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Contents

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project (3GPP).

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1 Scope

The present specification describes the protocol for the NEF Northbound interface between the NEF and the AF. The NEF Northbound interface and the related stage 2 functional requirements are defined in 3GPP TS 23.502 [2], 3GPP TS 23.316 [28] and 3GPP TS 23.288 [29].

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 23.502: "Procedures for the 5G system".

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

[4] 3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".

[5] Open API Initiative, "OpenAPI 3.0.0 Specification", https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md.

[6] 3GPP TS 33.501: "Security architecture and procedures for 5G System".

[7] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[8] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[9] 3GPP TS 29.521: "5G System; Binding Support Management Service; Stage 3".

[10] Void.

[11] 3GPP TS 23.222: "Common API Framework for 3GPP Northbound APIs; Stage 2".

[12] 3GPP TS 29.222: "Common API Framework for 3GPP Northbound APIs; Stage 3".

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

[14] 3GPP TS 33.122: "Security Aspects of Common API Framework for 3GPP Northbound APIs".

[15] Void.

[16] IETF RFC 5246: "The Transport Layer Security (TLS) Protocol Version 1.2".

[17] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[18] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[19] 3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".

[20] 3GPP TS 29.504: "5G System; Unified Data Repository Services; Stage 3".

[21] 3GPP TR 21.900: "Technical Specification Group working methods".

[22] 3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".

[23] 3GPP TS 29.519: "5G System; Usage of the Unified Data Repository service for Policy Control Data, Application Data and Structured Data for Exposure; Stage 3".

[24] 3GPP TS 29.541: "5G System; Network Exposure FunctionServices for Non-IP Data Delivery (NIDD); Stage 3".

[25] 3GPP TS 29.542: "5G System, Session Management Services for Non-IP Data Delivery (NIDD); Stage 3".

[26] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

[27] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[28] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G system (5GS)".

[29] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[30] 3GPP TS 23.032: "Universal Geographical Area Description (GAD)".

[31] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to Vehicle-to-Everything (V2X) services".

[32] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[33] 3GPP TS 24.588: "Vehicle-to-Everything (V2X) services in 5G System (5GS); User Equipment (UE) policies; Stage 3".

[34] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[35] 3GPP TS 29.515: "5G System; Gateway Mobile Location Services; Stage 3".

[36] 3GPP TS 23.273: "5G System Location Services (LCS)".

3 Definitions 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].

3.2 Abbreviations

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

ACS	Auto-Configuration Server
AF	Application Function
BDT	Background Data Transfer
CAPIF	Common API Framework
CP	Communication Pattern
DN	Data Network
DNAI	DN Access Identifier
DNN	Data Network Name
GMLC	Global Mobile Location Centre
GPSI	Generic Public Subscription Identifier
IPTV	Internet Protocol Television

MO-LR	Mobile Originated Location Request
NEF	Network Exposure Function
PCF	Policy Control Function
PCRF	Policy and Charging Rule Function
PFD	Packet Flow Description
PFDF	Packet Flow Description Function
REST	Representational State Transfer
SCEF	Service Capability Exposure Function
S-NSSAI	Single Network Slice Selection Assistance Information
UDR	Unified Data Repository
UP	User Plane
WB	Wide Band

4 NEF Northbound Interface

4.1 Overview

The NEF Northbound interface is between the NEF and the AF. It specifies RESTful APIs that allow the AF to access the services and capabilities provided by 3GPP network entities and securely exposed by the NEF.

This document also specifies the procedures triggered at the NEF by API requests from the AF and by event notifications received from 3GPP network entities.

The stage 2 level requirements and signalling flows for the NEF Northbound interface are defined in 3GPP TS 23.502 [2].

The NEF Northbound interface supports the following procedures:

1) Procedures for Monitoring
2) Procedures for Device Triggering
3) Procedures for resource management of Background Data Transfer
4) Procedures for CP Parameters, Network Configuration Parameters Provisioning, 5G LAN Parameters Provisioning, ACS Configuration Parameter Provisioning and Location Privacy Indication Parameters Provisioning
5) Procedures for PFD Management
6) Procedures for Traffic Influence
7) Procedures for changing the chargeable party at session set up or during the session
8) Procedures for setting up an AF session with required QoS
9) Procedures for MSISDN-less Mobile Originated SMS
10) Procedures for non-IP data delivery
11) Procedures for analytics information exposure
12) Procedure for applying BDT policy
13) Procedures for Enhanced Coverage Restriction Control
14) Procedures for IPTV Configuration
15) Procedures for Service Parameter Provisioning
16) Procedures for RACS Parameter Provisioning
17) Procedures for Mobile Originated Location Request

Which correspond to the following services respectively, supported by the NEF as defined in 3GPP TS 23.502 [2]:

1) Nnef_EventExposure service and Nnef_APISupportCapability service
2) Nnef_Trigger service
3) Nnef_BDTPNegotiation service
4) Nnef_ParameterProvision service
5) Nnef_PFDManagement service
6) Nnef_TrafficInfluence service
7) Nnef_ChargeableParty service
8) Nnef_AFsessionWithQoS service
9) Nnef_MSISDN-less_MO_SMS service
10) Nnef_NIDDConfiguration and Nnef_NIDD services
11) Nnef_AnalyticsExposure service
12) Nnef_ApplyPolicy service
13) Nnef_ECRestriction service
14) Nnef_IPTVConfiguration service
15) Nnef_ServiceParameter service
16) Nnef_UCMFProvisioning service
17) Nnef_Location service

NOTE 1: For Nnef_PFDManagement service, only the Nnef_PFDManagement_Create/Update/Delete service operations are applicable for the NEF Northbound interface.

NOTE 2: For Nnef_NIDD service, NF consumer other than the AF does not use the NEF Northbound interface.

NOTE 3: For Nnef_NIDDConfiguration service, the Nnef_NIDDConfiguration_Trigger service operation is only applicable for the NEF Northbound interface.

NOTE 4: The Nnef_APISupportCapability service is only applicable in the MonitoringEvent API when the monitoring type sets to "API_SUPPORT_CAPABILITY".

4.2 Reference model

The NEF Northbound interface resides between the NEF and the AF as depicted in figure 4.2.1. The overall NEF architecture is depicted in 3GPP TS 23.502 [2]. An AF can get services from multiple NEFs, and an NEF can provide service to multiple AFs.

NOTE: The AF can be provided by the third party.

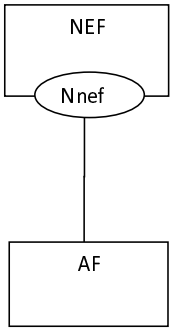

Figure 4.2-1: Reference Architecture for the Nnef Service; SBI representation

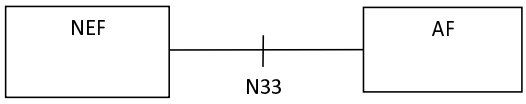

Figure 4.2-2: Reference Architecture for the Nnef Service; reference point representation

4.3 Functional elements

4.3.1 NEF

The Network Exposure Function (NEF) is a functional element that supports the following functionalities:

- The NEF shall securely expose network capabilities and events provided by 3GPP NFs to AF.
- The NEF shall provide a means for the AF to securely provide information to 3GPP network and may authenticate, authorize and assist in throttling the AF.
- The NEF shall be able to translate the information received from the AF to the one sent to internal 3GPP NFs, and vice versa.
- The NEF shall support to expose information (collected from other 3GPP NFs) to the AF.
- The NEF may support a PFD Function which allows the AF to provision PFD(s) and may store and retrieve PFD(s) in the UDR. The NEF further provisions PFD(s) to the SMF.

A specific NEF instance may support one or more of the functionalities described above and consequently an individual NEF may support a subset of the APIs specified for capability exposure.

NOTE: The NEF can access the UDR located in the same PLMN as the NEF.

4.3.2 AF

The Application Function (AF) may interact with the 3GPP Core Network via the NEF in order to access network capabilities.

4.4 Procedures over NEF Northbound Interface

4.4.1 Introduction

All procedures that operate across the NEF Northbound interface, as specified in 3GPP TS 23.502 [2], are specified in the following subclauses.

4.4.2 Procedures for Monitoring

The procedures for monitoring as described in subclause 4.4.2 of 3GPP TS 29.122 [4] shall be applicable in 5GS with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF;
- description of the HSS applies to the UDM, and the NEF shall interact with the UDM by using Nudm_EventExposure service as defined in 3GPP TS 29.503 [17];
- description of the MME/SGSN applies to the AMF, and the NEF shall interact with the AMF by using Namf_EventExposure service as defined in 3GPP TS 29.518 [18];
- description about the PCRF is not applicable;
- description about the change of IMSI-IMEI(SV) association monitoring event applies to the change of SUPI-PEI association monitoring event;
- if the "Loss_of_connectivity_notification" as defined in subclause 5.3.4 of 3GPP TS 29.122 [4] is supported, values 0-5 are not applicable for the lossOfConnectReason attribute within MonitoringEventReport data type, the lossOfConnectReason attribute shall be set to 6 if the UE is deregistered, 7 if the maximum detection timer expires or 8 if the UE is purged.
- the AF may include a periodic reporting time indicated by the "repPeriod" attribute within MonitoringEventSubscription data type, which is only applicable for Location_notification and Number_of_UEs_in_an_area_notification_5G features in the NEF.
- description about the PDN connectivity status event applies to the PDU session status event, the description of the MME/SGSN applies to the SMF during the reporting of monitoring event procedure, the NEF receives the event notification via Nsmf_EventExposure service as defined in 3GPP TS 29.508 [26];
- when sending the UDM/AMF event report to the AF, the NEF may store the event data in the report in the UDR as part of the data for exposure as specified in 3GPP TS 29.519 [23] by using Nudr_DataRepository service as specified in 3GPP TS 29.504 [20].
- If the "Downlink_data_delivery_status_5G" as defined in subclause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support the downlink data delivery status notification,
  - the AF shall send an HTTP POST message to the NEF to the resource "Monitoring Event Subscriptions" as defined in 5.3.3.2 of 3GPP TS 29.122 [4] for creating an subscription or send an HTTP PUT message to the NEF to the resource "Individual Monitoring Event Subscription" as defined in 5.3.3.3 of 3GPP TS 29.122 [4] for updating the subscription with the following difference:
    - within the MonitoringEventSubscription data structure the AF may additionally include packet filter descriptor(s) within the "dddTraDescriptors" attribute and the list of monitoring downlink data delivery status event(s) within the "dddStati" attribute;
    - the NEF shall subscribe the events to the appropriate UDM(s) within the network by invoking the Nudm_EventExposure_Subscribe service operation as defined in subclause 5.5.2.2 of 3GPP TS 29.503 [17].
  - when the NEF receives the event notification as defined in subclause 4.4.2 of 3GPP TS 29.508 [26], the NEF shall send an HTTP POST message to the AF as defined in subclause 4.4.2.3 of 3GPP TS 29.122 [4] with the difference that within each MonitoringEventReport data structure, the NEF shall include:

- the downlink data delivery status within the "dddStatus" attribute;

- the downlink data descriptor impacted by the downlink data delivery status change within the "dddTraDescriptor" attribute;

- the estimated buffering time within the "maxWaitTime" attribute if the downlink data delivery status is set to "BUFFERED";

- If the "Availability_after_DDN_failure_notification_enhancement" feature as defined in subclause 5.3.4 of 3GPP TS 29.122 [4] is supported, the AF shall send an HTTP POST message to the NEF to the resource "Monitoring Event Subscriptions" as defined in 5.3.3.2 of 3GPP TS 29.122 [4] for creating an subscription or send an HTTP PUT message to the NEF to the resource "Individual Monitoring Event Subscription" as defined in 5.3.3.3 of 3GPP TS 29.122 [4] for updating the subscription with the difference that within the MonitoringEventSubscription data structure, the AF shall include packet filter descriptions within the "dddTraDescriptors" attribute.

- If the "eLCS" feature as defined in subclause 5.3.4 of 3GPP TS 29.122 [4] is supported, the AF may send an HTTP POST message to the NEF to the resource "Monitoring Event Subscriptions" as defined in 5.3.3.2 of 3GPP TS 29.122 [4] for creating an subscription or send an HTTP PUT message to the NEF to the resource "Individual Monitoring Event Subscription" as defined in 5.3.3.3 of 3GPP TS 29.122 [4] for updating the subscription with the following difference:

  - within the MonitoringEventSubscription data structure, the AF may additionally include location QoS requirement within the "locQoS" attribute, service identifier with the "svcId" attribute, Location deferred requested event type within the "ldrType" attribute, the validity start time and the validity end time in the "locTimeWindow" attribute, the maximum age of location estimate within the "maxAgeOfLocEst" attribute, the requesting target UE velocity within the "velocityRequested" attribute, the linear distance within the "linearDistance" attribute, the reporting target UE location estimate indication within the "reportingLocEstInd" attribute, the sampling interval within the "samplingInterval" attribute, the maximum reporting expire interval within the "maxRptExpireIntvl" attribute as defined in subclause 5.3.2.3.2 of 3GPP TS 29.122 [4] for location information subscription; - if the NEF identifies the location request precision higher than cell level location accuracy is required based on the "locQos" attribute received, the NEF shall interact with the appropriate GMLC within the network by invoking the Ngmlc_Location_ProvideLocation service operation as defined in subclause 6.1 of 3GPP TS 29.515 [35];

  - if the location request precision is lower than or equal to cell level, based on implementation, the NEF may interact with the GMLC by invoking the Ngmlc_Location_ProvideLocation service operation as defined in subclause 6.1 of 3GPP TS 29.515 [35]; or retrieve the UE privacy from UDM by using Nudm_SDM service as described in subclause 5.2 of 3GPP TS 29.503 [17] and if the privacy setting is verified, the NEF shall interact with the UDM for the serving AMF address by invoking by using Nudm_UECM service as described in subclause 5.3 of 3GPP TS 29.503 [17]. After receiving the serving AMF address from the UDM, the NEF shall interact with the AMF by invoking the Namf_EventExposure_Subscribe service operation as defined in subclause 5.3 of 3GPP TS 29.518 [18]; or may interact with UDM by using Nudm_EventExposure service as defined in subclause 5.5 of 3GPP TS 29.503 [17] and the NEF receives the location event notification from the AMF via Namf_EventExposure service as defined in in subclause 5.5 of 3GPP TS 29.518 [18].

