P | Cardinality | Description |
|------|-----------|---|-------------|-------------|
| n/a | | | | |

This method shall support the request data structures specified in table 6.2.3.4.3.2-2 and the response data structures and response codes specified in table 6.2.3.4.3.2-3.

Table 6.2.3.4.3.2-2: Data structures supported by the DELETE Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a | | | |

Table 6.2.3.4.3.2-3: Data structures supported by the DELETE Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|--|---|-------------|------------------------|---|
| n/a | | | 204 No Content | Successful case. The Events Subscription sub-resource was deleted. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during an Events Subscription sub-resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during an Events Subscription sub-resource deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [4] for the DELETE method shall also apply. | | | | |

Table 6.2.3.4.3.2-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.2.3.4.3.2-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.2.3.4.4 Resource Custom Operations

None.

6.2.4 Custom Operations without associated resources

None.

6.2.5 Notifications

6.2.5.1 General

Notifications shall comply to clause 6.2 of 3GPP TS 29.500 [4] and clause 4.6.2.3 of 3GPP TS 29.501 [5].

Table 6.2.5.1-1: Notifications overview

| Notification | Callback URI | HTTP method or custom operation | Description (service operation) |
|---------------------|----------------------|---------------------------------|---|
| Event Notification | {notifUri}/notify | notify (POST) | TSCTSF event notification. |
| Termination Request | {notifUri}/terminate | terminate (POST) | Request for termination of an Individual TSC Application Session Context. |

6.2.5.2 Event Notification

6.2.5.2.1 Description

The Event Notification is used by the TSCTSF to report one or several observed application session context events to the NF service consumer that has subscribed to such notifications via the Events Subscription sub-resource.

6.2.5.2.2 Target URI

The Callback URI "{notifUri}/notify" shall be used with the callback URI variables defined in table 6.2.5.2.2-1.

Table 6.2.5.2.2-1: Callback URI variables

| Name | Definition |
|----------|--|
| notifUri | The Notification Uri as assigned within the Events Subscription sub-resource and described within the EventsSubscReqData type (see table 6.2.6.2.3-1) or EventsSubscReqDataRm (see table 6.2.6.2.5-1). |

6.2.5.2.3 Standard Methods

6.2.5.2.3.1 POST

This method shall support the request data structures specified in table 6.2.5.2.3.1-1 and the response data structures and response codes specified in table 6.2.5.2.3.1-1.

Table 6.2.5.2.3.1-2: Data structures supported by the POST Request Body

| Data type | P | Cardinality | Description |
|--------------------|---|-------------|---|
| EventsNotification | M | 1 | Provides Information about observed events. |

Table 6.2.5.2.3.1-3: Data structures supported by the POST Response Body

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|---|
| n/a | | | 204 No Content | The event notification is received successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.2.5.2.3.1-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

Table 6.2.5.2.3.1-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

6.2.5.3 Termination Request

6.2.5.3.1 Description

The Termination Request is used by the TSCTSF to request the NF service consumer the deletion of the Individual TSC Application Session Context resource.

6.2.5.3.2 Target URI

The Callback URI "{notifUri}/terminate " shall be used with the callback URI variables defined in table 6.2.5.3.2-1.

Table 6.2.5.3.2-1: Callback URI variables

| Name | Definition |
|----------|--|
| notifUri | The Notification Uri as assigned within the Individual TSC Application Session Context resource and described within the TscAppSessionContextData Data type (see table 6.2.6.2.2-1) or TscAppSessionContextUpdateData (see table 6.2.6.2.4-1). |

6.2.5.3.3 Standard Methods

6.2.5.3.3.1 POST

This method shall support the request data structures specified in table 6.2.5.3.3.1-1 and the response data structures and response codes specified in table 6.2.5.3.3.1-1.

Table 6.2.5.3.3.1-2: Data structures supported by the POST Request Body

| Data type | P | Cardinality | Description |
|-----------------|---|-------------|--|
| TerminationInfo | M | 1 | Provides information about the deletion of the resource. |

Table 6.2.5.3.3.1-3: Data structures supported by the POST Response Body

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|---|
| n/a | | | 204 No Content | The receipt of the Notification is acknowledged. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.2.5.3.3.1-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

Table 6.2.5.3.3.1-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected |

6.2.6 Data Model

6.2.6.1 General

This clause specifies the application data model supported by the API.

Table 6.2.6.1-1 specifies the data types defined for the Ntsctsf_QoSandTSCAssistance service based interface protocol.

Table 6.2.6.1-1: Ntsctsf_QoSandTSCAssistance specific Data Types

| Data type | Clause defined | Description | Applicability |
|--------------------------------|----------------|--|---------------|
| EventsNotification | 6.2.6.2.6 | Describes the notification(s) about the event(s) occurred within an Individual TSC Application Session Context resource. | |
| EventNotification | 6.2.6.2.7 | Describes the notification for an Event. | |
| EventsSubscReqData | 6.2.6.2.3 | Identifies the events the application subscribes to within an Individual TSC Application Session Context resource | |
| EventsSubscReqDataRm | 6.2.6.2.5 | This data type is defined in the same way as the "EventsSubscReqData" data type, but with the OpenAPI "nullable: true" property. | |
| TscAppSessionContextData | 6.2.6.2.2 | Represents the Individual TSC Application Session Context resource data. | |
| TscAppSessionContextUpdateData | 6.2.6.2.4 | Describes the modifications to an Individual TSC Application Session Context resource. | |
| TscEvent | 6.2.6.3.3 | Indicates the subscribed event(s). | |

Table 6.2.6.1-2 specifies data types re-used by the Ntsctsf_QoSandTSCAssistance service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Ntsctsf_QoSandTSCAssistance service based interface.

Table 6.2.6.1-2: Ntsctsf_QoSandTSCAssistance re-used Data Types

| Data type | Reference | Comments | Applicability |
|----------------------------|---------------------|--|----------------------|
| AccumulatedUsage | 3GPP TS 29.122 [21] | Accumulated Usage. | |
| AspId | 3GPP TS 29.514 [20] | Contains an identity of an application service provider. | |
| Dnn | 3GPP TS 29.571 [15] | The DNN the user is connected to. | |
| EthFlowDescription | 3GPP TS 29.514 [20] | Defines a packet filter for an Ethernet flow. | |
| EthFlowInfo | 3GPP TS 29.122 [21] | Contains an UL and/or DL Flow information. | Ethernet_UL/DL_Flows |
| FlowInfo | 3GPP TS 29.122 [21] | Contains the IP data flow information. | |
| IpAddr | 3GPP TS 29.571 [15] | Contains the IP address. | |
| MacAddr48 | 3GPP TS 29.571 [15] | MAC Address. | |
| QosMonitoringInformation | 3GPP TS 29.122 [21] | Contains Qos Monitoring information. | |
| QosMonitoringInformationRm | 3GPP TS 29.122 [21] | This data type is defined in the same way as the "QosMonitoringInformation" data type, but with the OpenAPI "nullable: true" property. | |
| QosMonitoringReport | 3GPP TS 29.122 [21] | Contains Qos Monitoring Report information. | |
| Snsai | 3GPP TS 29.571 [15] | Identifies the S-NSSAI. | |
| SponId | 3GPP TS 29.514 [20] | Contains an Identity of a sponsor. | |
| SponsoringStatus | 3GPP TS 29.514 [20] | Represents whether sponsored data connectivity is enabled or disabled/not enabled. | |
| SubscribedEvent | 3GPP TS 29.522 [17] | Indicates the subscribed event. | |
| SupportedFeatures | 3GPP TS 29.571 [15] | Used to negotiate the applicability of the optional features defined in table 5.8-1. | |
| TerminationInfo | 3GPP TS 29.514 [20] | Includes information related to the termination of the Individual TSC Application Session Context resource. | |
| TscQosRequirement | 3GPP TS 29.122 [21] | Contains the QoS requirements for time sensitive communication. | |
| TscQosRequirementRm | 3GPP TS 29.122 [21] | This data type is defined in the same way as the "TscQosRequirement" data type, but with removable attributes. | |
| UsageThreshold | 3GPP TS 29.122 [21] | Time period and/or traffic volume in which the QoS is to be applied. | |
| UsageThresholdRm | 3GPP TS 29.122 [21] | This data type is defined in the same way as the "UsageThreshold" data type, but with the OpenAPI "nullable: true" property. | |
| Uri | 3GPP TS 29.571 [15] | Identifies a referenced resource. | |

6.2.6.2 Structured data types

6.2.6.2.1 Introduction

This clause defines the structures to be used in resource representations.

6.2.6.2.2 Type TscAppSessionContextData

Table 6.2.6.2.2-1: Definition of type TscAppSessionContextData

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|------------------|---|---|-------------|--|----------------------|
| ueIpAddr | IpAddr | C | 0..1 | The address of the UE. (NOTE 1) | |
| ipDomain | string | C | 0..1 | The IPv4 address domain identifier. The attribute may only be provided if the ueIpAddr attribute is present and contains an IPv4 address. | |
| ueMac | MacAddr48 | C | 0..1 | Identifies the MAC address. (NOTE 1) | |
| dnn | Dnn | O | 0..1 | Data Network Name, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. | |
| snssai | Snssai | O | 0..1 | Identifies the S-NSSAI. | |
| notifUri | Uri | M | 1 | Notification URI for Individual TSC Application Session Context termination requests. | |
| appld | string | C | 0..1 | Identifies the Application Identifier. (NOTE 1) | |
| flowInfo | array(FlowInfo) | C | 1..N | Describe the IP data flow which requires QoS. (NOTE 1) (NOTE 4) | |
| enEthFlowInfo | array(EthFlowInfo) | C | 1..N | Identifies the Ethernet flows which require QoS. Each Ethernet flow consists of a flow identifier and the corresponding UL and/or DL flows. (NOTE 1) (NOTE 4) | Ethernet_UL/DL_Flows |
| ethFlowInfo | array(EthFlowDescription) | C | 1..N | Identifies Ethernet packet flows. (NOTE 1) | |
| aflid | string | M | 1 | Identifies the AF identifier. | |
| tscQosReq | TscQosRequirement | C | 0..1 | Contains the QoS requirements for time sensitive communication. (NOTE 2) | |
| qosReference | string | C | 0..1 | Identifies a pre-defined QoS information. (NOTE 2) (NOTE 3) | |
| altQosReferences | array(string) | C | 1..N | Identifies an ordered list of pre-defined QoS information. The lower the index of the array for a given entry, the higher the priority. (NOTE 3) | |
| altQosReqs | array(AlternativeServiceRequirementsData) | C | 1..N | Identifies an ordered list of alternative service requirements that include individual QoS parameter set(s). The lower the index of the array for a given entry, the higher the priority. (NOTE 3) | |
| sponId | SponId | O | 0..1 | Sponsor identity. | |
| aspld | Aspld | O | 0..1 | Application service provider identity. It shall be included if | |
| sponStatus | SponsoringStatus | O | 0..1 | Indication of whether sponsored connectivity is enabled or disabled/not enabled. The absence of the attribute indicates that the sponsored connectivity is enabled. | |
| evSubsc | EventsSubscReqData | O | 0..1 | Identifies the events the application subscribes to at creation of an Individual TSC Application Session Context resource. | |
| supFeat | SupportedFeatures | C | 0..1 | This IE represents a list of Supported features used as described in clause 6.2.8. It shall be supplied by the NF service consumer in the POST request and response of requests a creation of an Individual TSC Application Session Context resource. | |