  Upon receipt of successful location response from the GMLC or the AMF, the NEF shall create or update the resource and then send HTTP POST or PUT response to the AF as defined in subclause 4.4.2.3 of 3GPP TS 29.122 [4].Upon receipt of the location Report from the GMLC or the AMF, the NEF shall determine the monitoring event subscription associated with the corresponding Monitoring Event Report as defined in subclause 4.4.2.3 of 3GPP TS 29.122 [4].

  In order to delete a previous active configured monitoring event subscription at the NEF, the AF shall send an HTTP DELETE message to the NEF to the resource "Individual Monitoring Event Subscription" which is received in the response to the request that has created the monitoring events subscription resource. The NEF shall interact with the GMLC or the AMF or the UDM to remove the request, upon receipt of the successful response from the GMLC or the AMF or the UDM, the NEF shall delete the active resource "Individual Monitoring Event Subscription" addressed by the URI and send an HTTP response to the AF with a "204 No Content" status code, or a "200 OK" status code and including the monitoring event report if received.

4.4.3 Procedures for Device Triggering

The procedures for device triggering as described in subclause 4.4.6 of 3GPP TS 29.122 [4] shall be applicable in 5G with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF;
- description of the HSS applies to the UDM;
- the NEF shall interact with the UDM by using the Nudm_SubscriberDataManagement service and the Nudm_UEContextManagement service as defined in 3GPP TS 29.503 [17]; and
- the NEF acts as MTC-IWF.

4.4.4 Procedures for resource management of Background Data Transfer

The procedures for resource management of Background Data Transfer (BDT) in 5GS are described in subclause 4.4.3 of 3GPP TS 29.122 [4] with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF;
- If the feature Group_Id is supported, an external group identifier may be included in the HTTP POST or PUT request message by the NEF. If the external group Id is sent from the AF to the NEF, the NEF shall interact with the UDM by using Nudm_SubscriberDataManagement service as defined in 3GPP TS 29.503 [17] to translate the external group identifier into the corresponding internal group identifier;
- description of the PCRF applies to the PCF;
- the NEF shall interact with the PCF by using Npcf_BDTPolicyControl service as defined in 3GPP TS 29.554 [19];
- if the "BdtNotification_5G" feature is supported, the AF may include a notification URI within the "notificationDestination" attribute in the Bdt data type during the background data transfer policy negotiation. In addition, the AF may request to enable the BDT warning notification by setting the "warnNotifEnabled" attribute to true. When the NEF receives the BDT warning notification from the PCF as defined in clause 4.2.4.2 of 3GPP TS 29.554 [19] and the "warnNotifEnabled" attribute was set to true, the NEF shall send an HTTP POST message including the ExNotification data structure to the AF identified by the notification destination URI received during the background data transfer policy negotiation. The AF shall respond with an HTTP response to confirm the received notification. The AF may select one policy from the candidate of BDT policies if provided in the notification by using the HTTP PATCH message as described in subclause 5.4.3.3.3.3 of 3GPP TS 29.122 [4]. The AF may also request to disable/enable the BDT warning notification by including the "warnNotifEnabled" attribute in the HTTP PATCH message; and
- The AF may include a traffic descriptor of background data within the "trafficDes" attribute in the Bdt data type during the background data transfer policy negotiation.

4.4.5 Procedures for CP Parameters Provisioning

The procedures for CP parameters provisioning as described in subclause 4.4.9 of 3GPP TS 29.122 [4] shall be applicable in 5G with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF;
- description of the HSS applies to the UDM;
- the NEF shall interact with the UDM by using Nudm_ParameterProvision service as defined in 3GPP TS 29.503 [17]; and

- if the ExpectedUMT_5G feature as defined in subclause 5.10.4 of 3GPP TS 29.122 [4] is supported, the expected UE moving trajectory within the "expectedUmts" attribute shall also be included in the HTTP POST/PUT request. In addition, if the ExpectedUmtTime_5G feature as defined in subclause 5.10.4 of 3GPP TS 29.122 [4] is supported, the start time and duration may be provided in the "expectedUmts" attribute to indicate when the UE arrives at a location and how long the UE stays in the location and the periodicity in the "expectedUmtDays" attribute may be provided to indicate the effective days within a week.

4.4.6 Procedures for PFD Management

The procedures for PFD management as described in subclause 4.4.10 of 3GPP TS 29.122 [4] shall be applicable for 5GS with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF; and
- the NEF (PFDF) shall interact with the UDR for PFD management by using Nudr_DataRepository service as defined in 3GPP TS 29.504 [20]. The PFDF is functionality within the NEF.
- If the PFDs are provisioned to at least one of the subscribed SMFs (but not all) within the allowed delay, the NEF (PFDF) may notify the AF about the failed PFD provisioning with the HTTP POST message by including the PfdReport data structure in the body of the message. In addition, the NEF may include the location area(s) of the user plane(s) which are unable to enforce the provisioned PFD(s) within the "locationArea" attribute of the PFD report(s). If the PFDs are provisioned to none of the subscribed SMFs within the allowed delay, the NEF (PFDF) shall notify the AF about the failed PFD provisioning with the HTTP POST message using appropriate failure code as defined in Table 5.11.2.2.3-1 of 3GPP TS 29.122 [4].

NOTE 1: Unsuccessful PFDs provisioning to the subscribed SMFs within the allowed delay means that the PFDs are not provisioned successfully to the UPFs served by the failed SMFs.

NOTE 2: The NEF maps the 3GPP network area(s) to the geographic area(s), civic address(es) or DNAI(s) if the 3GPP network area(s) is not allowed to be exposed to the 3rd party according to the operator policy.

4.4.7 Procedures for Traffic Influence

4.4.7.1 General

In order to create a resource for the Traffic Influence, the AF shall send an HTTP POST message to the NEF to the resource "Traffic Influence Subscription", the body of the HTTP POST message may include the AF Service Identifier, external Group Identifier, external Identifier, any UE Indication, the UE IP address, GPSI, DNN, S-NSSAI, Application Identifier or traffic filtering information, Subscribed Event, Notification destination address, a list of geographic zone identifier(s), AF Transaction Identifier, a list of DNAI(s), routing profile ID(s) or N6 traffic routing information, Indication of application relocation possibility, type of notifications, Temporal, spatial validity conditions, and if the URLLC feature is supported, Indication of AF acknowledgement to be expected and/or Indication of UE IP address preservation. The Notification destination address shall be included if the Subscribed Event is included in the HTTP request message.

In order to update an existing traffic influence subscription, the AF shall send an HTTP PUT or PATCH message to the resource "Individual Traffic Influence Subscription" requesting to change the traffic influence parameters.

In order to delete an existing traffic influence subscription, the AF shall send an HTTP DELETE message to the NEF to the resource "Individual Traffic Influence Subscription".

Upon receipt of the HTTP request from the AF, if the AF is authorized, the NEF shall perform the mapping as described in 3GPP TS 23.501 [3], and then perform as described in subclause 4.4.7.2 if the request is for an individual UE or perform as described in subclause 4.4.7.3 if the request is for multiple UEs.

4.4.7.2 AF request identified by UE address

Upon receipt of the above AF request which is for an individual UE identified by IP or Ethernet address, the NEF may interact with the BSF to retrieve the related PCF information by invoking the Nbsf_Management_Discovery service

operation as described in 3GPP TS 29.521 [9], if the NEF receives an error code from the BSF, the NEF shall not create, update or delete the resource and shall respond to the AF with a proper error status code.

After receiving a successful response from the BSF, the NEF shall interact with the PCF by invoking the Npcf_PolicyAuthorization service as described in 3GPP TS 29.514 [7]. After receiving a successful response from the PCF, the NEF shall,

- for the HTTP POST request, create a resource "Individual Traffic Influence Subscription" which represents the traffic influence subscription, addressed by a URI that contains the AF Identifier and an NEF-created subscription identifier, and shall respond to the AF with a 201 Created status code, including a Location header field containing the URI for the created resource. The AF shall use the URI received in the Location header in subsequent requests to the NEF to refer to this traffic influence subscription.

- for the HTTP PUT or PATCH request, update a resource "Individual Traffic Influence Subscription" which represents the traffic influence subscription, and shall responds to the AF with a 200 OK status code.

- for the HTTP DELETE request, remove all properties of the resource and delete the corresponding active resource "Individual Traffic Influence Subscription" which represents the traffic influence subscription, then shall responds to the AF with a 204 No Content status code.

If the NEF receives a response with an error code from the PCF, the NEF shall not create, update or delete the resource and shall respond to the AF with a proper error status code.

4.4.7.3 AF request not identified by UE address

For AF request not identified by UE address, it may target an individual UE, a group of UEs or any UE. For an individual UE identified by GPSI, or a group of UEs identified by External Group Identifier, the NEF shall interact with the UDM by invoking the Nudm_SubscriberDataManagement service as described in 3GPP TS 29.503 [17] to retrieve the SUPI or Internal Group Identifier.

The NEF shall interact with the UDR by invoking the Nudr_DataRepository service as described in 3GPP TS 29.504 [20], if the NEF receives an error code from the UDR, the NEF shall not create, update or delete the resource and shall respond to the AF with a proper error status code.

After receiving a successful response from the UDR, the NEF shall,

- for the HTTP POST request, create a resource "Individual Traffic Influence Subscription" which represents the traffic influence subscription, addressed by a URI that contains the AF Identifier and an NEF-created subscription identifier, and shall respond to the AF with a 201 Created status code, including a Location header field containing the URI for the created resource. The AF shall use the URI received in the Location header in subsequent requests to the NEF to refer to this traffic influence subscription.

- for the HTTP PUT or PATCH request, update a resource "Individual Traffic Influence Subscription" which represents the traffic influence subscription, and shall responds to the AF with a 200 OK status code.

- for the HTTP DELETE request, delete the corresponding active resource "Individual Traffic Influence Subscription" which represents the traffic influence subscription, and shall responds to the AF with a 204 No Content status code.

4.4.7.4 Handling of UP path management event notification

If the NEF receives a UP path management event notification from the SMF indicating that the subscribed event has been detected, then the NEF shall provide a notification by sending an HTTP POST message that shall include the EventNotification data type at least with the subscribed event (e.g. UP Path has changed) to the AF identified by the notification destination received during creation of the Individual Traffic Influence Subscription. If a URI for AF acknowledgement within the "ackUri" attribute is provided by the SMF in the event notification as defined in 3GPP TS 29.508 [26], the NEF shall also provide a URI for AF acknowledgement within the "afAckUri" attribute in the EventNotification data.

Upon receipt of the event notification, the AF shall respond with a "204 No Content" status code to confirm the received event notification.

Afterwards, if a URI for AF acknowledgement within the "afAckUri" attribute is received during the UP path management event notification, the AF may determine that an application layer relocation is needed, and may then send

an HTTP POST request as acknowledgement for the UP path management event notification to inform the NEF about the result of application layer relocation. If the application layer is ready and/or the application relocation is completed, within the payload of the HTTP POST request, the AF shall include the AfAckInfo data type with the "afStatus" attribute sets to "SUCCESS" and may provide the N6 traffic routing information associated to the target DNAI as a "trafficRoute" attribute within the AfResultInfo data; otherwise, the AF shall indicate the failure by including the AfAckInfo data type in the payload with the "afStatus" attribute sets to the corresponding failure cause. The NEF Northbound interface transaction identifier generated by the AF shall also be provided as the "afTransId" attribute within the AfAckInfo data if the AF has previously provided it.

Upon receipt of the AF acknowledgement, the NEF shall respond with a "204 No Content" status code to confirm the received acknowledgement.

4.4.8 Procedures for changing the chargeable party at session set up or during the session

The procedures for changing the chargeable party at session set up or during the session in 5GS are described in subclause 4.4.4 of 3GPP TS 29.122 [4] with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF;
- description of the PCRF applies to the PCF;
- if the EthChgParty_5G feature as defined in subclause 5.5.4 of 3GPP TS 29.122 [4] is supported and the request is for Ethernet UE:
  - in the HTTP POST request, the AF shall include the UE MAC address within the "macAddr" attribute instead of the UE IP address and the Ethernet Flow description within the "ethFlowInfo" attribute instead of the IP Flow description;
  - in the HTTP PATCH request, the AF may update the Ethernet Flow description within the "ethFlowInfo" attribute;
- the NEF may interact with BSF by using Nbsf_Management_Discovery service (as defined in 3GPP TS 29.521 [9]) to retrieve the PCF address; and
- the NEF shall interact with the PCF by using Npcf_PolicyAuthorization service as defined in 3GPP TS 29.514 [7].

4.4.9 Procedures for setting up an AF session with required QoS

The procedures for setting up an AF session with required QoS in 5GS are described in subclause 4.4.13 of 3GPP TS 29.122 [4] with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF;
- description of the PCRF applies to the PCF;
- the NEF may interact with BSF by using Nbsf_Management_Discovery service as defined in 3GPP TS 29.521 [9] to retrieve the PCF address;
- the NEF shall interact with the PCF by using Npcf_PolicyAuthorization service as defined in 3GPP TS 29.514 [7] ;
- if the EthAsSessionQoS_5G feature as defined in subclause 5.14.4 of 3GPP TS 29.122 [4] is supported and the request is for Ethernet UE:
  - in the HTTP POST/PUT request, the AF shall include the UE MAC address within the "macAddr" attribute instead of the UE IP address and the Ethernet Flow description within the "ethFlowInfo" attribute instead of the IP Flow description;

- in the HTTP PATCH request, the AF may update the Ethernet Flow description within the "ethFlowInfo" attribute;

- if the "QoSMonitoring_5G" feature as defined in subclause 5.3.4 of 3GPP TS 29.122 [4] is supported, in order to support the QoS Monitoring, the AF shall include "qosMonInfo" 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 "repThreshDl" attribute;

    - the delay threshold for uplink with the "repThreshUl" 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.

  - when the NEF receives the event notification as defined in subclause 4.4.2 of 3GPP TS 29.508 [26] or subclause 4.2.5.14 of 3GPP TS 29.514 [7], the NEF shall include the QoS monitoring report within the "qosMonReport" attribute. Within the QosMonitoringReport data structure, the NEF shall include:

    - one or two uplink packet delays within the "ulDelays" attribute;

    - one or two downlink packet delays within the "dlDelays" attribute; and/or

    - one or two round trip packet delays within the "rtDelays" attribute; and

- if the "AlternativeQoS_5G" feature is supported, the AF may include an ordered list of QoS references within the "altQosReferences" attribute. The NEF shall transfer them to the PCF in the Npcf_PolicyAuthorization service. The NEF shall also subscribe to PCF event "QOS_NOTIF" in the Npcf_PolicyAuthorization service. When the NEF receives the notification of PCF event "QOS_NOTIF", it shall notify the AF with "QOS_GUARANTEED" event; or "QOS_NOT_GUARANTEED" event with the currently applied QoS reference.

NOTE: Based on the operator configuration, the QoS reference identifiers received from the AF can be the same or different as the QoS reference identifiers known at the PCF. The NEF can perform a mapping for the QoS reference identifier.

4.4.10 Procedures for MSISDN-less Mobile Originated SMS

The procedures are used by the NEF to send the MSISDN-less MO-SMS to the AF in 5GS are described in subclause 4.4.14 of 3GPP TS 29.122 [4] with the following differences:

- description of the SCS/AS applies to the AF;

- description of the SCEF applies to the NEF; and

- the NEF shall interact with UDM by using Nudm_SubscriberDataManagement service (as defined in 3GPP TS 29.503 [17]) to retrieve the external identifier.

4.4.11 Procedures for Network Configuration Parameters Provisioning

The procedures for network configuration parameters provisioning as described in subclause 4.4.12 of 3GPP TS 29.122 [4] shall be applicable in 5GS with the following differences:

- description of the SCS/AS applies to the AF;

- description of the SCEF applies to the NEF;

- description of the HSS applies to the UDM; and
- the NEF shall interact with the UDM by using Nudm_ParameterProvision service as specified in 3GPP TS 29.503 [17].

4.4.12 Procedures for Non-IP data delivery

4.4.12.1 General

The procedures are used by the NEF to send/receive the non-IP data to/from the AF. It comprises NIDD configuration and NIDD delivery.

The NIDD configuration may be triggered by the NEF or the AF. If it is triggered by the NEF, the NiddConfigurationTrigger API described in subclause 5.5 is used and the procedure is described in subclause 4.4.12.2.

4.4.12.2 NIDD configuration Triggered by the NEF

If the NEF receives a NIDD connection establishment request from the SMF and if there is no NIDD configuration for the UE, the NEF may send a NIDD configuration trigger to the AF. The NEF determines the destination URI by local configuration. The NEF shall send to the determined destination URL an HTTP POST request that shall include a NiddConfiguarationTrigger data type with:

- the NEF identifier,
- the AF identifier, and
- GPSI as UE identity.

The AF shall acknowledge the HTTP POST request with an HTTP 200 OK response. Then the AF may start NIDD configuration procedure as described in subclause 4.4.12.3.

4.4.12.3 NIDD configuration triggered by the AF and NIDD delivery

The procedures for NIDD configuration triggered by the AF and NIDD delivery are described in subclause 4.4.5 of 3GPP TS 29.122 [4] with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF;
- description of the MME/SGSN applies to the SMF;
- for the connection establishment, the interaction between the NEF and the SMF shall use Nnef_SMContext service as specified in 3GPP TS 29.541 [24];
- for MO NIDD, the interaction between the SMF and the NEF shall use Nnef_SMContext service as specified in 3GPP TS 29.541 [24]; and
- for MT NIDD, the interaction between the SMF and the NEF shall use Nsmf_NIDD service as specified in 3GPP TS 29.542 [25].

4.4.13 Procedures for RACS Parameter Provisioning

The procedures for RACS parameter provisioning as described in subclause 4.4.15 of 3GPP TS 29.122 [4] shall be applicable in 5G with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF.

4.4.14 Procedures for analytics information exposure

4.4.14.1 Subscription/unsubscription to notification of analytics information

The procedures are used by the AF to subscribe/unsubscribe to retrieve analytics information via NEF, and are used by the NEF to notify the AF about the requested analytics information as described in 3GPP TS 23.288 [29].

In order to subscribe to retrieve analytics information, the AF shall send an HTTP POST message to the NEF to the resource "Analytics Exposure Subscriptions", the HTTP POST message shall include AnalyticsExposureSubsc data structure as request body.

The AnalyticsExposureSubsc data structure shall include:

- an URI where to receive the requested notifications as "notifUri" attribute;
- Notification Correlation Identifier assigned by the NF service consumer for the requested notifications as "notifId" attribute; and
- a description of the subscribed events as "analyEventsSubs" attribute that for each event shall include
    1) an event identifier as "analyEvent" attribute.

The AnalyticsExposureSubsc data structure may include:

- event reporting requirement information as "analyRepInfo" attribute, which applies for all events in a subscription and may contain the following attributes:
    1) event notification method (periodic, one time, on event detection) as "notifMethod" attribute;
    2) maximum Number of Reports as "maxReportNbr" attribute;
    3) monitoring Duration as "monDur" attribute;
    4) repetition period for periodic reporting as "repPeriod" attribute;
    5) immediate reporting indication as "immRep" attribute;
    6) sampling ratio as "sampRatio" attribute;
    7) group reporting guard time as "grpRepTime" attribute.

Each AnalyticsEventSubsc data structure may include:

- event specific filters via the "analyEventFilter" attribute; and
- the indication of the UEs to which the subscription applies via "tgtUe" attribute, which if provided shall include one of the following attributes:
    1) identification of an individual UE via a "gpsi" attribute; or
    2) identification of a group of UE(s) via a "exterGroupId" attribute; or
    3) identification of any UE via the "anyUeInd" attribute.

In order to update an existing analytics exposure subscription, the AF shall send an HTTP PUT message to the NEF to the resource "Individual Analytics Exposure Subscription" requesting to change the subscription.

In order to delete an existing analytics exposure subscription, the AF shall send an HTTP DELETE message to the NEF to the resource "Individual Analytics Exposure Subscription".

Upon receipt of the HTTP request from the AF, if the AF is authorized, the NEF shall interact with the NWDAF to subscribe to, modify or cancel the subscription to the analytics information by using the Nnwdaf_EventsSubscription service as defined in 3GPP TS 29.520 [27]. If the NEF receives an error code from the NWDAF, the NEF shall not create, update or delete the resource and shall respond to the AF with a proper error status code.

After receiving a successful response from the NWDAF, the NEF shall,

- for the HTTP POST request, create a resource "Individual Analytics Exposure Subscription" which represents the analytics exposure subscription, addressed by a URI that contains the AF Identifier and an NEF-created subscription identifier, and shall respond to the AF with a 201 Created status code, including a Location header field containing the URI for the created resource. The AF shall use the URI received in the Location header in subsequent requests to the NEF to refer to this analytics exposure subscription.

- for the HTTP PUT request, update a resource "Individual Analytics Exposure Subscription" which represents the analytics exposure subscription, and shall responds to the AF with a 200 OK or 204 No Content status code.

- for the HTTP DELETE request, remove all properties of the resource and delete the corresponding active resource "Individual Analytics Exposure Subscription" which represents the analytics exposure subscription, then shall responds to the AF with a 204 No Content status code.

If the immediate reporting indication in the "immRep" attribute within the "analyRepInfo" attribute sets to true during the HTTP POST or PUT request, the NEF shall also include the reports of the events subscribed, if available, in the HTTP POST or PUT response to the AF.

If the NEF receives an analytics information notification from the NWDAF indicating that the subscribed analytics event has been detected, the NEF shall provide a notification by sending HTTP POST message that include the AnalyticsEventNotification data structure at least with the detected analytics event to the AF identified by the notification URI together with the notification correlation identifier received during creation of the Individual Analytics Exposure Subscription. Upon receipt of the analytics event notification, the AF shall respond with a "204 No Content" status code to confirm the received notification.

4.4.14.2 Fetch analytics information

The procedures are used by the AF to fetch analytics information via NEF.

In order to fetch analytics information, the AF shall send an HTTP POST message to the NEF to the customized operation URI "{apiRoot}/3gpp-analyticsexposure/v1/fetch", the HTTP POST message shall include AnalyticsRequest data structure as request body. The AnalyticsRequest data structure shall include:

- identification of the analytics events as "analyEvents" attribute;

and may include:

- description of the analytics reporting information as "analyRep" attribute;

- an event filter as "analyEventFilter" attribute.

- indication of the UEs to which the analytics request applies via:

  a) identification of an individual UE via a "gpsi" attribute; or

  b) identification of a group of UE(s) via a "exterGroupId" attribute; or

  c) identification of any UE via the "anyUeInd" attribute.

Upon the reception of an HTTP POST request, if the AF is authorized, the NEF shall interact with the UDM by using Nudm_SubscriberDataManagement service as defined in 3GPP TS 29.503 [17] to translate the GPSI or external group identifier into the corresponding SUPI or internal group identifier. After receiving a successful response from the UDM, the NEF shall interact with the NWDAF by using Nnwdaf_AnalyticsInfo service as defined in 3GPP TS 29.520 [27]. If the NEF receives an error code from the NWDAF, the NEF shall respond to the AF with a proper error status code. If a successful response including analytics information is received from the NWDAF, the NEF shall translate the network internal information to external information (e.g. SUPI to GPSI, Internal Group ID to External Group ID) and send an HTTP POST response to the AF by including analytics information within the AnalyticsData data structure.

4.4.15 Procedures for 5G LAN Parameter Provisioning

4.4.15.1 General

The procedures are used by the AF to provision 5G LAN type service related parameters to the NEF. The following procedures support:

- Management of 5G Virtual Network group membership; and/or
- Management of 5G Virtual Network group data

4.4.15.2 Creation of a new subscription for 5G LAN parameter provisioning

In order to create a new subscription to provision 5G LAN related parameters, the AF shall initiate an HTTP POST request to the NEF for the "5GLAN Parameters Provision Subscriptions" resource. The body of the HTTP POST message shall include the 5G LAN service related parameters within the "5gLanParams" attribute.

Upon receipt of the corresponding HTTP POST message, if the AF is authorized by the NEF to provision the parameters, the NEF shall interact with the UDM to create a subscription at the UDM by using Nudm_ParameterProvision service as defined in 3GPP TS 29.503 [17]. If the request is accepted by the UDM and the UDM informs the NEF with a successful response, the NEF shall create a new subscription and assign a subscription identifier for the "Individual 5GLAN Parameters Provision Subscription" resource. Then the NEF shall send a HTTP "201 Created" response with 5GLanParametersProvision data structure as response body and a Location header field containing the URI of the created individual subscription resource.

4.4.15.3 Modification of an existing subscription for 5G LAN parameter provisioning

To modify an existing subscription to provision 5G LAN parameters, the AF shall initiate an HTTP PUT/PATCH request to the NEF for the "Individual 5GLAN Parameters Provision Subscription" resource. The body of the HTTP PUT message shall include the 5GLanParametersProvision data type as defined in subclause 5.7.2.3.2. The External Group Identifier, DNN, S-NSSAI and PDU session type shall remain unchanged from previous values. The body of the HTTP PATCH message shall include the 5GLanParametersProvisionPatch data as defined in subclause 5.7.2.3.5.

Upon receipt of the corresponding HTTP PUT/PATCH message, if the AF is authorized by the NEF to provision the parameters, the NEF shall interact with the UDM to modify an existing subscription at the UDM by using Nudm_ParameterProvision service as defined in 3GPP TS 29.503 [17]. If the modification request is accepted by the UDM and the UDM informs the NEF with a successful response, the NEF shall update the existing subscription for the "Individual 5GLAN Parameters Provision Subscription" resource. Then the NEF shall send a HTTP response including "200 OK" status code with 5GLanParametersProvision data structure or "204 No Content" status code.