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|---|---|-------------|-------------|---------------|
| NOTE 1: | Either "ueIpAddr" attribute or "ueMac" attribute shall be included. If IP address is provided, IP flow information shall be provided. If ipv4, the domain identifier may be provided. If mac address is provided, Ethernet flow information shall be provided. One of IP flow information, Ethernet flow information or Application Identifier shall be provided. | | | | |
| NOTE 2: | The attributes "reqGbrDI", "reqGbrUI", "reqMbrDI", "reqMbrUI", "maxTscBurstSize", "req5Gsdelay", and "priority" within the "tscQosReq" attribute may be provided only if the "qosReference" attribute is not provided. At least one of "tscQosReq" attribute or "qosReference" attribute shall be included. | | | | |
| NOTE 3: | The attributes "altQoSReferences" and "altQoSReqs" are mutually exclusive. The attributes "qosReference" and "altQoSReqs" are also mutually exclusive. | | | | |
| NOTE 4: | When the Ethernet flow information is provided and the Ethernet_UL/DL_Flows feature is supported, either the "ethFlowInfo" or the "enEthFlowInfo" shall be provided, but not both simultaneously. | | | | |

6.2.6.2.3 Type EventsSubscReqData

Table 6.2.6.2.3-1: Definition of type EventsSubscReqData

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|--------------------------|---|-------------|--|---------------|
| events | array(TscEvent) | M | 1..N | Subscribed Events. | |
| notifUri | Uri | M | 1 | Notification URI for event notification. | |
| qosMon | QosMonitoringInformation | C | 0..1 | Qos Monitoring information. It can be present when the event "QOS_MONITORING" is subscribed. | |
| usgThres | UsageThreshold | C | 0..1 | Includes the volume and/or time thresholds for sponsored data connectivity. It can be present when the event "USAGE_REPORT" is subscribed. | |
| notifCorreId | string | M | 1 | It is used to set the value of Notification Correlation ID in the corresponding notification. | |

6.2.6.2.4 Type TscAppSessionContextUpdateData

Table 6.2.6.2.4-1: Definition of type TscAppSessionContextUpdateData

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|---|---|-------------|--|----------------------|
| notifUri | Uri | O | 0..1 | Notification URI for Individual TSC Application Session Context termination requests. | |
| appld | string | O | 0..1 | Identifies the external Application Identifier. (NOTE 1) | |
| flowInfo | array(FlowInfo) | O | 1..N | Describe the IP data flow which requires QoS. (NOTE 1) | |
| ethFlowInfo | array(EthFlowDescription) | O | 1..N | Identifies Ethernet packet flows. (NOTE 1) (NOTE 4) | |
| enEthFlowInfo | array(EthFlowInfo) | C | 1..N | Identifies the Ethernet flows which require QoS. Each Ethernet flow consists of a flow identifier and the corresponding UL and/or DL flows. (NOTE 1) (NOTE 4) | Ethernet_UL/DL_Flows |
| tscQosReq | TscQosRequirementRm | C | 0..1 | Contains the QoS requirements for time sensitive communication. (NOTE 2) | |
| qosReference | string | C | 0..1 | Identifies a pre-defined QoS information. (NOTE 2) (NOTE 3) | |
| altQosReferences | array(string) | C | 1..N | Identifies an ordered list of pre-defined QoS information. The lower the index of the array for a given entry, the higher the priority. (NOTE 3) | |
| altQosReqs | array(AlternativeServiceRequirementsData) | C | 1..N | Identifies an ordered list of alternative service requirements that include individual QoS parameter set(s). The lower the index of the array for a given entry, the higher the priority. (NOTE 3) | |
| evSubsc | EventsSubscReqDataRm | O | 0..1 | Identifies the events the application subscribes to at modification of an Individual TSC Application Session Context resource. | |
| sponId | SponId | O | 0..1 | Sponsor identity. | |
| aspld | Aspld | O | 0..1 | Application service provider identity. It shall be included if | |
| sponStatus | SponsoringStatus | O | 0..1 | Indication of whether sponsored connectivity is enabled or disabled/not enabled. The absence of the attribute indicates that the sponsored connectivity is enabled. | |
| <p>NOTE 1: One of IP flow information, Ethernet flow information or Application Identifier may be provided.</p> <p>NOTE 2: Either "tscQosReq" attribute or "qosReference" attribute may be provided.</p> <p>NOTE 3: The attributes "altQoSReferences" and "altQoSReqs" are mutually exclusive. The attributes "qosReference" and "altQoSReqs" are also mutually exclusive.</p> <p>NOTE 4: When the Ethernet flow information is provided and the Ethernet_UL/DL_Flows feature is supported, either the "ethFlowInfo" or the "enEthFlowInfo" shall be provided, but not both simultaneously.</p> | | | | | |

6.2.6.2.5 Type EventsSubscReqDataRm

This data type is defined in the same way as the "EventsSubscReqData" data type, but:

- with the OpenAPI "nullable: true" property; and
- the removable attribute "usgThres" is defined with the removable data type "UsageThresholdRm"; and removable attribute "qosMon" is defined with the removable data type "QosMonitoringInformationRm".

Table 6.2.6.2.5-1: Definition of type EventsSubscReqDataRm

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|----------------------------|---|-------------|--|---------------|
| events | array(TscEvent) | M | 1..N | Subscribed Events. | |
| notifUri | Uri | O | 0..1 | Notification URI for event notification. | |
| qosMon | QosMonitoringInformationRm | O | 0..1 | Qos Monitoring information. It can be present when the event "QOS_MONITORING" is subscribed. | |
| usgThres | UsageThresholdRm | C | 0..1 | Includes the volume and/or time thresholds for sponsored data connectivity. It can be present when the notified event is "USAGE_REPORT". | |
| notifCorrelId | string | O | 0..1 | It is used to set the value of Notification Correlation ID in the corresponding notification. | |

6.2.6.2.6 Type EventsNotification

Table 6.2.6.2.6-1: Definition of type EventsNotification

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|--------------------------|---|-------------|---|---------------|
| notifCorrelId | string | M | 1 | It is used to set the value of Notification Correlation ID in the corresponding notification. | |
| events | array(EventNotification) | M | 1..N | Contains the reported event(s). | |

6.2.6.2.7 Type EventNotification

Table 6.2.6.2.7-1: Definition of type EventNotification

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|----------------|----------------------------|---|-------------|---|---------------|
| event | TscEvent | M | 1 | Indicates the event reported by the TSCTSF. | |
| flowIds | array(integer) | O | 1..N | Identifies the flows that were sent during event subscription | |
| qosMonReports | array(QosMonitoringReport) | C | 1..N | QoS Monitoring reporting information. It shall be present when the notified event is "QOS_MONITORING". | |
| appliedQosRef | string | C | 0..1 | The currently applied alternative QoS requirement referring to an alternative QoS reference or a requested alternative QoS parameter set. Applicable for event QOS_NOT_GUARANTEED or SUCCESSFUL_RESOURCES_ALLOCATION. When it is omitted and the "event" attribute is QOS_NOT_GUARANTEED, the event report indicates that the lowest priority alternative QoS profile could not be fulfilled either. | |
| usgRep | AccumulatedUsage | C | 0..1 | Indicates the measured volume and/or time for sponsored data connectivity. Applicable for event USAGE_REPORT. | |

6.2.6.3 Simple data types and enumerations

6.2.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

6.2.6.3.2 Simple data types

The simple data types defined in table 6.2.6.3.2-1 shall be supported.

Table 6.2.6.3.2-1: Simple data types

| Type Name | Type Definition | Description | Applicability |
|-----------|--|-------------|---------------|
| | <one simple data type, i.e. boolean, integer, number, or string> | | |

6.2.6.3.3 Enumeration: TscEvent

The enumeration TscEvent represents event for TSC. It shall comply with the provisions defined in table 6.2.6.3.3-1.

Table 6.2.6.3.3-1: Enumeration TscEvent

| Enumeration value | Description | Applicability |
|---------------------------------|--|---------------|
| FAILED_RESOURCES_ALLOCATION | Indicates that one or more of the SDFs of an Individual TSC Application Session Context are deactivated. It also indicates that the resources requested for a particular service information cannot be successfully allocated. | |
| SUCCESSFUL_RESOURCES_ALLOCATION | Indicates that the resources requested for particular service information have been successfully allocated. | |
| QOS_GUARANTEED | The QoS targets of one or more SDFs are guaranteed again. | |
| QOS_NOT_GUARANTEED | The QoS targets of one or more SDFs are not being guaranteed. | |
| QOS_MONITORING | Indicates a QoS monitoring event. | |
| USAGE_REPORT | Volume and/or time usage for sponsored data connectivity. | |

6.2.7 Error Handling

6.2.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [4].

For the Ntsctsf_QoSandTSCAssistance API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Ntsctsf_QoSandTSCAssistance API.

6.2.7.2 Protocol Errors

No specific procedures for the Ntsctsf_QoSandTSCAssistance service are specified.