4.4.15.4 Deletion of an existing subscription for 5G LAN parameter provisioning

To delete an existing subscription to 5GLAN provision parameters, the AF shall initiate an HTTP DELETE request to the NEF for the "Individual 5GLAN Parameters Provision Subscription" resource.

Upon receipt of the corresponding HTTP DELETE message, if the AF is authorized, the NEF shall interact with the UDM to delete an existing parameters provision subscription at the UDM by using Nudm_ParameterProvision service as defined in 3GPP TS 29.503 [17]. If the request is accepted by the UDM and informs the NEF with a successful response, the NEF shall delete the existing subscription for the "Individual 5GLAN Parameters Provision Subscription" resource. Then the NEF shall send a HTTP "204 No Content" response.

4.4.16 Procedures for applying BDT policy

In order to create a resource for the applying a previously negotiated Background Data Transfer Policy to a UE or a Group of UEs, the AF shall send an HTTP POST message to the NEF to the resource "Applied BDT Policy Subscriptions". The body of the HTTP POST message shall contain the external Group Identifier or external Identifier, and the Background Data Transfer Reference ID for a previously negotiated policy of a background data transfer.

Upon receipt of the HTTP POST request from the AF, if the AF is authorized, the NEF shall interact with the UDM by invoking the Nudm_SubscriberDataManagement service as described in 3GPP TS 29.503 [17] to retrieve the SUPI or Internal Group Identifier.

In order to update an existing applied BDT policy subscription, the AF shall send an HTTP PATCH message to the resource "Individual Applied BDT Policy Subscription" requesting to change the applied BDT policy. The AF shall include in the body of the HTTP PATCH request the new Background Data Transfer Reference ID.

In order to delete an existing applied BDT policy subscription, the AF shall send an HTTP DELETE message to the NEF to the resource "Individual Applied BDT Policy Subscription".

The NEF shall interact with the UDR by invoking the Nudr_DataRepository service as described in 3GPP TS 29.504 [20], if the NEF receives an error code from the UDR, the NEF shall not create, update or delete the resource and shall respond to the AF with a proper error status code.

After receiving a successful response from the UDR, the NEF shall:

- for the HTTP POST request, create a resource "Individual Applied BDT Policy Subscription" addressed by a URI that contains the AF Identifier and an NEF-created subscription identifier, and shall respond to the AF with a "201 Created" status code, including a Location header field containing the URI of the created resource. The AF shall use the URI received in the Location header in subsequent requests to the NEF to refer to this resource.
- for the HTTP PATCH request, update a resource "Individual Applied BDT Policy Subscription" which represents the applied BDT policy subscription, and shall respond to the AF with a "200 OK" or "204 No Content" status code.
- for the HTTP DELETE request, delete the corresponding active resource "Individual Applied BDT Policy Subscription", and shall respond to the AF with a "204 No Content" status code.

4.4.17 Procedures for Enhanced Coverage Restriction Control

The procedures for network configuration parameters provisioning as described in subclause 4.4.11 of 3GPP TS 29.122 [4] shall be applicable in 5GS with the following differences:

- description of the SCS/AS applies to the AF;
- description of the SCEF applies to the NEF;
- description of the HSS applies to the UDM; and
- upon receipt of HTTP POST request from the AF to query the current status of enhanced coverage restriction, the NEF shall interact with the UDM by using the Nudm_SubscriberDataManagement service as specified in 3GPP TS 29.503 [17].
- upon receipt of HTTP POST request from the AF to configure the enhanced converage restriction, the NEF shall interact with the UDM by using the Nudm_ParameterProvision service as specified in 3GPP TS 29.503 [17].
- if the ECR_WB_5G feature is supported, in order to configure the enhanced coverage restriction for WB UE, the HTTP POST request message shall include the WB mode related enhanced coverage restriction information via the "ecrDataWbs" attribute for the WB UE.

4.4.18 Procedures for IPTV Configuration

The procedures are used by the AF to authorize the request and forward the request for IPTV configuration information via NEF.

In order to configure IPTV information, the AF shall send an HTTP POST message to the NEF to the resource "IPTV Configurations", the HTTP POST message shall include IptvConfigData data structure as request body. The IptvConfigData data structure shall include:

- indication of the UEs to which the subscription applies via:
  a) identification of an individual UE via a "gpsi" attribute; or
  b) identification of a group of UE(s) via a "exterGroupId" attribute;
- an application identifier as "appId" attribute; and
- a list of Multicast Access Control as "multiAccCtrls" attribute;

and may include:

- an DNN as "dnn" attribute;
- an S-NSSAI as "snssai" attribute.

In order to update an existing analytics exposure subscription, the AF shall send an HTTP PUT or HTTP PATCH message to the NEF to the resource "Individual IPTV Configuration" requesting to change the subscription. The External Group Identifier, GPSI, DNN, S-NSSAI and Application Identifier shall remain unchanged from previous values in the HTTP PUT message.

In order to delete an existing analytics exposure subscription, the AF shall send an HTTP DELETE message to the NEF to the resource "Individual IPTV Configuration".

Upon receipt of the HTTP request from the AF, if the AF is authorized, the NEF shall interact with the UDM by invoking the Nudm_SubscriberDataManagement service as described in 3GPP TS 29.503 [17] to retrieve the SUPI or Internal Group Identifier. Then the NEF shall interact with the UDR to create, update or delete the IPTV configuration by using the Nudr_DataRepository service as defined in 3GPP TS 29.519 [23]. If the NEF receives an error code from the UDR, the NEF shall not create, update or delete the resource and shall respond to the AF with a proper error status code.

After receiving a successful response from the UDR, the NEF shall,

- for the HTTP POST request, create a resource "Individual IPTV Configuration" which represents the IPTV configuration request, addressed by a URI that contains the AF Identifier and an NEF-created configuration identifier, and shall respond to the AF with a 201 Created status code, including a Location header field containing the URI for the created resource. The AF shall use the URI received in the Location header in subsequent requests to the NEF to refer to this IPTV configuration.

- for the HTTP PUT or HTTP PATCH request, update a resource "Individual IPTV Configuration" which represents the IPTV configuration, and shall responds to the AF with a 200 OK or 204 No Content status code.

- for the HTTP DELETE request, remove all properties of the resource and delete the corresponding active resource "Individual IPTV Configuration", then shall responds to the AF with a 204 No Content status code.

4.4.19 Procedures for Location Privacy Indication Parameters Provisioning

The procedures are used by the AF to provision Location Privacy Indication parameters to the NEF. The procedures are applicable for an individual UE or a group of UEs.

In order to provision Location Privacy Indication parameters, the AF shall initiate an HTTP POST request to the NEF for the "LPI Parameters Provisionings" resource. The body of the HTTP POST message shall include the Location Privacy Indication related parameters within the LpiParametersProvision data structure.

Upon receipt of the corresponding HTTP POST message, if the AF is authorized by the NEF to provision the parameters, the NEF shall interact with the UDM to create a resource at the UDM by using Nudm_ParameterProvision service as defined in 3GPP TS 29.503 [17]. If the request is accepted by the UDM and the UDM informs the NEF with a successful response, the NEF shall create a new resource and assign an identifier for the "Individual LPI Parameters Provisioning" resource. Then the NEF shall send a HTTP "201 Created" response with LpiParameterProvision data structure as response body and a Location header field containing the URI of the created individual resource. In order to update an existing individual LPI Parameters Provisioning, the AF may send an HTTP PUT message to the resource "individual LPI Parameters Provisioning" requesting the NEF to change all properties in the existing resource. The body of the HTTP PUT request message shall include LpiParametersProvision data type as defined in subclause 5.10.2.3.2. The External Group Identifier or GPSI shall remain unchanged from previous values.

Upon receipt of the corresponding HTTP PUT message, if the AF is authorized by the NEF to provision the parameters, the NEF shall interact with the UDM to modify an existing resource at the UDM by using Nudm_ParameterProvision service as defined in 3GPP TS 29.503 [17]. If the modification request is accepted by the UDM and the UDM informs the NEF with a successful response, the NEF shall update the existing resource for the "Individual LPI Parameters Provisioning" resource. Then the NEF shall send a HTTP response including "200 OK" status code with LpiParametersProvision data structure or "204 No Content" status code.

To delete an existing to LPI Parameters Provisioning, the AF shall initiate an HTTP DELETE request to the NEF for the "Individual LPI Parameters Provisioning" resource.

Upon receipt of the corresponding HTTP DELETE message, if the AF is authorized, the NEF shall interact with the UDM to delete an existing LPI Parameters Provisioning at the UDM by using Nudm_ParameterProvision service as defined in 3GPP TS 29.503 [17]. If the request is accepted by the UDM, the NEF shall delete the existing resource for the "Individual LPI Parameters Provisioning" resource. Then the NEF shall send a HTTP "204 No Content" response.

4.4.20 Procedures for service specific parameter provisioning

The procedures are used by the AF to provide service specific parameters to 5G system via NEF.

In order to provision the service specific parameter, the AF shall send an HTTP POST message to the NEF to the resource "Service Parameter Subscriptions", the HTTP POST message shall include ServiceParameterData data structure as request body. The ServiceParameterData data structure shall include:

- service description via:

  a) an combination of DNN and S-NSSAI within the "dnn" attribute and the "snssai" attribute respectively;

  b) an AF servcie identifier within the "afServiceId" attribute; or

  c) an application identifier within the "appId" attribute;

- indication of the UEs to which the subscription applies via:

  a) identification of an individual UE within the "gpsi" attribute;

  b) an IPv4 address of the UE within the "ueIpv4" attribute;

  c) an IPv6 address of the UE within the "ueIpv6" attribute;

  d) an MAC address of the UE within the "ueMac" attribute;

  e) an identification of a group of UE(s) within the "exterGroupId" attribute; or

  f) identification of any UE within the "anyUeInd" attribute.

- configuration parameters for V2X communication over PC5 within the "paramOverPc5" attribute; and

- configuration parameters for V2X communication over Uu within the "paramOverUu" attribute.

In order to update an existing analytics exposure subscription, the AF shall send an HTTP PUT or HTTP PATCH message to the NEF to the resource "Individual Service Parameter Subscription" requesting to change the subscription.

In order to delete an existing service paramter subscription, the AF shall send an HTTP DELETE message to the NEF to the resource "Individual Service Parameter Subscription".

Upon receipt of the HTTP request from the AF, if the AF is authorized, the NEF shall interact with the UDM by invoking the Nudm_SubscriberDataManagement service as described in 3GPP TS 29.503 [17] to retrieve the SUPI or Internal Group Identifier. Then the NEF shall interact with the UDR to create, update or delete the service parameter by using the Nudr_DataRepository service as defined in 3GPP TS 29.519 [23]. If the NEF receives an error code from the UDR, the NEF shall not create, update or delete the resource and shall respond to the AF with a proper error status code.

After receiving a successful response from the UDR, the NEF shall,

- for the HTTP POST request, create a resource "Individual Service Parameter Subscription" which represents the Service Parameter provisioning request, addressed by a URI that contains the AF Identifier and an NEF-created configuration identifier, and shall respond to the AF with a 201 Created status code, including a Location header field containing the URI for the created resource. The AF shall use the URI received in the Location header in subsequent requests to the NEF to refer to this Service Parameter Subscription.

- for the HTTP PUT or HTTP PATCH request, update a resource "Individual Service Parameter Subscription" which represents the service parameter, and shall responds to the AF with a 200 OK or 204 No Content status code.

- for the HTTP DELETE request, remove all properties of the resource and delete the corresponding active resource "Individual Service Parameter Subscription", then shall responds to the AF with a 204 No Content status code.

4.4.21 Procedures for ACS configuration parameter provisioning

The procedures are used by the AF to provide ACS configuration information to 5G system via NEF.

In order to provision the ACS configuration information, the AF shall send an HTTP POST message to the NEF to the resource "ACS Configuration Subscriptions", the HTTP POST message shall include AcsConfigurationData data structure as request body. The AcsConfigurationData data structure shall include the URL of the ACS or the address of the ACS within the "acsInfo" attribute.

In order to update an existing ACS configuration subscription, the AF shall send an HTTP PUT message to the NEF to the resource "Individual ACS Configuration Subscription" requesting to change the subscription. The body of the HTTP PUT request message shall include AcsConfigurationData data type. The External Group Identifier or GPSI shall remain unchanged from previous values.

In order to delete an existing ACS configuration subscription, the AF shall send an HTTP DELETE message to the NEF to the resource "Individual ACS configuration Subscription".

Upon receipt of the corresponding HTTP message, if the AF is authorized by the NEF to provision the parameters, the NEF shall interact with the UDM to create a subscription at the UDM by using Nudm_ParameterProvision service as defined in 3GPP TS 29.503 [17].

After receiving a successful response from the UDM, the NEF shall,

- for the HTTP POST request, create a resource "Individual ACS Configuration Subscription" which represents the ACS configuration parameter provisioning request, addressed by a URI that contains the AF Identifier and an NEF-created configuration identifier, and shall respond to the AF with a 201 Created status code, including a Location header field containing the URI for the created resource. The AF shall use the URI received in the Location header in subsequent requests to the NEF to refer to this ACS Configuration Subscription.

- for the HTTP PUT request, update a resource "Individual ACS Configuration Subscription" which represents the ACS configuration, and shall responds to the AF with a 200 OK or 204 No Content status code.- for the HTTP DELETE request, remove all properties of the resource and delete the corresponding active resource "Individual ACS Configuration Subscription", then shall responds to the AF with a 204 No Content status code.