6.2.7.3 Application Errors

The application errors defined for the Ntsctsf_QoSandTSCAssistance service are listed in Table 6.2.7.3-1.

Table 6.2.7.3-1: Application errors

| Application Error | HTTP status code | Description |
|-------------------|------------------|-------------|
| | | |

6.2.8 Feature negotiation

The optional features in table 6.2.8-1 are defined for the Ntsctsf_QoSandTSCAssistance API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.2.8-1: Supported Features

| Feature number | Feature Name | Description |
|----------------|----------------------|--|
| 1 | Ethernet_UL/DL_Flows | Indicates the support of the description of the Ethernet flows as the combination of Flow Identifier, and UL and/or DL Ethernet flows. |

6.2.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Ntsctsf_QoSandTSCAssistance API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Ntsctsf_QoSandTSCAssistance API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Ntsctsf_QoSandTSCAssistance service.

The Ntsctsf_QoSandTSCAssistance API defines a single scope "ntsctsf-qos-tscai" for the entire service, and it does not define any additional scopes at resource or operation level.

6.3 Ntsctsf_ASTI Service API

6.3.1 Introduction

The Ntsctsf_ASTI service shall use the Ntsctsf_ASTI API.

The API URI of the Ntsctsf_ASTI API shall be:

{apiRoot}/<apiName>/<apiVersion>

The request URIs used in HTTP requests from the NF service consumer towards the NF service producer shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [5], i.e.:

{apiRoot}/<apiName>/<apiVersion>/<apiSpecificResourceUriPart>

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "ntsctsf-asti".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 6.3.3.

6.3.2 Usage of HTTP

6.3.2.1 General

HTTP/2, IETF RFC 7540 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Ntsctsf_ASTI API is contained in Annex A.

6.3.2.2 HTTP standard headers

6.3.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

6.3.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.4 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [13].

6.3.2.3 HTTP custom headers

The mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] shall be supported, and the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4] may be supported.

In this Release of the specification, no specific custom headers are defined for the Ntsctsf_ASTI API.

6.3.3 Resources

6.3.3.1 Overview

This clause describes the structure for the Resource URIs and the resources and methods used for the service.

Figure 6.2.3.1-1 depicts the resource URIs structure for the Ntsctsf_ASTI API.

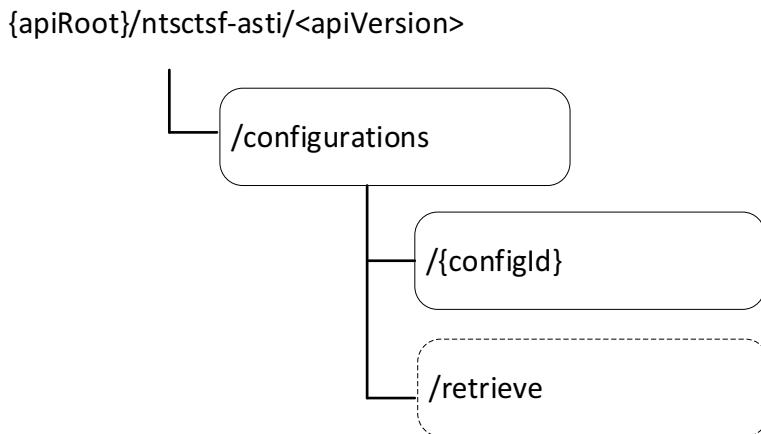


Figure 6.3.3.1-1: Resource URI structure of the Ntsctsf_ASTI API

Table 6.3.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 6.3.3.1-1: Resources and methods overview

| Resource name | Resource URI | HTTP method or custom operation | Description |
|-------------------------------|----------------------------|---------------------------------|---|
| ASTI Configurations | /configurations/ | POST | Create a new configuration of the 5G access stratum time distribution. |
| | configurations/retrieve | retrieve (POST) | Request the status of the access stratum time distribution for a list of UEs. |
| Individual ASTI Configuration | /configurations/{configId} | PUT | Request to update the 5G access stratum time distribution configuration. |
| | | DELETE | Request to delete the 5G access stratum time distribution configuration. |

6.3.3.2 Resource: ASTI Configurations

6.3.3.2.1 Description

This resource allows a NF service consumer to create a new Individual ASTI Configuration resource.

6.3.3.2.2 Resource Definition

Resource URI: {apiRoot}/ntsctsf-asti/<apiVersion>/configurations

This resource shall support the resource URI variables defined in table 6.3.3.2.2-1.

Table 6.3.3.2.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|---------|-----------|------------------|
| apiRoot | string | See clause 6.3.1 |

6.3.3.2.3 Resource Standard Methods

6.3.3.2.3.1 POST

This method shall support the URI query parameters specified in table 6.3.3.2.3.1-1.

Table 6.3.3.2.3.1-1: URI query parameters supported by the POST method on this resource

| Name | Data type | P | Cardinality | Description | Applicability |
|------|-----------|---|-------------|-------------|---------------|
| n/a | | | | | |

This method shall support the request data structures specified in table 6.3.3.2.3.1-2 and the response data structures and response codes specified in table 6.3.3.2.3.1-3.

Table 6.3.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

| Data type | P | Cardinality | Description |
|----------------------------|---|-------------|--|
| AccessTimeDistributionData | M | 1 | Contains the information for the creation of a new Individual ASTI Configuration resource. |

Table 6.3.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|--|---|-------------|----------------|---|
| AccessTimeDistributionData | M | 1 | 201 Created | The resource was created successfully and a representation of the created resource is returned. The URI of the created resource shall be returned in the "Location" HTTP header. |
| NOTE: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 6.3.3.2.3.1-4: Headers supported by the 201 response code on this resource

| Name | Data type | P | Cardinality | Description |
|----------|-----------|---|-------------|--|
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/ntsctsf-asti/<apiVersion>/configurations/{configId} |

6.3.3.2.4 Resource Custom Operations

6.3.3.2.4.1 Overview

Table 6.3.3.2.4.1-1: Custom operations

| Operation Name | Custom operation URI | Mapped HTTP method | Description |
|----------------|--------------------------|--------------------|--|
| retrieve | /configurations/retrieve | retrieve (POST) | Request the status of the 5G access stratum time distribution for a list of UEs. |

6.3.3.2.4.2 Operation: retrieve

6.3.3.2.4.2.1 Description

6.3.3.2.4.2.2 Operation Definition

This custom operation retrieves the status of the access stratum time distribution for a list of UEs.

This operation shall support the request data structures specified in table 6.3.3.2.4.2.2-1 and the response data structure and response codes specified in table 6.3.3.2.4.2.2-2.

Table 6.3.3.2.4.2.2-1: Data structures supported by the POST Request Body on this resource

| Data type | P | Cardinality | Description |
|-------------------|---|-------------|---|
| StatusRequestData | M | 1 | Parameters to be sent by the NF service consumer when the status of the 5G access stratum time distribution for a list of UEs is requested. |

Table 6.3.3.2.4.2.2-2: Data structures supported by the POST Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|----------------|--|
| StatusResponseData | M | 1 | 200 OK | Status of the 5G access stratum time distribution for a list of UEs is returned. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] shall also apply. | | | | |

6.3.3.3 Resource: Individual ASTI Configuration

6.3.3.3.1 Description

This resource allows a NF service consumer to read, modify or delete an existing Individual ASTI Configuration resource.

6.3.3.3.2 Resource Definition

Resource URI: {apiRoot}/ntscsf-asti/<apiVersion>/configurations/{configId}

This resource shall support the resource URI variables defined in table 6.3.3.3.2-1.

Table 6.3.3.3.2-1: Resource URI variables for this resource

| Name | Data type | Definition |
|----------|-----------|--|
| apiRoot | string | See clause 6.3.1 |
| configId | string | Identifier of an Individual ASTI Configuration resource. |

6.3.3.3.3 Resource Standard Methods

6.3.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 6.3.3.3.3.2-1.

Table 6.3.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

| Name | Data type | P | Cardinality | Description |
|------|-----------|---|-------------|-------------|
| n/a | | | | |

This method shall support the request data structures specified in table 6.3.3.3.3.2-2 and the response data structures and response codes specified in table 6.3.3.3.3.2-3.

Table 6.3.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

| Data type | P | Cardinality | Description |
|----------------------------|---|-------------|--|
| AccessTimeDistributionData | M | 1 | Contains the modification(s) to apply to the Individual ASTI Configuration resource. |

Table 6.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|---|
| AccessTimeDistributionData | M | 1 | 200 OK | Successful case. The Individual ASTI Configuration resource was modified and a representation of that resource is returned. |
| n/a | | | 204 No Content | Successful case. The Individual ASTI Configuration resource was modified. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during an Individual ASTI Configuration resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during an Individual ASTI Configuration resource modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [4] for the PATCH method shall also apply. | | | | |

Table 6.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.3.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 6.3.3.3.3.3-1.

Table 6.3.3.3.3.3-1: URI query parameters supported by the DELETE method on this resource

| Name | Data type | P | Cardinality | Description |
|------|-----------|---|-------------|-------------|
| n/a | | | | |

This method shall support the request data structures specified in table 6.3.3.3.3.3-2 and the response data structures and response codes specified in table 6.3.3.3.3.3-3.

Table 6.3.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

| Data type | P | Cardinality | Description |
|-----------|---|-------------|-------------|
| n/a | | | |

Table 6.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

| Data type | P | Cardinality | Response codes | Description |
|---|---|-------------|------------------------|--|
| n/a | | | 204 No Content | The configuration was terminated successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during an Individual ASTI Configuration resource modification deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during an Individual ASTI Configuration resource modification e deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| NOTE: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [4] for the PATCH method shall also apply. | | | | |

Table 6.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

Table 6.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

| Name | Data type | P | Cardinality | Description |
|-----------------------|-----------|---|-------------|---|
| Location | string | M | 1 | An alternative URI of the resource located in an alternative TSCTSF (service) instance. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the request is redirected. |

6.3.3.3.4 Resource Custom Operations

None.

6.3.4 Custom Operations without associated resources

None.

6.3.5 Notifications

None.

6.3.6 Data Model

6.3.6.1 General

This clause specifies the application data model supported by the API.