4.4.22 Procedures for Mobile Originated Location Request

4.4.22.1 General

The procedure is used by NEF to transfer the updated UE location information to AF. The following procedure support:

- Notify the AF of the updated UE location information as described in subclause 6.2 of 3GPP TS 23.273 [36];

4.4.22.2 Location Update Notification triggered by UE

In order to notify the AF of the updated UE location information received from GMLC, the NEF shall initiate an HTTP POST request to the AF. The body of the HTTP POST message shall include the location information related to UE MO-LR.

Upon receipt of the corresponding HTTP POST message, if the AF cannot handle the location estimate of the UE, e.g. the UE does not register to the AF, the AF shall respond to the NEF with an error code. Otherwise, the AF shall handle the location estimate according to the Service Identity if provided, and send a HTTP response including "204 No Content" status code.

5 NEF Northbound APIs

5.1 Introduction

The NEF Northbound APIs are a set of APIs defining the related procedures and resources for the interaction between the NEF and the AF.

5.2 Information applicable to several APIs

The usage of HTTP, content type and URI structure definition, as specified in subclauses 5.2.2, 5.2.3 and 5.2.4 of 3GPP TS 29.122 [4] respectively, shall be applicable for NEF Northbound APIs.

The notification, error handling, feature negotiation, HTTP custom headers as specified in subclauses 5.2.5, 5.2.6, 5.2.7, 5.2.8 of 3GPP TS 29.122 [4] respectively, shall be applicable for NEF Northbound APIs except that the SCEF is replaced by the NEF and the SCS/AS is replaced by the AF.

The conventions for Open API specification files as specified in subclause 5.2.10 of 3GPP TS 29.122 [4] shall be applicable for NEF Northbound APIs.

5.3 Reused APIs

This subclause describes the northbound APIs which are applicable for both EPS and 5GS.

Table 5.3-1: Reused APIs applicable for both EPS and 5GS

API Name	Differences
ResourceManagementOfBdt	- The "LocBdt_5G" feature as described in subclause 5.4.4 of 3GPP TS 29.122 [4] may only be supported in 5G. - The "Group_Id" feature as described in subclause 5.4.4 of 3GPP TS 29.122 [4] may be supported in 5G. - The "BdtNotification_5G" feature as described in subclause 5.4.4 of 3GPP TS 29.122 [4] may only be supported in 5G.
PfdManagement	The "FailureLocation_5G" feature as described in subclause 5.11.4 of 3GPP TS 29.122 [4] may only be supported in 5G.
MonitoringEvent	- The "Number_of_UEs_in_an_area_notification_5G" feature as described in subclause 5.3.4 of 3GPP TS 29.122 [4] may only be supported in 5G. - The "Downlink_data_delivery_status_5G" feature as described in subclause 5.3.4 of 3GPP TS 29.122 [4] may only be supported in 5G. - The "Availability_after_DDN_failure_notification_enhancement" feature as described in subclause 5.3.4 of 3GPP TS 29.122 [4] may only be supported in 5G. - For the "Pdn_connectivity_status" feature, APN is equivalent to DNN; the non-IP PDN type is equivalent to the unstructured PDU session type; and the enumeration InterfaceIndication value "PDN_GATEWAY" stands for PDU session anchored in UPF in 5G. - The "eLCS" feature as described in subclause 5.3.4 of 3GPP TS 29.122 [4] may only be supported in 5G.
DeviceTriggering	
CpProvisioning	- The "ExpectedUMT_5G" and "ExpectedUmtTime_5G" features as described in subclause 5.10.4 of 3GPP TS 29.122 [4] may only be supported in 5G. - The "ScheduledCommType_5G" feature as described in subclause 5.10.4 of 3GPP TS 29.122 [4] may only be supported in 5G.
ChargeableParty	- The "EthChgParty_5G" and "MacAddressRange_5G" features as described in subclause 5.5.4 of 3GPP TS 29.122 [4] may only be supported in 5G. - The events (i.e. LOSS_OF_BEARER, RECOVERY_OF_BEARER and RELEASE_OF_BEARER) do not apply for 5G.
AsSessionWithQoS	- The "EthAsSessionQoS_5G", "QoSMonitoring_5G", "MacAddressRange_5G" and "AlternativeQoS_5G" features as described in subclause 5.14.4 of 3GPP TS 29.122 [4] may only be supported in 5G. - The events (i.e. LOSS_OF_BEARER, RECOVERY_OF_BEARER and RELEASE_OF_BEARER) do not apply for 5G.
MsisdnLessMoSms	
NpConfiguration	The "NpExpiry_5G" feature as described in subclause 5.13.4 of 3GPP TS 29.122 [4] may only be supported in 5G.
NIDD	
RacsParameterProvisioning	
ECRControl	

5.4 TrafficInfluence API

5.4.1 Resources

5.4.1.1 Overview

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-traffic-influence/v1/

"apiRoot" is set as described in subclause 5.2.4 in 3GPP TS 29.122 [4]. "apiName" shall be set to "3gpp-traffic-influence" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

This subclause describes the structure for the Resource URIs as shown in figure 5.4.1.1-1 and the resources and HTTP methods used for the TrafficInfluence API.

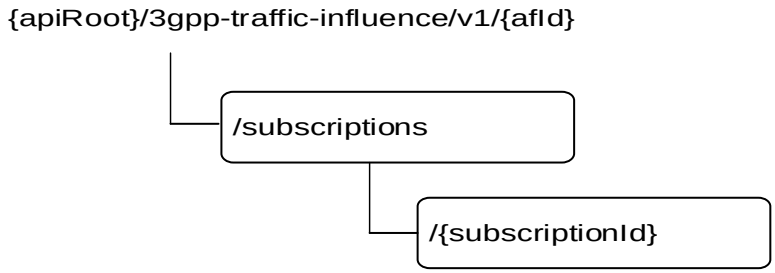

Figure 5.4.1.1-1: Resource URI structure of the TrafficInfluence API

Table 5.4.1.1-1 provides an overview of the resources and HTTP methods applicable for the TrafficInfluence API.

Table 5.4.1.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
Traffic Influence Subscription	{apiRoot}/3gpp-traffic-Influence/v1/{afId}/subscriptions	GET	Read all subscriptions for a given AF
		POST	Create a new subscription to traffic influence
Individual Traffic Influence Subscription	{apiRoot}/3gpp-traffic-Influence/v1/{afId}/subscriptions/{subscriptionId}	GET	Read the subscription to the traffic influence
		PUT	Modify all of the properties of an existing subscription to an traffic influence
		PATCH	Modify part of the properties of an existing subscription to an traffic influence
		DELETE	Delete the subscription to the traffic influence

5.4.1.2 Resource: Traffic Influence Subscription

5.4.1.2.1 Introduction

This resource allows a AF to read all active traffic influence subscribtions for the given AF.

5.4.1.2.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-traffic-influence/v1/{afId}/subscriptions**

This resource shall support the resource URI variables defined in table 5.4.1.2.2-1.

Table 5.4.1.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.

5.4.1.2.3 Resource Methods

5.4.1.2.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.4.1.2.2.

5.4.1.2.3.2 GET

The GET method allows to read all active subscriptions for a given AF. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.4.1.2.3.2-1.

Table 5.4.1.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.4.1.2.3.2-2 and the response data structures and response codes specified in table 5.4.1.2.3.2-3.

Table 5.4.1.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.4.1.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(TrafficInfluSub)	M	0..N	200 OK	The subscription information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.4.1.2.3.3 POST

The POST method creates a new subscription resource to traffic influence subscription for a given AF. The AF shall initiate the HTTP POST request message and the NEF shall respond to the message. The NEF shall construct the URI of the created resource.

This method shall support the request data structures specified in table 5.4.1.2.3.3-1 and the response data structures and response codes specified in table 5.4.1.2.3.3-2.

Table 5.4.1.2.3.3-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
TrafficInfluSub	M	1	Parameters to register a subscription to influencing traffic routing and/or notification about UP management events with the NEF.

Table 5.4.1.2.3.3-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
TrafficInfluSub	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 codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

Table 5.4.1.2.3.3-3: 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}/3gpp-traffic-Influence/v1/{afId}/subscriptions/{subscriptionId}

5.4.1.3 Resource: Individual Traffic Influence Subscription

5.4.1.3.1 Introduction

This resource allows a AF to register a subscription to influencing traffic routing and/or notification about UP management events with the NEF.

5.4.1.3.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-traffic-influence/v1/{afId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.4.1.3.2-1.

Table 5.4.1.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.
subscriptionId	string	Identifier of the subscription.

5.4.1.3.3 Resource Methods

5.4.1.3.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.4.1.3.2.

5.4.1.3.3.2 GET

The GET method allows to read the active subscription for a given AF and subscription Id. The AF shall initiate the HTTP GET request message and theNEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.4.1.3.3.2-1.

Table 5.4.1.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.4.1.3.3.2-2 and the response data structures and response codes specified in table 5.4.1.3.3.2-3.

Table 5.4.1.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.4.1.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
TrafficInfluSub	M	1	200 OK	The subscription information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.4.1.3.3 PUT

The PUT method modifies an existing subscription resource to update a subscription. The AF shall initiate the HTTP PUT request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.4.1.3.3.3-1 and the response data structures and response codes specified in table 5.4.1.3.3.3-2.

Table 5.4.1.3.3.3-1: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
TrafficInfluSub	M	1	Modify an existing subscription to influencing traffic routing and/or notification about UP management events with the NEF.

Table 5.4.1.3.3.3-2: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
TrafficInfluSub	M	1	200 OK	The subscription was updated successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.4.1.3.4 PATCH

The PATCH method allows to change some properties of an existing traffic influence subscription. The AF shall initiate the HTTP PATCH request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.4.1.3.3.4-1 and the response data structures and response codes specified in table 5.4.1.3.3.4-2.

Table 5.4.1.3.3.4-1: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
TrafficInfluSubPatch	M	1	Partial update of a subscription to influencing traffic routing and/or notifications about UP management events with the NEF.

Table 5.4.1.3.3.4-2: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
TrafficInfluSub	M	1	200 OK	The subscription was modified successfully.

NOTE:	The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.

5.4.1.3.3.5 DELETE

The DELETE method deletes the traffic influence subscription for a given AF. The AF shall initiate the HTTP DELETE request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.4.1.3.3.5-1.

Table 5.4.1.3.3.5-1: 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 5.4.1.3.3.5-2 and the response data structures and response codes specified in table 5.4.1.3.3.5-3.

Table 5.4.1.3.3.5-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.4.1.3.3.5-3: 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 terminated successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.4.2 Notifications

5.4.2.1 Introduction

Upon receipt of a UP management event notification from the SMF indicating the subscribed event (e.g. a DNAI has changed) is detected, the NEF shall send an HTTP POST message including the notified event to the AF.

Upon receipt of the event notification, the AF may send an HTTP POST request as acknowledgement for the UP path management event notification to inform the NEF about the result of application layer relocation.

The NEF and the AF shall support the notification mechanism as described in subclause 5.2.5 of 3GPP TS 29.122 [4].

Table 5.4.2.1-1: Notifications overview

Notification	Custom operation URI	Mapped HTTP method	Description
Event Notification	{notificationDestination}	POST	The UP management event notification from the NEF to the AF.
Acknowledgement of event notification	{afAckUri}	POST	The Acknowledgement of Event Notification is used by the AF to acknowledge the NEF about handling result of the event notification.

5.4.2.2 Event Notification

5.4.2.2.1 Description

The Event Notification is used by the NEF to report the UP path management event notification from the SMF to the AF.

5.4.2.2.2 Target URI

URI: **{notificationDestination}**

The operation shall support the URI variables defined in table 5.4.2.2.2-1.

Table 5.4.2.2.2-1: URI variables

Name	Data type	Definition
notificationDestination	Link	Callback reference provided by the AF during creation of the subscription within the TrafficInfluSub data type as defined in Table 5.4.3.3.2-1.

5.4.2.2.3 Operation Definition

5.4.2.2.3.1 Notification via HTTP POST

This method shall support the request data structures specified in table 5.4.2.2.3.1-1 and the response data structures and response codes specified in table 5.4.2.2.3.1-2.

Table 5.4.2.2.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
EventNotification	M	1	The UP management event notification is provided by the NEF to the AF.

Table 5.4.2.2.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
N/A			204 No Content	The event notification is received successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.4.2.2.3.2 Notification via Websocket

If supported by both AF and NEF and successfully negotiated, the EventNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4 of 3GPP TS 29.122 [4].

5.4.2.3 Acknowledgement of event notification

5.4.2.3.1 Description

The Acknowledgement of Event Notification is used by the AF to acknowledge the NEF about handling result of the event notification (e.g. UP path change).

5.4.2.3.2 Target URI

URI: **{afAckUri}**

The operation shall support the URI variables defined in table 5.4.2.3.2-1.

Table 5.4.2.3.2-1: URI variables

Name	Data type	Definition
afAckUri	Link	Callback reference provided by the NEF during event notification within the EventNotification data type as defined in Table 5.4.3.3.4-1.

5.4.2.3.3 Operation Definition

5.4.2.3.3.1 Notification via HTTP POST

This method shall support the request data structures specified in table 5.4.2.3.3.1-1 and the response data structures and response codes specified in table 5.4.2.3.3.1-2.

Table 5.4.2.2.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AfAckInfo	M	1	Acknowledgement information of event notification.

Table 5.4.2.3.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
N/A			204 No Content	The acknowledgement of event notification is received successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.4.3 Data Model

5.4.3.1 General

This subclause specifies the application data model supported by the TrafficInfluence API.