Table 6.3.6.1-1 specifies the data types defined for the Ntsctsf_ASTI service based interface protocol.

Table 6.3.6.1-1: Ntsctsf_ASTI specific Data Types

| Data type | Clause defined | Description | Applicability |
|----------------------------|----------------|---|---------------|
| AccessTimeDistributionData | 6.3.6.2.2 | Contains the parameters for the creation of 5G access stratum time distribution configuration. | |
| AsTimeDistributionParam | 6.3.6.2.3 | Contains the 5G access stratum time distribution parameters. | |
| ActiveUe | 6.3.6.2.6 | Contains the UE identifier whose status of the access stratum time distribution is active and the optional requested time synchronization error budget. | |
| StatusRequestData | 6.3.6.2.4 | Contains the parameters for retrieval of the status of the access stratum time distribution for a list of UEs. | |
| StatusResponseData | 6.3.6.2.5 | Contains the parameters for the status of the access stratum time distribution for a list of UEs. | |

Table 6.3.6.1-2 specifies data types re-used by the Ntsctsf_ASTI service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Ntsctsf_ASTI service based interface.

Table 6.3.6.1-2: Ntsctsf_ASTI re-used Data Types

| Data type | Reference | Comments | Applicability |
|-------------------|---------------------|--|---------------|
| ExternalGroupId | 3GPP TS 29.571 [15] | Identifies an External Group. | |
| Gpsi | 3GPP TS 29.571 [15] | The external identification of the user (i.e., an External Id or an MSISDN). | |
| GroupId | 3GPP TS 29.571 [15] | Identifies a group of internal globally unique ID. | |
| Supi | 3GPP TS 29.571 [15] | The identification of the user (i.e. IMSI, NAI). | |
| SupportedFeatures | 3GPP TS 29.571 [15] | Used to negotiate the applicability of the optional features defined in table 6.3.8-1. | |
| TemporalValidity | 3GPP TS 29.514 [20] | TemporalValidity | |
| UInteger | 3GPP TS 29.571 [15] | Unsigned integer. | |

6.3.6.2 Structured data types

6.3.6.2.1 Introduction

This clause defines the structures to be used in resource representations.

6.3.6.2.2 Type: AccessTimeDistributionData

Table 6.3.6.2.2-1: Definition of type AccessTimeDistributionData

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|---|-------------------------|---|-------------|--|---------------|
| supis | array(Supi) | C | 1..N | Subscription Permanent Identifier(s). (NOTE) | |
| gpsis | array(Gpsi) | C | 1..N | Public user Identifier(s). (NOTE) | |
| interGrpld | Groupld | C | 0..1 | The internal Group Id(s). (NOTE) | |
| exterGrpld | ExternalGroupld | C | 0..1 | The external Group Id(s). (NOTE) | |
| asTimeDisParam | AsTimeDistributionParam | M | 1 | 5G access stratum time distribution parameters | |
| suppFeat | SupportedFeatures | C | 0..1 | Represents the features supported by the NF service consumer. This parameter shall be supplied by the NF service consumer in the POST request and the response that requested the creation of an Individual ASTI Configuration resource. | |
| NOTE: One of "supis", "gpsis", "exterGroupld" or "interGrpld" attributes shall be provided. | | | | | |

6.3.6.2.3 Type: AsTimeDistributionParam

Table 6.3.6.2.3-1: Definition of type AsTimeDistributionParam

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|------------------|------------------|---|-------------|---|---------------|
| asTimeDisEnabled | boolean | O | 0..1 | When this attribute is included and set to true, it indicates that the access stratum time distribution via Uu reference point is activated. When present it shall be set as follows: - true: activated. - false (default): deactivated. | |
| timeSyncErrBdgt | UInteger | O | 0..1 | Indicates the time synchronization error budget in terms of time units of nanoseconds. | |
| tempValidity | TemporalValidity | O | 0..1 | Indicates the time interval during which the AF request is to be applied. | |

6.3.6.2.4 Type: StatusRequestData

Table 6.3.6.2.4-1: Definition of type StatusRequestData

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|--|-------------|---|-------------|---------------------------------------|---------------|
| supis | array(Supi) | C | 1..N | Subscription Permanent Identifier(s). | |
| gpsis | array(Gpsi) | C | 1..N | Public User Identifier(s). (NOTE) | |
| NOTE: Either the "supis" or the "gpsis" attribute is included, based on whether the request contained an internal or an external identifier. | | | | | |

6.3.6.2.5 Type: StatusResponseData

Table 6.3.6.2.5-1: Definition of type StatusResponseData

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|--|-----------------|---|-------------|--|---------------|
| inactiveUes | array(Supi) | O | 1..N | Indicate the SUPI(s) whose status of the access stratum time distribution is inactive. (NOTE) | |
| inactiveGpsis | array(Gpsi) | O | 1..N | Indicate the GPSI(s) whose status of the access stratum time distribution is inactive. (NOTE) | |
| activeUes | array(ActiveUe) | O | 1..N | Contains the UE identifier(s) whose status of the access stratum time distribution is active and the optional requested time synchronization error budget. | |
| NOTE: Either the "inactiveUes" or the "inactiveGpsis" attribute is included, based on whether the request contained an internal or an external identifier. | | | | | |

6.3.6.2.6 Type: ActiveUe

Table 6.3.6.2.6-1: Definition of type ActiveUe

| Attribute name | Data type | P | Cardinality | Description | Applicability |
|--|-----------|---|-------------|--|---------------|
| supi | Supi | C | 0..1 | Indicate the SUPI whose status of the access stratum time distribution is active. (NOTE) | |
| gpsi | Gpsi | C | 0..1 | Indicate the GPSI whose status of the access stratum time distribution is active. (NOTE) | |
| timeSyncErrBdgt | UInteger | O | 0..1 | Indicates the time synchronization error budget in terms of time units of nanoseconds. | |
| NOTE: Either the "supi" or the "gpsi" attribute is included, based on whether the request contained an internal or an external identifier. | | | | | |

6.3.6.3 Simple data types and enumerations

6.3.6.3.1 Introduction

This clause defines simple data types and enumerations that can be referenced from data structures defined in the previous clauses.

6.3.6.3.2 Simple data types

The simple data types defined in table 6.3.6.3.2-1 shall be supported.

Table 6.3.6.3.2-1: Simple data types

| Type Name | Type Definition | Description | Applicability |
|-----------|-----------------|-------------|---------------|
| | | | |

6.3.7 Error Handling

6.3.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [5].

For the Ntsctsf_ASTI API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

In addition, the requirements in the following clauses are applicable for the Ntsctsf_ASTI API.

6.3.7.2 Protocol Errors

No specific procedures for the Ntsctsf_ASTI service are specified.

6.3.7.3 Application Errors

The application errors defined for the Ntsctsf_ASTI service are listed in Table 6.3.7.3-1.

Table 6.3.7.3-1: Application errors

| Application Error | HTTP status code | Description |
|-------------------|------------------|-------------|
| | | |

6.3.8 Feature negotiation

The optional features in table 6.3.8-1 are defined for the Ntsctsf_ASTI API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 6.3.8-1: Supported Features

| Feature number | Feature Name | Description |
|----------------|--------------|-------------|
| | | |

6.3.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Ntsctsf_ASTI API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If OAuth2 is used, an NF Service Consumer, prior to consuming services offered by the Ntsctsf_ASTI API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

NOTE: When multiple NRFs are deployed in a network, the NRF used as authorization server is the same NRF that the NF Service Consumer used for discovering the Ntsctsf_ASTI service.

The Ntsctsf_ASTI API defines a single scope "ntsctsf-asti" for the entire service, and it does not define any additional scopes at resource or operation level.

Annex A (normative): OpenAPI specification

A.1 General

This Annex specifies the formal definition of the API(s) defined in the present specification. It consists of OpenAPI specifications in YAML format.

This Annex takes precedence when being discrepant to other parts of the specification with respect to the encoding of information elements and methods within the API(s).

NOTE 1: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see 3GPP TS 29.501 [5] clause 5.3.1 and 3GPP TR 21.900 [7] clause 5B).

A.2 Ntsctsf_TimeSynchronization API

openapi: 3.0.0

info:

```
title: Ntsctsf_TimeSynchronization Service API
version: 1.0.2
description: |
  TSCTSF Time Synchronization Service.
  © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.
```

externalDocs:

```
description: >
  3GPP TS 29.565 V17.2.0; 5G System; Time Sensitive Communication and Time Synchronization
  Function
  Services; Stage 3.
```

```
url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.565/'
```

servers:

```
- url: '{apiRoot}/ntsctsf-time-sync/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501
```

security:

```
- {}
- oAuth2ClientCredentials:
  - ntsctsf-time-sync
```

paths:

```
/subscriptions:
  post:
    summary: Creates a new subscription to notification of capability of time synchronization
```

service resource

```
operationId: TimeSynchronizationExposureSubscriptions
tags:
  - Time Synchronization Exposure Subscriptions (Collection)
requestBody:
  description: Contains the information for the creation the resource.
  required: true
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/TimeSyncExposureSubsc'
```

responses:

```
'201':
  description: Successful creation of the resource.
```

```

content:
  application/json:
    schema:
      $ref: '#/components/schemas/TimeSyncExposureSubsc'
headers:
  Location:
    description: >
      Contains the URI of the created individual time synchronization exposure
      subscription resource, according to the structure
      {apiRoot}/ntsctsf-time-sync/{apiVersion}/subscriptions/{subscriptionId}
    required: true
    schema:
      type: string
'400':
  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
'401':
  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
'403':
  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
callbacks:
  subsEventNotification:
    '{$request.body#/subsNotifUri':
      post:
        requestBody:
          description: Notification of an event occurrence in the TSCTSF.
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TimeSyncExposureSubsNotif'
        responses:
          '204':
            description: The receipt of the notification is acknowledged.
          '307':
            $ref: 'TS29571_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29571_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29571_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29571_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29571_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29571_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'

/subscriptions/{subscriptionId}:
  get:

```

```

summary: "Reads an existing Individual Time Synchronization Exposure Subscription"
operationId: GetIndividualTimeSynchronizationExposureSubscription
tags:
  - Individual Time Synchronization Exposure Subscription (Document)
parameters:
  - name: subscriptionId
    description: String identifying an Individual Time Synchronization Exposure Subscription
    in: path
    required: true
    schema:
      type: string
responses:
  '200':
    description: A representation of the resource is returned.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/TimeSyncExposureSubsc'
  '307':
    $ref: 'TS29571_CommonData.yaml#/components/responses/307'
  '308':
    $ref: 'TS29571_CommonData.yaml#/components/responses/308'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29571_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '406':
    $ref: 'TS29571_CommonData.yaml#/components/responses/406'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'
put:
  operationId: ReplaceIndividualTimeSynchronizationExposureSubscription
  summary: Replace an individual Time Synchronization Exposure Subscription
  tags:
    - IndividualTimeSynchronizationExposureSubscription (Document)
  requestBody:
    required: true
    content:
      application/json:
        schema:
          $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/TimeSyncExposureSubsc'
  parameters:
    - name: subscriptionId
      description: String identifying an Individual Time Synchronization Exposure Subscription.
      in: path
      required: true
      schema:
        type: string
  responses:
    '200':
      description: OK. Resource was successfully modified and representation is returned.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/TimeSyncExposureSubsc'
    '204':
      description: No Content. Resource was successfully modified.
    '307':
      $ref: 'TS29571_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29571_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':

```



```

    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '411':
    $ref: 'TS29571_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29571_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29571_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'
delete:
  operationId: DeleteIndividualTimeSynchronizationExposureSubscription
  summary: Delete an Individual TimeSynchronization Exposure Subscription
  tags:
    - Individual Time Synchronization Exposure Subscription (Document)
  parameters:
    - name: subscriptionId
      in: path
      description: String identifying an Individual Time Synchronization Exposure Subscription.
      required: true
      schema:
        type: string
  responses:
    '204':
      description: No Content. Resource was successfully deleted.
    '307':
      $ref: 'TS29571_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29571_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '429':
      $ref: 'TS29571_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      $ref: 'TS29571_CommonData.yaml#/components/responses/default'

/subscriptions/{subscriptionId}/configurations:
  post:
    summary: "Craete a new Individual Time Synchronization Exposure Configuration"
    operationId: CreateIndividualTimeSynchronizationExposureConfiguration
    tags:
      - Individual Time Synchronization Exposure Configuration (Document)
    parameters:
      - name: subscriptionId
        description: String identifying an Individual Time Synchronization Exposure Subscription.
        in: path
        required: true
        schema:
          type: string
    requestBody:
      description: Contains the information for the creation the resource.
      required: true
      content:
        application/json:
          schema:
            $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/TimeSyncExposureConfig'
    responses:
      '201':
        description: Successful creation of the resource.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TimeSyncExposureConfig'

```

```

headers:
  Location:
    description: >
      Contains the URI of the created individual time synchronization exposure
      configuration resource, according to the structure
      {apiRoot}/ntsctsf-time-sync/{apiVersion}/subscriptions/{subscriptionId}
      /configurations/{configurationId}
    required: true
    schema:
      type: string
'307':
  $ref: 'TS29571_CommonData.yaml#/components/responses/307'
'308':
  $ref: 'TS29571_CommonData.yaml#/components/responses/308'
'400':
  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
'401':
  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
'403':
  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
callbacks:
  configEventNotification:
    '{$request.body#/configNotifUri':
      post:
        requestBody:
          description: Notification of an event occurrence in the TSCTSF.
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TimeSyncExposureConfigNotif'
        responses:
          '204':
            description: The receipt of the notification is acknowledged.
          '307':
            $ref: 'TS29571_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29571_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29571_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29571_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29571_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29571_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'

/subscriptions/{subscriptionId}/configurations/{configurationId}:

```

```

get:
  summary: "Reads an existing Individual Time Synchronization Exposure Configuration"
  operationId: GetIndividualTimeSynchronizationExposureConfiguration
  tags:
    - Individual Time Synchronization Exposure Configuration (Document)
  parameters:
    - name: subscriptionId
      description: String identifying an Individual Time Synchronization Exposure Subscription.
      in: path
      required: true
      schema:
        type: string
    - name: configurationId
      description: String identifying an Individual Time Synchronization Exposure Configuration.
      in: path
      required: true
      schema:
        type: string
  responses:
    '200':
      description: A representation of the resource is returned.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/TimeSyncExposureConfig'
    '307':
      $ref: 'TS29571_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29571_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '406':
      $ref: 'TS29571_CommonData.yaml#/components/responses/406'
    '429':
      $ref: 'TS29571_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      $ref: 'TS29571_CommonData.yaml#/components/responses/default'
put:
  operationId: ReplaceIndividualTimeSynchronizationExposureConfiguration
  summary: Replace an individual Time Synchronization Exposure Configuration
  tags:
    - IndividualTimeSynchronizationExposureConfiguration (Document)
  requestBody:
    required: true
    content:
      application/json:
        schema:
          $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/TimeSyncExposureConfig'
  parameters:
    - name: subscriptionId
      description: String identifying an Individual Time Synchronization Exposure Subscription.
      in: path
      required: true
      schema:
        type: string
    - name: configurationId
      description: String identifying an Individual Time Synchronization Exposure Configuration.
      in: path
      required: true
      schema:
        type: string
  responses:
    '200':
      description: OK. Resource was successfully modified and representation is returned.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/TimeSyncExposureConfig'

```

```

'204':
  description: No Content. Resource was successfully modified.
'307':
  $ref: 'TS29571_CommonData.yaml#/components/responses/307'
'308':
  $ref: 'TS29571_CommonData.yaml#/components/responses/308'
'400':
  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
'401':
  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
'403':
  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
delete:
  operationId: DeleteIndividualTimeSynchronizationExposureConfiguration
  summary: Delete an Individual TimeSynchronization Exposure Configuration
  tags:
    - Individual Time Synchronization Exposure Configuration (Document)
  parameters:
    - name: subscriptionId
      in: path
      description: String identifying an Individual Time Synchronization Exposure Subscription.
      required: true
      schema:
        type: string
    - name: configurationId
      in: path
      description: String identifying an Individual Time Synchronization Exposure Configuration.
      required: true
      schema:
        type: string
  responses:
    '204':
      description: No Content. Resource was successfully deleted
    '307':
      $ref: 'TS29571_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29571_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '429':
      $ref: 'TS29571_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
    default:
      $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{nrfApiRoot}/oauth2/token'

```

```

    scopes:
      ntsctsf-timesynchronization: Access to the Ntsctsf_TimeSynchronization API

schemas:
  TimeSyncExposureSubsc:
    description: >
      Contains the parameters for the subscription to notification of capability of time
      synchronization service.
    type: object
    properties:
      supis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        minItems: 1
      gpsis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        minItems: 1
      interGrpId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
      exterGrpId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ExternalGroupId'
      anyUeInd:
        type: boolean
        description: >
          Identifies whether the request applies to any UE. This attribute shall set to "true" if
          applicable for any UE, otherwise, set to "false".
      notifMethod:
        $ref: 'TS29508_Nsmf_EventExposure.yaml#/components/schemas/NotificationMethod'
      dnn:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
      snssai:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
      subscribedEvents:
        type: array
        items:
          $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/SubscribedEvent'
        minItems: 1
      eventFilters:
        type: array
        items:
          $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/EventFilter'
        minItems: 1
      subsNotifUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      subsNotifId:
        type: string
        description: Notification Correlation ID assigned by the NF service consumer.
      maxReportNbr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      expiry:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      repPeriod:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DurationSec'
      suppFeat:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - subsNotifUri
      - subsNotifId
      - dnn
      - snssai
      - subscribedEvents
    oneOf:
      - required: [supis]
      - required: [interGrpId]
      - required: [gpsis]
      - required: [exterGrpId]
      - required: [anyUeInd]

  TimeSyncExposureSubsNotif:
    description: Contains the notification of time synchronization service.
    type: object
    properties:
      subsNotifId:
        type: string
        description: Notification Correlation ID assigned by the NF service consumer.

```

```

eventNotifs:
  type: array
  items:
    $ref: '#/components/schemas/SubsEventNotification'
  minItems: 1

```

```

SubsEventNotification:
  description: >
    Contains the notification of capability of time synchronization for a list of UEs.
  type: object
  properties:
    event:
      $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/SubscribedEvent'
    timeSyncCapas:
      type: array
      items:
        $ref: '#/components/schemas/TimeSyncCapability'
      minItems: 1
  required:
    - event

```

```

TimeSyncCapability:
  description: Contains the capability of time synchronization service.
  type: object
  properties:
    upNodeId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint64'
    gmCapables:
      type: array
      items:
        $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/GmCapable'
      minItems: 1
    asTimeRes:
      $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/AsTimeResource'
    ptpCapForUes:
      type: object
      additionalProperties:
        $ref: '#/components/schemas/PtpCapabilitiesPerUe'
      minProperties: 1
      description: >
        Contains the PTP capabilities supported by each of the SUPI(s). The key of the map is
the
        SUPI.
    ptpCapForGpsis:
      type: object
      additionalProperties:
        $ref: '#/components/schemas/PtpCapabilitiesPerUe'
      minProperties: 1
      description: >
        Contains the PTP capabilities supported by each of the GPSI(s). The key of the map is
the
        GPSI.
  required:
    - upNodeId
  anyOf:
    - required: [gmCapables]
    - required: [asTimeRes]

```

```

PtpCapabilitiesPerUe:
  description: Contains the supported PTP capabilities per UE.
  type: object
  properties:
    supi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    gpsi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
    ptpCaps:
      type: array
      items:
        $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/EventFilter'
      minItems: 1
  required:
    - ptpCaps
  oneOf:
    - required: [supi]
    - required: [gpsi]

```

```

TimeSyncExposureConfigNotif:
  description: Contains the notification of time synchronization service state.