5.4.3.2 Reused data types

The data types reused by the TrafficInfluence API from other specifications are listed in table 5.4.3.2-1.

Table 5.4.3.2-1: Re-used Data Types

Data type	Reference	Comments
Dnai	3GPP TS 29.571 [8]	Identifies a DNAI.
DnaiChangeType	3GPP TS 29.571 [8]	Describes the types of DNAI change.
Dnn	3GPP TS 29.571 [8]	Identifies a DNN.
EthFlowDescription	3GPP TS 29.514 [7]	Contains the Ethernet data flow information. (NOTE)
ExternalGroupId	3GPP TS 29.122 [4]	External Group Identifier for a user group.
FlowInfo	3GPP TS 29.122 [4]	Contains the IP data flow information.
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
Ipv4Addr	3GPP TS 29.122 [4]	Identifies an IPv4 address.
Ipv6Addr	3GPP TS 29.122 [4]	Identifies an IPv6 address.
Ipv6Prefix	3GPP TS 29.571 [8]	Identifies an IPv6 Prefix.
Link	3GPP TS 29.122 [4]	Identifies a referenced resource.
MacAddr48	3GPP TS 29.571 [8]	Identifies a MAC address.
Port	3GPP TS 29.122 [4]	Identifies a port number.
RouteToLocation	3GPP TS 29.571 [8]	Describes the traffic routes to the locations of the application.
Snssai	3GPP TS 29.571 [8]	Identifies the S-NSSAI.
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.4.4-1.
TemporalValidity	3GPP TS 29.514 [7]	Indicates the time interval(s) during which the AF request is to be applied
WebsockNotifConfig	3GPP TS 29.122 [4]	Contains the configuration parameters to set up notification delivery over Websocket protocol.
NOTE: In order to support a set of MAC addresses with a specific range in the traffic filter, feature MacAddressRange as specified in clause 5.4.4 shall be supported.		

5.4.3.3 Structured data types

5.4.3.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.4.3.3.2 Type: TrafficInfluSub

This type represents a traffic influence subscription. The same structure is used in the subscription request and subscription response.

Table 5.4.3.3.2-1: Definition of type TrafficInfluSub

Attribute name	Data type	P	Cardinality	Description	Applicability (NOTE 1)
afServiceId	string	O	0..1	Identifies a service on behalf of which the AF is issuing the request.	
afAppId	string	O	0..1	Identifies an application. (NOTE 3)	
afTransId	string	O	0..1	Identifies an NEF Northbound interface transaction, generated by the AF.	
appReloInd	boolean	O	0..1	Identifies whether an application can be relocated once a location of the application has been selected. Set to "true" if it can be relocated; otherwise set to "false". Default value is "false" if omitted.	
dnn	Dnn	O	0..1	Identifies a DNN, 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 an S-NSSAI.	
externalGroupId	ExternalGroupId	O	0..1	Identifies a group of users. (NOTE 2)	
anyUeInd	boolean	O	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 2)	
subscribedEvents	array(SubscribedEvent)	O	1..N	Identifies the requirement to be notified of the event(s).	
gpsi	Gpsi	O	0..1	Identifies a user. (NOTE 2)	
ipv4Addr	Ipv4Addr	O	0..1	Identifies the IPv4 address. (NOTE 2)	
ipv6Addr	Ipv6Addr	O	0..1	Identifies the IPv6 address. (NOTE 2)	
macAddr	MacAddr48	O	0..1	Identifies the MAC address.	
dnaiChgType	DnaiChangeType	O	0..1	Identifies a type of notification regarding UP path management event.	
notificationDestination	Link	C	0..1	Contains the Callback URL to receive the notification from the NEF. It shall be present if the "subscribedEvents" is present.	
requestTestNotification	boolean	O	0..1	Set to true by the AF to request the NEF to send a test notification as defined in subclause 5.2.5.3 of 3GPP TS 29.122 [4]. Set to false or omitted otherwise.	Notification_test_event
websockNotifConfig	WebsockNotifConfig	O	0..1	Configuration parameters to set up notification delivery over Websocket protocol.	Notification_websocket

self	Link	C	0..1	Link to the created resource. This parameter shall be supplied by the NEF in HTTP responses that include an object of TrafficInfluSub type	
trafficFilters	array(FlowInfo)	O	1..N	Identifies IP packet filters. (NOTE 3)	
ethTrafficFilters	array(EthFlowDescription)	O	1..N	Identifies Ethernet packet filters. (NOTE 3)	
trafficRoutes	array(RouteToLocation)	O	1..N	Identifies the N6 traffic routing requirement.	
tfcCorrInd	boolean	O	0..1	Indication of traffic correlation. May only be included when "externalGroupId" attribute was included within the TrafficInfluSub data type previously. It is used to indicate that for the group of UEs, the targeted PDU sessions should be correlated by a common DNAI. Set to "true" if it should be correlated; otherwise set to "false". Default value is "false" if omitted.	
tempValidities	array(TemporalValidity)	O	0..N	Indicates the time interval(s) during which the AF request is to be applied.	
validGeoZoneIds	array(string)	O	1..N	Identifies a geographic zone that the AF request applies only to the traffic of UE(s) located in this specific zone.	
afAckInd	boolean	O	0..1	Identifies whether the AF acknowledgement of UP path event notification is expected. Set to "true" if the AF acknowledge is expected; otherwise set to "false". Default value is "false" if omitted.	URLLC
addrPreserInd	boolean	O	0..1	Indicates whether UE IP address should be preserved. This attribute shall set to "true" if preserved, otherwise, set to "false". Defalult value is "false" if omitted.	URLLC
suppFeat	SupportedFeatures	C	0..1	Indicates the list of Supported features used as described in subclause 5.4.4. This attribute shall be provided in the POST request and in the response of successful resource creation.	

NOTE 1: Properties marked with a feature as defined in subclause 5.4.4 are applicable as described in subclause 5.2.7 of 3GPP TS 29.122 [4]. If no feature is indicated, the related property applies for all the features.

NOTE 2: One of individual UE identifier (i.e. "gpsi", "ipv4Addr" or "ipv6Addr"), External Group Identifier (i.e. "externalGroupId") or any UE indication "anyUeInd" shall be included.

NOTE 3: One of "afAppId", "trafficFilters" or "ethTrafficFilters" shall be included.

5.4.3.3.3 Type: TrafficInfluSubPatch

This type represents a subscription of traffic influence parameters provided by the AF to the NEF. The structure is used for HTTP PATCH request.

Table 5.4.3.3.3-1: Definition of type TrafficInfluSubPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
appReloInd	boolean	O	0..1	Identifies whether an application can be relocated once a location of the application has been selected. (NOTE)	
trafficFilters	array(FlowInfo)	O	1..N	Identifies IP packet filters.	
ethTrafficFilters	array(EthFlowDescription)	O	1..N	Identifies Ethernet packet filters.	
trafficRoutes	array(RouteToLocation)	O	1..N	Identifies the N6 traffic routing requirement. (NOTE)	
tfcCorrInd	boolean	O	0..1	Indication of traffic correlation. May only be included when "externalGroupId" attribute was included within the TrafficInfluSub data type previously. It is used to indicate that for the group of UEs, the targeted PDU sessions should be correlated by a common DNAI.	
tempValidities	array(TemporalValidity)	O	1..N	Indicates the time interval(s) during which the AF request is to be applied. (NOTE)	
validGeoZoneIds	array(string)	O	1..N	Identifies a geographic zone that the AF request applies only to the traffic of UE(s) located in this specific zone. (NOTE)	
afAckInd	boolean	O	0..1	Identifies whether the AF acknowledgement of UP path event notification is expected.	URLLC
addrPreserInd	boolean	O	0..1	Indicates whether UE IP address should be preserved. (NOTE)	URLLC
NOTE: The value of the property shall be set to NULL for removal.					

5.4.3.3.4 Type: EventNotification

Table 5.4.3.3.4-1: Definition of type EventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability (NOTE 1)
afTransId	string	O	0..1	Identifies an NEF Northbound interface transaction, generated by the AF.	
dnaiChgType	DnaiChangeType	M	1	Identifies the type of notification regarding UP path management event.	
sourceTrafficRoute	RouteToLocation	O	0..1	Identifies the N6 traffic routing information associated to the source DNAI. May be present if the "subscribedEvent" sets to "UP_PATH_CHANGE". (NOTE 3)	
subscribedEvent	SubscribedEvent	M	1	Identifies a UP path management event the AF requested to be notified of.	
targetTrafficRoute	RouteToLocation	O	0..1	Identifies the N6 traffic routing information associated to the target DNAI. May be present if the "subscribedEvent" sets to "UP_PATH_CHANGE". (NOTE 3)	
sourceDnai	Dnai	O	0..1	Source DN Access Identifier. Shall be included for event "UP_PATH_CHANGE" if the DNAI changed (NOTE 2, NOTE 3).	
targetDnai	Dnai	O	0..1	Target DN Access Identifier. Shall be included for event "UP_PATH_CHANGE" if the DNAI changed (NOTE 2, NOTE 3).	
gpsi	Gpsi	O	0..1	Identifies a user.	
srcUeIpv4Addr	Ipv4Addr	O	0..1	The IPv4 Address of the served UE for the source DNAI.	
srcUeIpv6Prefix	Ipv6Prefix	O	0..1	The Ipv6 Address Prefix of the served UE for the source DNAI.	
tgtUeIpv4Addr	Ipv4Addr	O	0..1	The IPv4 Address of the served UE for the target DNAI.	
tgtUeIpv6Prefix	Ipv6Prefix	O	0..1	The Ipv6 Address Prefix of the served UE for the target DNAI.	
ueMac	MacAddr48	O	0..1	UE MAC address of the served UE.	
afAckUri	Link	O	0..1	The URI provided by the NEF for the AF acknowledgement. May only be included for event "UP_PATH_CHANGE".	URLLC

NOTE 1: Properties marked with a feature as defined in subclause 5.4.4 are applicable as described in subclause 5.2.7 of 3GPP TS 29.122 [4]. If no feature is indicated, the related property applies for all the features.

NOTE 2: If the DNAI is not changed while the N6 traffic routing information is changed, the "sourceDnai" attribute and "targetDnai" attribute shall not be provided.

NOTE 3: The change from the UP path status where no DNAI applies to a status where a DNAI applies indicates the activation of the related AF request and therefore only the target DNAI and N6 traffic routing information is provided in the event notification; the change from the UP path status where a DNAI applies to a status where no DNAI applies indicates the de-activation of the related AF request and therefore only the source DNAI and N6 traffic routing information is provided in the event notification.

5.4.3.3.5 Type: AfResultInfo

Table 5.4.3.3.5-1: Definition of type AfResultInfo

Attribute name	Data type	P	Cardinality	Description
afStatus	AfResultStatus	M	1	Identifies the result of the application relocation.
trafficRoute	RouteToLocation	O	0..1	Identifies the N6 traffic routing information associated to the target DNAI. May only be present if the "afStatus" sets to "SUCCESS".

5.4.3.3.6 Type AfAckInfo

Table 5.4.3.3.6-1: Definition of type AfAckInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
afTransId	string	C	0..1	Identifies an NEF Northbound interface transaction, generated by the AF. It shall be provided if the AF has previously provided it.	
ackResult	AfResultInfo	M	1	Identifies the result of application layer handling.	
gpsi	Gpsi	O	0..1	Identifies a GPSI.	

5.4.3.4 Simple data types and enumerations

5.4.3.4.1 Introduction

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

5.4.3.4.2 Simple data types

The simple data types defined in table 5.4.3.4.2-1 shall be supported.

Table 5.4.3.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.4.3.4.3 Enumeration: SubscribedEvent

The enumeration SubscribedEvent represents the type of UP patch management events of which the AF requests to be notified. It shall comply with the provisions defined in table 5.4.3.4.3-1.

Table 5.4.3.4.3-1: Enumeration SubscribedEvent

Enumeration value	Description
UP_PATH_CHANGE	The AF requests to be notified when the UP path changes for the PDU session.

5.4.3.4.4 Enumeration: AfResultStatus

The enumeration AfResultStatus represents the status of application handling result. It shall comply with the provisions defined in table 5.4.3.4.4-1.

Table 5.4.3.4.4-1: Enumeration AfResultStatus

Enumeration value	Description
SUCCESS	The application layer is ready or the relocation is completed.
TEMP_CONGESTION	The application relocation fails due to temporary congestion.
RELOC_NO_ALLOWED	The application relocation fails because application relocation is not allowed.
OTHER	The application relocation fails due to other reason.

5.4.4 Used Features

The table below defines the features applicable to the TrafficInfluence API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.4.4-1: Features used by TrafficInfluence API

Feature number	Feature Name	Description
1	Notification_websocket	The delivery of notifications over Websocket is supported as described in 3GPP TS 29.122 [4]. This feature requires that the Notification_test_event feature is also supported.
2	Notification_test_event	The testing of notification connection is supported as described in 3GPP TS 29.122 [4].
3	URLLC	This feature indicates support of Ultra Reliable Low Latency Communication (URLLC) requirements (i.e. AF application relocation acknowledgement and UE address(es) preservation).
4	MacAddressRange	Indicates the support of a set of MAC addresses with a specific range in the traffic filter.
Feature: A short name that can be used to refer to the bit and to the feature, e.g. "Notification". Description: A clear textual description of the feature.		

5.5 NiddConfigurationTrigger API

5.5.1 Resources

There is no resource defined for this API.

5.5.2 Notifications

5.5.2.1 Introduction

Upon receipt of a NIDD connection establishment request from the SMF and there is no NIDD configuration for the UE, the NEF may send an HTTP POST message in order to trigger the AF to start the NIDD configuration procedure as described in subclause 5.6.3.2.3.4 of 3GPP TS 29.122 [4].

Table 5.5.2.1-1: Notifications overview

Notification	Custom operation URI	Mapped HTTP method	Description
Event Notification	{notificationUri}	POST	Request for the NIDD Configuration Trigger

5.5.2.2 Event Notification

URI: **{notificationUri}**

The operation shall support the URI variables defined in table 5.5.2.2-1.

Table 5.5.2.2-1: URI variables

Name	Data type	Definition
notificationUri	Link	A URI indicating the notification destination where N33 notification requests shall be delivered to. This URI shall be preconfigured in the NEF.

5.5.2.3 Operation Definition

5.5.2.3.1 Notification via HTTP POST

This method shall support the request data structures specified in table 5.5.2.3.1-1 and the response data structures and response codes specified in table 5.5.2.3.1-2.

Table 5.5.2.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
NiddConfiguration Trigger	M	1	The NIDD Configuration Trigger is provided by the NEF to the AF.

Table 5.5.2.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
NiddConfigurationTriggerReply	M	1	200 OK	The trigger is received successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.5.2.3.2 Notification via Websocket

Not specified in the present specification.

5.5.3 Data Model

5.5.3.1 General

This subclause specifies the application data model supported by the NiddConfigurationTrigger API.

5.5.3.2 Reused data types

The data types reused by the NiddConfigurationTrigger API from other specifications are listed in table 5.5.3.2-1.

Table 5.5.3.2-1: Re-used Data Types

Data type	Reference	Comments
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.5.4-1.

5.5.3.3 Structured data types

5.5.3.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.5.3.3.2 Type: NiddConfigurationTrigger

This type represents a NIDD configuration trigger which is sent from the NEF to the AF.

Table 5.5.3.3.2-1: Definition of type NiddConfigurationTrigger

Attribute name	Data type	P	Cardinality	Description	Applicability (NOTE)
afId	string	M	1	Identifies the trigger receiving entity.	
nefId	string	M	1	Identifies the trigger sending entity.	
gpsi	Gpsi	M	1	Identifies a user.	
suppFeat	SupportedFeatures	M	1	Indicates the list of Supported features used as described in subclause 5.5.4.	
NOTE: Properties marked with a feature as defined in subclause 5.5.4 are applicable as described in subclause 5.2.7 of 3GPP TS 29.122 [4]. If no feature is indicated, the related property applies for all the features.					

5.5.3.3.3 Type: NiddConfigurationTriggerReply

This data type represents a reply to a NIDD configuration trigger and is sent from the AF to the NEF.

Table 5.15.2.1.3-1: Definition of type NiddConfigurationTriggerReply

Attribute name	Data type	P	Cardinality	Description	Applicability (NOTE)
suppFeat	SupportedFeatures	M	1	Indicates the list of Supported features used as described in subclause 5.5.4.	
NOTE: Properties marked with a feature as defined in subclause 5.5.4 are applicable as described in subclause 5.2.7 of 3GPP TS 29.122 [4]. If no feature is indicated, the related property applies for all the features.					

5.5.3.4 Simple data types and enumerations

5.5.3.4.1 Introduction

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

5.5.3.4.2 Simple data types

The simple data types defined in table 5.5.3.4.2-1 shall be supported.

Table 5.5.3.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.5.4 Used Features

The table below defines the features applicable to the NiddConfigurationTrigger API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.5.4-1: Features used by NiddConfigurationTrigger API

Feature number	Feature Name	Description

5.6 AnalyticsExposure API

5.6.1 Resources

5.6.1.1 Overview

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-analyticsexposure/v1/

"apiRoot" is set as described in subclause 5.2.4 in 3GPP TS 29.122 [4]. "apiName" shall be set to "3gpp-analyticsexposure" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

This subclause describes the structure for the Resource URIs as shown in figure 5.6.1.1-1 and the resources and HTTP methods used for the AnalyticsExposure API.

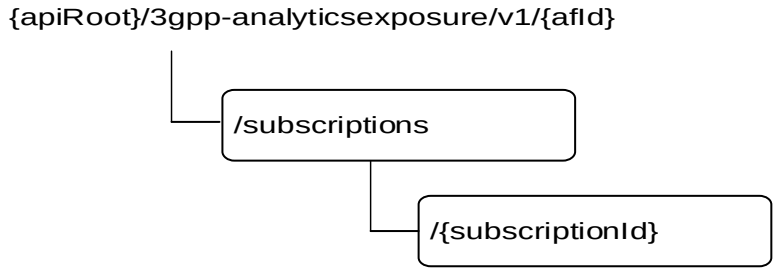

Figure 5.6.1.1-1: Resource URI structure of the AnalyticsExposure API

Table 5.6.1.1-1 provides an overview of the resources and HTTP methods applicable for the AnalyticsExposure API.

Table 5.6.1.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
Analytics Exposure Subscriptions	{apiRoot}/3gpp-analyticsexposure/v1/{afId}/subscriptions	GET	Read all subscriptions for a given AF
		POST	Create a new subscription to analytics exposure
Individual Analytics Exposure Subscription	{apiRoot}/3gpp-analyticsexposure/v1/{afId}/subscriptions /{subscriptionId}	GET	Read the subscription to the analytics exposure
		PUT	Modify all of the properties of an existing subscription to an analytics exposure
		DELETE	Delete the subscription to the analytics exposure

5.6.1.2 Resource: Analytics Exposure Subscriptions

5.6.1.2.1 Introduction

This resource allows a AF to read all active analytics exposure subscribtions for the given AF, or allows a AF to create a new subscription to retrieve analytics information.

5.6.1.2.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-analyticsexposure/v1/{afId}/subscriptions**

This resource shall support the resource URI variables defined in table 5.6.1.2.2-1.

Table 5.6.1.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.

5.6.1.2.3 Resource Methods

5.6.1.2.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.6.1.2.2.

5.6.1.2.3.2 GET

The GET method allows to read all active subscriptions for a given AF. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.6.1.2.3.2-1.

Table 5.6.1.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
supp-feat	SupportedFeatures	O	0..1	The features supported by the NF service consumer.

This method shall support the request data structures specified in table 5.6.1.2.3.2-2 and the response data structures and response codes specified in table 5.6.1.2.3.2-3.

Table 5.6.1.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.6.1.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(AnalyticsExposureSubsc)	M	0..N	200 OK	The subscription information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.6.1.2.3.3 POST

The POST method creates a new subscription resource to analytics exposure subscription for a given AF. The AF shall initiate the HTTP POST request message and the NEF shall respond to the message. The NEF shall construct the URI of the created resource.

This method shall support the request data structures specified in table 5.6.1.2.3.3-1 and the response data structures and response codes specified in table 5.6.1.2.3.3-2.

Table 5.6.1.2.3.3-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AnalyticsExposureSubsc	M	1	Parameters to request a subscription to retrieve analytics information with the NEF.

Table 5.6.1.2.3.3-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AnalyticsExposureSubsc	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 codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

Table 5.6.1.2.3.3-3: 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}/3gpp-analyticsexposure/v1/{afId}/subscriptions/{subscriptionId}

5.6.1.3 Resource: Individual Analytics Exposure Subscription

5.6.1.3.1 Introduction

This resource allows a AF to read/modify/cancel a subscription to retrieve analytics information with the NEF.

5.6.1.3.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-analyticsexposure/v1/{afId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.6.1.3.2-1.

Table 5.6.1.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.
subscriptionId	string	Identifier of the subscription resource.

5.6.1.3.3 Resource Methods

5.6.1.3.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.6.1.3.2.

5.6.1.3.3.2 GET

The GET method allows to read the active subscription for a given AF and subscription Id. The AF shall initiate the HTTP GET request message and theNEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.6.1.3.3.2-1.

Table 5.6.1.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
supp-feat	SupportedFeatures	O	0..1	The features supported by the NF service consumer.

This method shall support the request data structures specified in table 5.6.1.3.3.2-2 and the response data structures and response codes specified in table 5.6.1.3.3.2-3.

Table 5.6.1.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.6.1.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AnalyticsExposureSubsc	M	1	200 OK	The subscription information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.6.1.3.3.3 PUT

The PUT method modifies an existing subscription resource to update a subscription. The AF shall initiate the HTTP PUT request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.6.1.3.3.3-1 and the response data structures and response codes specified in table 5.6.1.3.3.3-2.

Table 5.6.1.3.3.3-1: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
AnalyticsExposureSubsc	M	1	Modify an existing subscription to retrieve analytics information with the NEF.

Table 5.6.1.3.3.3-2: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AnalyticsExposureSubsc	M	1	200 OK	The subscription was updated successfully.
N/A			204 No Content	The subscription was updated successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.6.1.3.3.4 DELETE

The DELETE method deletes the analytics exposure subscription for a given AF. The AF shall initiate the HTTP DELETE request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.6.1.3.3.4-1.

Table 5.6.1.3.3.4-1: 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 5.6.1.3.3.4-2 and the response data structures and response codes specified in table 5.6.1.3.3.4-3.

Table 5.6.1.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.6.1.3.3.4-3: 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 terminated successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.6.1a Custom Operations without associated resources

5.6.1a.1 Overview

Custom operations used for this API are summarized in table 5.6.1a.1-1. "apiRoot" is set as described in subclause 5.2.4 of 3GPP TS 29.122 [4].

Table 5.6.1a.1-1: Custom operations without associated resources

Operation name	Custom operation URI	Mapped HTTP method	Description
fetch	{apiRoot}/3gpp-analyticsexposure/v1/{afId}/fetch	POST	Request to fetch analytics information

5.6.1a.2 Operation: fetch

5.6.1a.2.1 Description

The custom operation allows a service consumer to fetch analytics information via the NEF.

5.6.1a.2.2 Operation Definition

This operation shall support the response data structures and response codes specified in tables 5.6.1a.2.2-1 and 5.6.1a.2.2-2.

Table 5.6.1a.2.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AnalyticsRequest	M	1	Parameters to request to fetch analytics information.

Table 5.6.1a.2.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AnalyticsData	M	1	200 OK	The requested analytics information was returned successfully.
n/a			204 No Content	If the request Analytics data does not exist, the NEF shall respond with "204 No Content".
NOTE: The manadatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

5.6.2 Notifications

5.6.2.1 Introduction

Upon receipt of analytics information notification from the NWDAF indicating the subscribed analytics event is detected, the NEF shall send an HTTP POST message including the notified analytics event to the AF. The NEF and the AF shall support the notification mechanism as described in subclause 5.2.5 of 3GPP TS 29.122 [4].

Table 5.6.2.1-1: Notifications overview

Notification	Custom operation URI	Mapped HTTP method	Description
Event Notification	{notifUri}	POST	The analytics event notification is provided by the NEF to the AF.

5.6.2.2 Event Notification

URI: **{notifUri}**

The operation shall support the URI variables defined in table 5.6.2.2-1.

Table 5.6.2.2-1: URI variables

Name	Definition
notifUri	Callback reference provided by the AF during creation of the subscription within the AnalyticsExposureSubsc data type as defined in Table 5.6.3.3.2-1.

5.6.2.3 Operation Definition

5.6.2.3.1 Notification via HTTP POST

This method shall support the request data structures specified in table 5.6.2.3.1-1 and the response data structures and response codes specified in table 5.6.2.3.1-2.

Table 5.6.2.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AnalyticsEventNotification	M	1	The analytics event notification is provided by the NEF to the AF.

Table 5.6.2.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
N/A			204 No Content	The event notification is received successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.6.2.3.2 Notification via Websocket

If supported by both AF and NEF and successfully negotiated, the AnalyticsEventNotification may alternatively be delivered through the Websocket mechanism as defined in subclause 5.2.5.4 of 3GPP TS 29.122 [4].

5.6.3 Data Model

5.6.3.1 General

This subclause specifies the application data model supported by the AnalytcisExposure API.

5.6.3.2 Reused data types

The data types reused by the AnalytcisExposure API from other specifications are listed in table 5.6.3.2-1.

Table 5.6.3.2-1: Re-used Data Types

Data type	Reference	Comments
AdditionalMeasurement	3GPP TS 29.520 [27]	
ReportingInformation	3GPP TS 29.523 [22]	Describes the analytics reporting requirement information.
BitRate	3GPP TS 29.571 [8]	
CongestionType	3GPP TS 29.520 [27]	
DateTime	3GPP TS 29.122 [4]	
Dnn	3GPP TS 29.571 [8]	
DurationSec	3GPP TS 29.122 [4]	Seconds of duration.
EventReportingRequirement	3GPP TS 29.520 [27]	
ExternalGroupId	3GPP TS 29.122 [4]	External Group Identifier for a user group.
ExceptionId	3GPP TS 29.520 [27]	
ExpectedAnalyticsType	3GPP TS 29.520 [27]	
ExpectedUeBehaviourData	3GPP TS 29.503 [17]	
Float	3GPP TS 29.571 [8]	
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
NetworkPerfRequirement	3GPP TS 29.520 [27]	
QosRequirement	3GPP TS 29.520 [27]	
RetainabilityThreshold	3GPP TS 29.520 [27]	
SamplingRatio	3GPP TS 29.571 [8]	Indicates Sampling Ratio.
ScheduledCommunicationTime	3GPP TS 29.122 [4]	
Snssai	3GPP TS 29.571 [8]	
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.6.4-1.
ThresholdLevel	3GPP TS 29.520 [27]	
TimeWindow	3GPP TS 29.122 [4]	
UeCommunication	3GPP TS 29.520 [27]	
Uinteger	3GPP TS 29.571 [8]	Unsigned integer.
Uri	3GPP TS 29.571 [8]	Identifies a referenced resource.
LocationArea5G	3GPP TS 29.122 [4]	

5.6.3.3 Structured data types

5.6.3.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.6.3.3.2 Type: AnalyticsExposureSubsc

This type represents an analytics exposure subscription. The same structure is used in the subscription request and subscription response.