```

```

type: object
properties:
  configNotifId:
    type: string
    description: Notification Correlation ID assigned by the NF service consumer.
  stateOfConfig:
    $ref: '#/components/schemas/StateOfConfiguration'
required:
  - configNotifId
  - stateOfConfig

StateOfConfiguration:
description: Contains the state of the time synchronization configuration.
type: object
properties:
  stateNwtt:
    type: boolean
    description: >
      When the PTP port state is Leader, Follower or Passive, it is included and set to true
      to indicate the state of configuration for NW-TT port is active; when PTP port state is
      in any other case, it is included and set to false to indicate the state of
      configuration for NW-TT port is inactive. Default value is false.
  stateOfDstts:
    description: Contains the PTP port states of the DS-TT(s).
    type: array
    items:
      $ref: '#/components/schemas/StateOfDstt'
    minItems: 1

StateOfDstt:
description: Contains the PTP port state of a DS-TT.
type: object
properties:
  supi:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  gpsi:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
  state:
    type: boolean
    description: >
      When the PTP port state is Leader, Follower or Passive, it is included and set to true
      to indicate the state of configuration for DS-TT port is active; when PTP port state is
      in any other case, it is included and set to false to indicate the state of
      configuration for DS-TT port is inactive. Default value is false.
required:
  - state
oneOf:
  - required: [supi]
  - required: [gpsi]

TimeSyncExposureConfig:
description: Contains the Time Synchronization Configuration parameters.
type: object
properties:
  upNodeId:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Uint64'
  reqPtpIns:
    $ref: '#/components/schemas/PtpInstance'
  gmEnable:
    type: boolean
    description: >
      Indicates that the AF requests 5GS to act as a grandmaster for PTP or gPTP if it is
      included and set to true.
  gmPrio:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/UInteger'
  timeDom:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/UInteger'
  timeSyncErrBdgt:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/UInteger'
  configNotifId:
    type: string
    description: Notification Correlation ID assigned by the NF service consumer.
  configNotifUri:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
  tempValidity:
    $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/TemporalValidity'
required:
  - upNodeId

```

```

- reqPtpIns
- timeDom
- configNotifId
- configNotifUri

PtpInstance:
description: Contains PTP instance configuration and activation requested by the AF.
type: object
properties:
  instanceType:
    $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/InstanceType'
  protocol:
    $ref: 'TS29522_TimeSyncExposure.yaml#/components/schemas/Protocol'
  ptpProfile:
    type: string
  portConfigs:
    type: array
    items:
      $ref: '#/components/schemas/ConfigForPort'
    minItems: 1
required:
- instanceType
- protocol
- ptpProfile

ConfigForPort:
description: Contains configuration for each port.
type: object
properties:
  supi:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
  gpsi:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
  n6Ind:
    type: boolean
  ptpEnable:
    type: boolean
  logSyncInter:
    type: integer
  logSyncInterInd:
    type: boolean
  logAnnouInter:
    type: integer
  logAnnouInterInd:
    type: boolean
oneOf:
- required: [supi]
- required: [gpsi]
- required: [n6Ind]

```

A.3 Ntsctsf_QoSandTSCAssistance API

openapi: 3.0.0

info:

```

title: Ntsctsf_QoSandTSCAssistance Service API
version: 1.0.2
description: |
  TSCTSF QoS and TSC Assistance Service.
  © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
  All rights reserved.

```

externalDocs:

```

description: >
  3GPP TS 29.565 V17.2.0; 5G System; Time Sensitive Communication and Time Synchronization
  function
  Services; Stage 3.
url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.565/'

```

servers:

```

- url: '{apiRoot}/ntsctsf-qos-tscai/v1'
  variables:
    apiRoot:
      default: https://example.com
      description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

```



```

security:
  - {}
  - OAuth2ClientCredentials:
    - ntsctsf-qos-tscai

paths:
  /tsc-app-sessions:
    post:
      summary: Creates a new Individual TSC Application Session Context resource
      operationId: PostTSCAppSessions
      tags:
        - TSC Application Sessions (Collection)
      requestBody:
        description: Contains the information for the creation the resource.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TscAppSessionContextData'
      responses:
        '201':
          description: Successful creation of the resource.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TscAppSessionContextData'
          headers:
            Location:
              description: >
                Contains the URI of the created individual TSC application session context resource,
                according to the structure
                {apiRoot}/ntsctsf-qos-tscai/v1/tsc-app-sessions/{appSessionId} or the URI of the
                created events subscription sub-resource, according to the structure
                {apiRoot}/ntsctsf-qos-tscai/v1/tsc-app-sessions/{appSessionId}/events-subscription
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        terminationRequest:
          '{$request.body#/notifUri}/terminate':
            post:
              requestBody:
                description: >
                  Request of the termination of the Individual TSC Application Session Context
                required: true
                content:
                  application/json:
                    schema:
                      $ref:
'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/TerminationInfo'
      responses:
        '204':
          description: The receipt of the notification is acknowledged.
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':

```

```

    $ref: 'TS29571_CommonData.yaml#/components/responses/308'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29571_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '411':
    $ref: 'TS29571_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29571_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29571_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'
eventNotification:
  '{$request.body#/evSubsc/notifUri}/notify':
    post:
      requestBody:
        description: Notification of an event occurrence in the TSCTSF.
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EventsNotification'
      responses:
        '204':
          description: The receipt of the notification is acknowledged.
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
/tsc-app-sessions/{appSessionId}:
  get:
    summary: Reads an existing Individual TSC Application Session Context
    operationId: GetTSCAppSession
    tags:
      - Individual TSC Application Session Context (Document)
    parameters:
      - name: appSessionId
        description: String identifying the resource.
        in: path
        required: true
        schema:
          type: string
    responses:
      '200':
        description: A representation of the resource is returned.

```

```

    content:
      application/json:
        schema:
          $ref: '#/components/schemas/TscAppSessionContextData'
    '307':
      $ref: 'TS29571_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29571_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '406':
      $ref: 'TS29571_CommonData.yaml#/components/responses/406'
    '429':
      $ref: 'TS29571_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'
patch:
  summary: Modifies an existing Individual TSC Application Session Context
  operationId: ModAppSession
  tags:
    - Individual TSC Application Session Context (Document)
  parameters:
    - name: appSessionId
      description: String identifying the resource.
      in: path
      required: true
      schema:
        type: string
  requestBody:
    description: Modification of the resource.
    required: true
    content:
      application/merge-patch+json:
        schema:
          $ref: '#/components/schemas/TscAppSessionContextUpdateData'
  responses:
    '200':
      description: >
        successful modification of the resource and a representation of that resource is
        returned.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/TscAppSessionContextData'
    '204':
      description: The successful modification.
    '307':
      $ref: 'TS29571_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29571_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '411':
      $ref: 'TS29571_CommonData.yaml#/components/responses/411'
    '413':
      $ref: 'TS29571_CommonData.yaml#/components/responses/413'
    '415':
      $ref: 'TS29571_CommonData.yaml#/components/responses/415'
    '429':
      $ref: 'TS29571_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'

```

```

'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
callbacks:
  eventNotification:
    '{$request.body#/evSubsc/notifUri}/notify':
      post:
        requestBody:
          description: Notification of an event occurrence in the TSCTSF.
          required: true
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/EventsNotification'
        responses:
          '204':
            description: The receipt of the notification is acknowledged.
          '307':
            $ref: 'TS29571_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29571_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29571_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29571_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29571_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29571_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'
/tsc-app-sessions/{appSessionId}/delete:
  post:
    summary: Deletes an existing Individual TSC Application Session Context
    operationId: DeleteTSCAppSession
    tags:
      - Individual TSC Application Session Context (Document)
    parameters:
      - name: appSessionId
        description: String identifying the Individual TSC Application Session Context resource.
        in: path
        required: true
        schema:
          type: string
    requestBody:
      description: >
        Deletion of the Individual TSC Application Session Context resource, request notification.
      required: false
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/EventsSubscReqData'
    responses:
      '200':
        description: The deletion of the resource is confirmed and a resource is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EventsNotification'
      '204':
        description: The deletion is confirmed without returning additional data.
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'

```

```

'400':
  $ref: 'TS29571_CommonData.yaml#/components/responses/400'
'401':
  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
'403':
  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
/tsc-app-sessions/{appSessionId}/events-subscription:
  put:
    summary: Creates or modifies an Events Subscription subresource
    operationId: putEventsSubsc
    tags:
      - Events Subscription (Document)
    parameters:
      - name: appSessionId
        description: String identifying the Events Subscription resource
        in: path
        required: true
        schema:
          type: string
    requestBody:
      description: Creation or modification of an Events Subscription resource.
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/EventsSubscReqData'
    responses:
      '201':
        description: >
          The creation of the Events Subscription resource is confirmed and its representation is
          returned.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EventsSubscReqData'
        headers:
          Location:
            description: >
              Contains the URI of the created Events Subscription resource,
              according to the structure
              {apiRoot}/ntsctsf-qos-tscai/v1/tsc-app-sessions/{appSessionId}/events-subscription
            required: true
            schema:
              type: string
      '200':
        description: >
          The modification of the Events Subscription resource is confirmed and its representation
          is returned.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EventsSubscReqData'
      '204':
        description: >
          The modification of the Events Subscription subresource is confirmed without returning
          additional data.
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'

```

```

'401':
  $ref: 'TS29571_CommonData.yaml#/components/responses/401'
'403':
  $ref: 'TS29571_CommonData.yaml#/components/responses/403'
'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'
callbacks:
  eventNotification:
    '{$request.body#/notifUri}/notify':
      post:
        requestBody:
          description: >
            TSCTSF.
            Contains the information for the notification of an event occurrence in the

            required: true
            content:
              application/json:
                schema:
                  $ref: '#/components/schemas/EventsNotification'
        responses:
          '204':
            description: The receipt of the notification is acknowledged.
          '307':
            $ref: 'TS29571_CommonData.yaml#/components/responses/307'
          '308':
            $ref: 'TS29571_CommonData.yaml#/components/responses/308'
          '400':
            $ref: 'TS29571_CommonData.yaml#/components/responses/400'
          '401':
            $ref: 'TS29571_CommonData.yaml#/components/responses/401'
          '403':
            $ref: 'TS29571_CommonData.yaml#/components/responses/403'
          '404':
            $ref: 'TS29571_CommonData.yaml#/components/responses/404'
          '411':
            $ref: 'TS29571_CommonData.yaml#/components/responses/411'
          '413':
            $ref: 'TS29571_CommonData.yaml#/components/responses/413'
          '415':
            $ref: 'TS29571_CommonData.yaml#/components/responses/415'
          '429':
            $ref: 'TS29571_CommonData.yaml#/components/responses/429'
          '500':
            $ref: 'TS29571_CommonData.yaml#/components/responses/500'
          '503':
            $ref: 'TS29571_CommonData.yaml#/components/responses/503'
          default:
            $ref: 'TS29571_CommonData.yaml#/components/responses/default'
delete:
  summary: Deletes the Events Subscription subresource.
  operationId: DeleteEventsSubsc
  tags:
    - Events Subscription (Document)
  parameters:
    - name: appSessionId
      description: String identifying the Individual TSC Application Session Context resource
      in: path
      required: true
      schema:
        type: string
  responses:
    '204':
      description: >

```

The deletion of the of the Events Subscription sub-resource is confirmed without returning

```

    additional data.
  '307':
    $ref: 'TS29571_CommonData.yaml#/components/responses/307'
  '308':
    $ref: 'TS29571_CommonData.yaml#/components/responses/308'
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29571_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'

```

components:

```

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{nrfApiRoot}/oauth2/token'
        scopes:
          ntsctsf-qos-tscai: Access to the Ntsctsf_QoSandTSCAssistance API

```

schemas:

```

TscAppSessionContextData:
  description: Represents an Individual TSC Application Session Context resource.
  type: object
  required:
    - notifUri
    - afId
    - qosReference
  oneOf:
    - required: [ueIpAddr]
    - required: [ueMac]
  properties:
    ueIpAddr:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
    ipDomain:
      type: string
      description: The IPv4 address domain identifier.
    ueMac:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
    dnn:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
    snssai:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
    notifUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    appId:
      type: string
      description: Identifies the Application Identifier.
    ethFlowInfo:
      type: array
      items:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
      minItems: 1
    enEthFlowInfo:
      type: array
      items:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/EthFlowInfo'
      minItems: 1
      description: >
        Identifies the Ethernet flows which require QoS. Each Ethernet flow consists of a flow
        identifier and the corresponding UL and/or DL flows.
    flowInfo:
      type: array

```

```

    items:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
    minItems: 1
  afId:
    type: string
    description: Identifies the AF identifier.
  tscQosReq:
    $ref: 'TS29122_AsSessionWithQoS.yaml#/components/schemas/TscQosRequirement'
  qosReference:
    type: string
    description: Identifies a pre-defined QoS information.
  altQosReferences:
    type: array
    items:
      type: string
    minItems: 1
    description: Identifies an ordered list of pre-defined QoS information.
  altQosReqs:
    type: array
    items:
      $ref:
'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/AlternativeServiceRequirementsData'
    minItems: 1
    description: >
      Identifies an ordered list of alternative service requirements that include individual
      QoS parameter sets. The lower the index of the array for a given entry, the higher the
      priority.
  aspId:
    $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/AspId'
  sponId:
    $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/SponId'
  sponStatus:
    $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/SponsoringStatus'
  evSubsc:
    $ref: '#/components/schemas/EventsSubscReqData'
  suppFeat:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  TscAppSessionContextUpdateData:
    description: >
      Describes the authorization data of an Individual TSC Application Session Context created by
      the PCF.
    type: object
  properties:
    notifUri:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
    appId:
      type: string
      description: Identifies the Application Identifier.
    ethFlowInfo:
      type: array
      items:
        $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
      minItems: 1
    enEthFlowInfo:
      type: array
      items:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/EthFlowInfo'
      minItems: 1
      description: >
        Identifies the Ethernet flows which require QoS. Each Ethernet flow consists of a flow
        identifier and the corresponding UL and/or DL flows.
    flowInfo:
      type: array
      items:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
      minItems: 1
    tscQosReq:
      $ref: 'TS29122_AsSessionWithQoS.yaml#/components/schemas/TscQosRequirementRm'
    qosReference:
      type: string
      description: Identifies a pre-defined QoS information.
    altQosReferences:
      type: array
      items:
        type: string
      minItems: 1
      description: Identifies an ordered list of pre-defined QoS information.
    altQosReqs:

```



```

    type: array
    items:
      $ref:
'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/AlternativeServiceRequirementsData'
    minItems: 1
    description: >
      Identifies an ordered list of alternative service requirements that include individual
      QoS parameter sets. The lower the index of the array for a given entry, the higher the
      priority.
    aspId:
      $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/AspId'
    sponId:
      $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/SponId'
    sponStatus:
      $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/SponsoringStatus'
    evSubsc:
      $ref: '#/components/schemas/EventsSubscReqDataRm'

```

EventsSubscReqData:

```

description: Identifies the events the application subscribes to.
type: object
required:
- events
- notifUri
- notifCorreId
properties:
  events:
    type: array
    items:
      $ref: '#/components/schemas/TscEvent'
    minItems: 1
  notifUri:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
  qosMon:
    $ref: 'TS29122_AsSessionWithQoS.yaml#/components/schemas/QoSMonitoringInformation'
  usgThres:
    $ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThreshold'
  notifCorreId:
    type: string

```

EventsSubscReqDataRm:

```

description: >
  This data type is defined in the same way as the EventsSubscReqData data type, but with the
  OpenAPI nullable property set to true.
type: object
required:
- events
properties:
  events:
    type: array
    items:
      $ref: '#/components/schemas/TscEvent'
    minItems: 1
  notifUri:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
  qosMon:
    $ref: 'TS29122_AsSessionWithQoS.yaml#/components/schemas/QoSMonitoringInformationRm'
  usgThres:
    $ref: 'TS29122_CommonData.yaml#/components/schemas/UsageThresholdRm'
  notifCorreId:
    type: string
nullable: true

```

EventsNotification:

```

description: Describes the notification of matched events.
type: object
required:
- notifCorreId
- events
properties:
  notifCorreId:
    type: string
  events:
    type: array
    items:
      $ref: '#/components/schemas/EventNotification'
    minItems: 1

```

EventNotification:

```

description: Describes a notification of an matched event.
type: object
required:
  - event
properties:
  event:
    $ref: '#/components/schemas/TscEvent'
  flowIds:
    type: array
    items:
      type: integer
    minItems: 1
    description: Identifies the IP flows that were sent during event subscription.
  qosMonReports:
    type: array
    items:
      $ref: 'TS29122_AsSessionWithQoS.yaml#/components/schemas/QosMonitoringReport'
    minItems: 1
  usgRep:
    $ref: 'TS29122_CommonData.yaml#/components/schemas/AccumulatedUsage'
  appliedQosRef:
    type: string
    description: >
      The currently applied alternative QoS requirement referring to an alternative QoS
      reference or a requested alternative QoS parameter set. Applicable for
      event QOS_NOT_GUARANTEED or SUCCESSFUL_RESOURCES_ALLOCATION.

#
# ENUMERATIONS DATA TYPES
#
TscEvent:
  description: Represents an event to notify to the AF.
  anyOf:
  - type: string
  enum:
    - FAILED_RESOURCES_ALLOCATION
    - QOS_MONITORING
    - QOS_GUARANTEED
    - QOS_NOT_GUARANTEED
    - SUCCESSFUL_RESOURCES_ALLOCATION
    - USAGE_REPORT
  - type: string

```

A.4 Ntsctsf_ASTI API

openapi: 3.0.0

```

info:
  title: Ntsctsf_ASTI Service API
  version: 1.0.1
  description: |
    TSCTSFS Access Stratum time distribution configuration Service.
    © 2022, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.565 V17.1.0; 5G System; Time Sensitive Communication and
    Time Synchronization Function Services; Stage 3.
  url: 'https://www.3gpp.org/ftp/Specs/archive/29_series/29.565/'

servers:
  - url: '{apiRoot}/ntsctsf-asti/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:
  - {}
  - oAuth2ClientCredentials:
    - ntsctsf-asti

paths:
  /configurations:
    post:

```

```

summary: Creates a new Individual ASTI Configuration resource.
operationId: ASTIConfiguration
tags:
  - ASTI Configurations (Collection)
requestBody:
  description: Contains the information for the creation the resource.
  required: true
  content:
    application/json:
      schema:
        $ref: '#/components/schemas/AccessTimeDistributionData'
responses:
  '201':
    description: Successful creation of the resource.
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/AccessTimeDistributionData'
    headers:
      Location:
        description: >
          Contains the URI of the created individual ASTI Configuration resource,
          according to the structure
          {apiRoot}/ntsctsf-asti/{apiVersion}/configurations/{configId}
        required: true
        schema:
          type: string
  '400':
    $ref: 'TS29571_CommonData.yaml#/components/responses/400'
  '401':
    $ref: 'TS29571_CommonData.yaml#/components/responses/401'
  '403':
    $ref: 'TS29571_CommonData.yaml#/components/responses/403'
  '404':
    $ref: 'TS29571_CommonData.yaml#/components/responses/404'
  '411':
    $ref: 'TS29571_CommonData.yaml#/components/responses/411'
  '413':
    $ref: 'TS29571_CommonData.yaml#/components/responses/413'
  '415':
    $ref: 'TS29571_CommonData.yaml#/components/responses/415'
  '429':
    $ref: 'TS29571_CommonData.yaml#/components/responses/429'
  '500':
    $ref: 'TS29571_CommonData.yaml#/components/responses/500'
  '503':
    $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'

```

/configurations/retrieve:

```

post:
  summary: Request the status of the 5G access stratum time distribution for a list of UEs.
  operationId: RequestStatusof5GAccessStratumTimeDistribution
  tags:
    - ASTI Configurations
  requestBody:
    description: >
      Contains the information for the status of the 5G access stratum time distribution.
    required: true
    content:
      application/json:
        schema:
          $ref: '#/components/schemas/StatusRequestData'
  responses:
    '200':
      description: >
        Successful retrieval of the status of the 5G access stratum time distribution.
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/StatusResponseData'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'

```

```

'404':
  $ref: 'TS29571_CommonData.yaml#/components/responses/404'
'411':
  $ref: 'TS29571_CommonData.yaml#/components/responses/411'
'413':
  $ref: 'TS29571_CommonData.yaml#/components/responses/413'
'415':
  $ref: 'TS29571_CommonData.yaml#/components/responses/415'
'429':
  $ref: 'TS29571_CommonData.yaml#/components/responses/429'
'500':
  $ref: 'TS29571_CommonData.yaml#/components/responses/500'
'503':
  $ref: 'TS29571_CommonData.yaml#/components/responses/503'
default:
  $ref: 'TS29571_CommonData.yaml#/components/responses/default'

/configurations/{configId}:
  put:
    summary: Modifies an existing Individual ASTI Configuration resource.
    operationId: ModifyIndividualASTIConfiguration
    tags:
      - Individual ASTI Configuration (Document)
    parameters:
      - name: configId
        description: String identifying an Individual ASTI Configuration.
        in: path
        required: true
        schema:
          type: string
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AccessTimeDistributionData'
    responses:
      '200':
        description: OK. Resource was successfully modified and representation is returned.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AccessTimeDistributionData'
      '204':
        description: No Content. Resource was successfully modified.
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    delete:
      operationId: DeleteIndividualASTIConfiguration
      summary: Delete an Individual ASTI Configuration
      tags:
        - Individual ASTI Configuration (Document)
      parameters:
        - name: configId

```

```

    in: path
    description: String identifying an Individual ASTI Configuration.
    required: true
    schema:
      type: string
  responses:
    '204':
      description: No Content. Resource was successfully deleted.
    '307':
      $ref: 'TS29571_CommonData.yaml#/components/responses/307'
    '308':
      $ref: 'TS29571_CommonData.yaml#/components/responses/308'
    '400':
      $ref: 'TS29571_CommonData.yaml#/components/responses/400'
    '401':
      $ref: 'TS29571_CommonData.yaml#/components/responses/401'
    '403':
      $ref: 'TS29571_CommonData.yaml#/components/responses/403'
    '404':
      $ref: 'TS29571_CommonData.yaml#/components/responses/404'
    '429':
      $ref: 'TS29571_CommonData.yaml#/components/responses/429'
    '500':
      $ref: 'TS29571_CommonData.yaml#/components/responses/500'
    '503':
      $ref: 'TS29571_CommonData.yaml#/components/responses/503'
  default:
    $ref: 'TS29571_CommonData.yaml#/components/responses/default'

```

components:

```

securitySchemes:
  oAuth2ClientCredentials:
    type: oauth2
    flows:
      clientCredentials:
        tokenUrl: '{nrfApiRoot}/oauth2/token'
        scopes:
          ntsctsf-asti: Access to the Ntsctsf_ASTI API

```

schemas:

```

AccessTimeDistributionData:
  description: >
    Contains the parameters for the creation of 5G access stratum time distribution
    configuration.
  type: object
  properties:
    supis:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      minItems: 1
    gpsis:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      minItems: 1
    interGrpId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
    exterGrpId:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/ExternalGroupId'
    asTimeDisParam:
      $ref: '#/components/schemas/AsTimeDistributionParam'
    suppFeat:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
  required:
    - asTimeDisParam
  oneOf:
    - required: [supis]
    - required: [interGrpId]
    - required: [gpsis]
    - required: [exterGrpId]

```

```

AsTimeDistributionParam:
  description: Contains the 5G access stratum time distribution parameters.
  type: object
  properties:
    asTimeDisEnabled:

```

```
    type: boolean
    description: >
      When this attribute is included and set to true, it indicates that the access stratum
      time distribution via Uu reference point is activated.
  timeSyncErrBdgt:
    $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
  tempValidity:
    $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/TemporalValidity'

StatusRequestData:
  description: >
    Contains the parameters for retrieval of the status of the access stratum time distribution
    for a list of UEs.
  type: object
  properties:
    supis:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      minItems: 1
    gpsis:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      minItems: 1
  oneOf:
    - required: [supis]
    - required: [gpsis]

StatusResponseData:
  description: >
    Contains the parameters for the status of the access stratum time distribution for a list of
    UEs.
  type: object
  properties:
    inactiveUes:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      minItems: 1
    inactiveGpsis:
      type: array
      items:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      minItems: 1
    activeUes:
      type: array
      items:
        $ref: '#/components/schemas/ActiveUe'
      minItems: 1

ActiveUe:
  description: >
    Contains the UE identifier whose status of the access stratum time distribution is active
    and the optional requested time synchronization error budget.
  type: object
  properties:
    supi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
    gpsi:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
    timeSyncErrBdgt:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
  oneOf:
    - required: [supi]
    - required: [gpsi]
```

Annex B (informative): Change history

| Change history | | | | | | | |
|----------------|--------------|-----------|------|-----|-----|---|-------------|
| Date | Meeting | TDoc | CR | Rev | Cat | Subject/Comment | New version |
| 2021-08 | | | | | | TS skeleton | 0.0.0 |
| 2021-08 | CT3#117e | C3-214576 | | | | Inclusion of documents agreed in CT3#117e: C3-214145, C3-214149, C3-214154, C3-214466, C3-214467, C3-214468, C3-214469, C3-214505, C3-214506, C3-214507, C3-214508, C3-214509, C3-214510 | 0.1.0 |
| 2021-10 | CT3#118e | C3-215473 | | | | Inclusion of documents agreed in CT3#118e: C3-215347, C3-215348, C3-215349, C3-215350, C3-215351, C3-215352, C3-215353, C3-215354, C3-215356, C3-215357, C3-215358, C3-215470 | 0.2.0 |
| 2021-11 | CT3#119e | C3-216517 | | | | Inclusion of documents agreed in CT3#119e: C3-216114, C3-216115, C3-216116, C3-216121, C3-216397, C3-216398, C3-216399, C3-216400, C3-216401, C3-216402, C3-216426, C3-216594, C3-215357, C3-216595 | 0.3.0 |
| 2021-12 | CT#94-e | CP-213208 | | | | Presentation for information | 1.0.0 |
| 2022-01 | CT3#119bis-e | C3-220449 | | | | Inclusion of documents agreed in CT3#119bis-e: C3-220424, C3-220165, C3-220166, C3-220167, C3-220425, C3-220423, C3-220415, C3-220359, C3-220172 | 1.1.0 |
| 2022-02 | CT3#120e | C3-221512 | | | | Inclusion of documents agreed in CT3#120e: C3-221181, C3-221184, C3-221185, C3-221186, C3-221187, C3-221189, C3-221190, C3-221191, C3-221192, C3-221237, C3-221445, C3-221446, C3-221469, C3-221552, C3-221606, C3-221650 | 1.2.0 |
| 2022-04 | CT3#121e | C3-222482 | | | | Inclusion of documents agreed in CT3#121e: C3-222176, C3-222177, C3-222178, C3-222179, C3-222181, C3-222182, C3-222183, C3-222295, C3-222420, C3-222424, C3-222435, C3-222489, C3-222503, C3-222507, C3-222555, C3-222556, C3-222564, | 1.3.0 |
| 2022-05 | CT3#122e | C3-223505 | | | | Inclusion of documents agreed in CT3#122e: C3-223121, C3-223122, C3-223124, C3-223126, C3-223229, C3-223230, C3-223131, C3-223132, C3-223283, C3-223286, C3-223469, C3-223471, C3-223472, C3-223490, C3-223494, C3-223495, C3-223660, C3-223661, C3-223693, C3-223739, C3-223744, C3-223749, | 1.4.0 |
| 2022-06 | CT#96 | CP-221099 | | | | Presentation to TSG CT for approval | 2.0.0 |
| 2022-06 | CT#96 | CP-221099 | | | | Approved by TSG CT | 17.0.0 |
| 2022-09 | CT#97e | CP-222113 | 0001 | - | F | Add PUT method in table 6.1.3.1-1 | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0002 | 1 | F | Correction to 5G access time distribution | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0003 | 1 | F | Correction to initial provisioning of TSC related service information | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0004 | - | F | Correction to notification about TSC application session context event | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0005 | - | F | Correction to notification about TSC application session context termination | 17.1.0 |
| 2020-09 | CT#97e | CP-222113 | 0006 | 1 | F | Correction to subscription to events for the existing TSC application session context | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0007 | 1 | F | Correction to the procedure of creating a new subscription | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0009 | 1 | F | Corrections to the methods of Ntsctsf_ASTI Service API | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0010 | 1 | F | Corrections to the methods of Ntsctsf_QoSandTSCAssistance API | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0011 | - | F | Corrections to the methods of Ntsctsf_TimeSynchronization API | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0013 | 1 | F | Handling of temporal validity condition | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0018 | - | F | Support of sponsored connectivity | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0019 | 1 | F | Correction to the references | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0020 | 1 | F | Correction to time synchronization capabilities subscription | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0021 | 1 | F | Data Model corrections | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0022 | 1 | F | Correction of the association of Time Sync Exposure subscriptions to AF sessions | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0023 | 1 | F | Correction of the handling of AM policies upon Time Sync configuration | 17.1.0 |
| 2022-09 | CT#97e | CP-222114 | 0024 | 1 | F | TSCTSF API corrections | 17.1.0 |
| 2022-09 | CT#97e | CP-222183 | 0025 | 1 | F | Mapping of GPSIs and Group Identifiers to a SUPI list | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0026 | - | F | Definitions of HTTP "403 Forbidden" response | 17.1.0 |
| 2022-09 | CT#97e | CP-222113 | 0027 | - | F | Initial provisioning of TSC related service information | 17.1.0 |
| 2022-09 | CT#97e | CP-222121 | 0028 | - | F | Update of info and externalDocs fields | 17.1.0 |
| 2022-12 | CT#98e | CP-223181 | 0029 | 1 | F | Corrections in the error budget calculation | 17.2.0 |
| 2022-12 | CT#98e | CP-223181 | 0030 | - | F | Miscellaneous corrections in the Time Synchronization API | 17.2.0 |
| 2022-12 | CT#98e | CP-223181 | 0033 | - | F | Correction to Ethernet flows | 17.2.0 |
| 2022-12 | CT#98e | CP-223188 | 0034 | - | F | Update of info and externalDocs fields | 17.2.0 |

History

| Document history | | |
|-------------------------|----------------|-------------|
| V17.0.0 | July 2022 | Publication |
| V17.1.0 | September 2022 | Publication |
| V17.2.0 | January 2023 | Publication |
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