Table 5.6.3.3.2-1: Definition of type AnalyticsExposureSubsc

Attribute name	Data type	P	Cardinality	Description	Applicability (NOTE)
analyEventsSubs	array(AnalyticsEventSubsc)	M	1..N	Subscribed analytics events.	
analyRepInfo	ReportingInformation	O	0..1	Reporting requirement information of the subscription. If omitted, the default values within the ReportingInformation data type apply.	
notifUri	Uri	M	1	Notification URI for analytics event reporting.	
notifId	string	M	1	Notification Correlation ID assigned by the NF service consumer.	
eventNotifis	array(AnalyticsEventNotif)	C	1..N	Represents the Events to be reported. Shall only be present if the immediate reporting indication in the "immRep" attribute within the "analyRepInfo" attribute sets to true during the event subscription, and the reports are available.	
suppFeat	SupportedFeatures	C	0..1	Indicates the list of Supported features used as described in subclause 5.6.4. This attribute shall be provided in the POST request and in the response of successful resource creation, or in the HTTP GET response if the "supp-feat" attribute query parameter is included in the HTTP GET request.	
self	Link	C	0..1	Identifies the Individual Analytics Exposure Subscription resource. Shall be present in the HTTP GET response when reading all the subscriptions for an AF.	
NOTE: Properties marked with a feature as defined in subclause 5.6.4 are applicable as described in subclause 5.2.7 of 3GPP TS 29.122 [4]. If no feature is indicated, the related property applies for all the features.					

5.6.3.3.3 Type: AnalyticsEventNotification

Table 5.6.3.3.3-1: Definition of type AnalyticsEventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
notifId	string	M	1	Notification Correlation ID assigned by the NF service consumer.	
analyEventNotifs	array(AnalyticsEventNotif)	M	1..N	Represents the analytics events to be reported according to the subscription corresponding to the Notification Correlation ID.	

5.6.3.3.4 Type: AnalyticsEventNotif

Table 5.6.3.3.4-1: Definition of type AnalyticsEventNotif

Attribute name	Data type	P	Cardinality	Description	Applicability
analyEvent	AnalyticsEvent	M	1	Detected analytics event.	
expiry	DateTime	O	0..1	Defines the expiration time after which the analytics information will become invalid.	
timeStamp	DateTime	M	1	Time at which the event is observed.	
ueMobilityInfos	array(UeMobilityExposure)	C	1..N	Contains the UE mobility information. Shall be present if the "analyEvent" attribute sets to "UE_MOBILITY"	Ue_Mobility
ueCommInfos	array(UeCommunication)	C	1..N	Contains the application communication information. Shall be present if the "analyEvent" attribute sets to "UE_COMM"	Ue_Communication
abnormalInfos	array(AbnormalExposure)	C	1..N	Contains the user's abnormal behavior information. Shall be present if the "analyEvent" attribute sets to "ABNORMAL_BEHAVIOR"	Abnormal_Behavior
congestInfos	array(CongestInfo)	C	1..N	Contains the UE's user data congestion information. Shall be present if the "analyEvent" attribute sets to "CONGESTION"	Congestion
nwPerfInfos	array(NetworkPerfExposure)	C	1..N	The network performance information. Shall be present when the requested event is "NETWORK_PERFORMANCE".	Network_Performance
qosSustainInfos	array(QosSustainabilityExposure)	C	1..N	Contains the QoS sustainability information. Shall be present if the "analyEvent" attribute is set to "QOS_SUSTAINABILITY"	QoS_Sustainability

5.6.3.3.5 Type: AnalyticsEventSubsc

Table 5.6.3.3.5-1: Definition of type AnalyticsEventSubsc

Attribute name	Data type	P	Cardinality	Description	Applicability
analyEvent	AnalyticsEvent	M	1	Requested analytics event.	
analyEventFilter	AnalyticsEventFilterSubsc	O	0..1	Represents analytics event filter.	(NOTE)
tgtUe	TargetUeId	O	0..1	Identifies target UE information	(NOTE)
NOTE: Applicability is further described in the corresponding data type.					

5.6.3.3.6 Type: AnalyticsEventFilterSubsc

Table 5.6.3.3.6-1: Definition of type AnalyticsEventFilterSubsc

Attribute name	Data type	P	Cardinality	Description	Applicability
locArea	LocationArea5G	O	0..1	Network area of interest (NOTE 1)	Abnormal_Behavior Congestion Ue_Communication Ue_Mobility QoS_Sustainability Network_Performance
appIds	array(ApplicationId)	O	1..N	Each element identifies an application.	Abnormal_Behavior Ue_Communication
excepRequs	array(Exception)	O	1..N	Represents a list of Exception Ids with associated thresholds. (NOTE 2, NOTE 3)	Abnormal_Behavior
exptAnaType	ExpectedAnalyticsType	O	0..1	Represents expected UE analytics type. (NOTE 3)	Abnormal_Behavior
exptUeBehav	ExpectedUeBehaviourData	O	0..1	Represents expected UE behaviour.	Abnormal_Behavior
reptThlds	array(ThresholdLevel)	O	1..N	Represents the congestion levels to be reached in order to be notified by the NEF. (NOTE 4)	Congestion
nwPerfReqs	array(NetworkPerfRequirement)	C	1..N	Represents the network performance requirements. This attribute shall be included when eventId is "NETWORK_PERFORMANCE".	Network_Performance
snssai	Snssai	O	0..1	Identifies the network slice information	Ue_Communication QoS_Sustainability Abnormal_Behavior Congestion
qosReq	QosRequirement	C	0..1	Represents the QoS requirements. This attribute shall be included when eventId is "QOS_SUSTAINABILITY".	QoS_Sustainability
qosFlowRetThds	array(RetainabilityThreshold)	C	1..N	Represents the QoS flow retainability thresholds, Shall be supplied for the 5QI of GBR resource type. (NOTE 5)	QoS_Sustainability
ranUeThrouThds	array(BitRate)	C	1..N	Represents the RAN UE throughput thresholds. Shall be supplied for the 5QI of non-GBR resource type. (NOTE 5)	QoS_Sustainability
extraReportReq	EventReportingRequirement	O	0..1	The extra event reporting requirement information. (NOTE 6)	

NOTE 1: The "locArea" attribute shall be provided if the "tgtUe" attribute sets to "anyUeInd".
NOTE 2: Only "excepId" and "excepLevel" within the Exception data type apply to the "excepRequs" attribute.
NOTE 3: Either "excepRequs" or "exptAnaType" shall be provided if the subscribed event is "ABNORMAL_BEHAVIOUR".
NOTE 4: If the subscribed event is "CONGESTION", this attribute shall be provided if "notifMethod" within "analyRepInfo" sets to "ON_EVENT_DETECTION" or omitted.
NOTE 5: For "QOS_SUSTAINABILITY", this property shall be provided if the "notifMethod" in "analyRepInfo" is set to "ON_EVENT_DETECTION" or omitted.
NOTE 6: The "sampRatio" attribute within EventReportingRequirement data type is not applicable for the present API.

5.6.3.3.7 Type TargetUeId

Table 5.6.3.3.7-1: Definition of type TargetUeId

Attribute name	Data type	P	Cardinality	Description	Applicability
anyUeInd	boolean	O	0..1	Identifies whether the AF request applies to any UE. This attribute shall set to "true" if applicable for any UE, otherwise, set to "false".	Abnormal_Behavior Congestion Network_Performance QoS_Sustainability
gpsi	Gpsi	O	0..1	Identifies a GPSI for an UE.	Abnormal_Behavior Congestion Ue_Mobility Ue_Communication Network_Performance
exterGroupId	ExternalGroupId	O	0..1	Represents an external group identifier and identifies a group of UEs.	Abnormal_Behavior Ue_Mobility Ue_Communication Network_Performance
NOTE: For an applicable feature, only one attribute identifying the target UE shall be provided.					

5.6.3.3.8 Void

5.6.3.3.9 Type UeMobilityExposure

Table 5.6.3.3.9-1: Definition of type UeMobilityExposure

Attribute name	Data type	P	Cardinality	Description	Applicability
ts	DateTime	O	0..1	This attribute identifies the timestamp when the UE arrives the location. (NOTE 1)	
recurringTime	ScheduledCommunicationTime	O	0..1	Identifies time of the day and day of the week which are valid within the observation period when the UE moves. (NOTE 1, NOTE 2)	
duration	DurationSec	M	1	This attribute identifies the time duration the UE stays in the location. If the analytics result applies for a group of UEs, it indicates the average duration for the group of UEs.	
durationVariance	Float	C	0..1	This attribute indicates the variance of the analysed durations for the group of UEs. It shall be provided if the analytics result applies for a group of UEs.	
locInfo	array(UeLocationInfo)	M	1..N	This attribute includes a list of UE location information during the time duration.	
NOTE 1: Either ts or recurringTime shall be provided. NOTE 2: If this attribute is present, it indicates the UE movement is periodic. This attribute is suitable to be present for a recurring mobility in a long observation time.					

5.6.3.3.10 Type UeLocationInfo

Table 5.6.3.3.10-1: Definition of type UeLocationInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
loc	LocationArea5G	M	1	This attribute contains the detailed location.	
ratio	SamplingRatio	C	0..1	This attribute contains the percentage of UEs in the group. Shall be present if the analytics result applies for a group of UEs.	
confidence	Uinteger	C	0..1	Indicates the confidence of the prediction. (NOTE) Shall be present if the analytics result is a prediction.	
NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, a zero confidence shall be returned.					

5.6.3.3.11 Void

5.6.3.3.12 Type: AnalyticsRequest

Table 5.6.3.3.12-1: Definition of type AnalyticsRequest

Attribute name	Data type	P	Cardinality	Description	Applicability
analyEvent	AnalyticsEvent	M	1	Identifies the analytics type.	
analyEventFilter	AnalyticsEventFilter	C	0..1	Shall be included to identify the analytics when filter information is needed for the related event.	
analyRep	EventReportingRequirement	O	0..1	Identifies the analytics reporting requirement information.	
tgtUe	TargetUeId	O	0..1	Identifies the target UE information.	
suppFeat	SupportedFeatures	M	1	Represents the features supported by the NF service consumer.	

5.6.3.3.13 Type AnalyticsEventFilter

Table 5.6.3.3.13-1: Definition of type AnalyticsEventFilter

Attribute name	Data type	P	Cardinality	Description	Applicability
locArea	LocationArea5G	C	0..1	This IE represents the network area where the NF service consumer wants to know the analytics result. Shall be present if the "analyEvent" attribute sets to "QOS_SUSTAINABILITY".	Ue_Mobility Ue_Communication Network_Performance QoS_Sustainability Abnormal_Behavior Congestion
dnn	Dnn	O	0..1	Identifies the DNN.	Ue_Communication Abnormal_Behavior
nwPerfTypes	array(NetworkPerfType)	C	1..N	Represents the network performance requirements. This attribute shall be included when eventId is "NETWORK_PERFORMANCE".	Network_Performance
appIds	array(ApplicationId)	O	1..N	Each element identifies an application. The absence of appIds means all applications.	Ue_Communication Abnormal_Behavior
excepIds	array(ExceptionId)	O	1..N	Represents a list of Exception Ids. (NOTE)	Abnormal_Behavior
exptAnaType	ExpectedAnalyticsType	O	0..1	Represents expected UE analytics type. (NOTE)	Abnormal_Behavior
exptUeBehav	ExpectedUeBehaviourData	O	0..1	Represents expected UE behaviour.	Abnormal_Behavior
snssai	Snssai	O	0..1	Identifies the network slice information	Ue_Communication QoS_Sustainability Abnormal_Behavior Congestion
qosReq	QosRequirement	C	0..1	Represents the QoS requirements. This attribute shall be included when analyEvent is "QOS_SUSTAINABILITY".	QoS_Sustainability
NOTE: Either "excepIds" or "exptAnaType" shall be provided if the subscribed event is "ABNORMAL_BEHAVIOUR".					

5.6.3.3.14 Type AnalyticsData

Table 5.6.3.3.14-1: Definition of type AnalyticsData

Attribute name	Data type	P	Cardinality	Description	Applicability
expiry	DateTime	O	0..1	Defines the expiration time after which the analytics information will become invalid.	
ueMobilityInfos	array(UeMobilityExposure)	C	1..N	Contains the UE mobility information. Shall be present if the "analyEvent" attribute sets to "UE_MOBILITY"	Ue_Mobility
ueCommInfos	array(UeCommunication)	C	1..N	Contains the application communication information. Shall be present if the "analyEvent" attribute sets to "UE_COMM"	Ue_Communication
nwPerfInfos	array(NetworkPerfExposure)	C	1..N	The network performance information. Shall be present when the requested event is "NETWORK_PERFORMANCE".	Network_Performance
abnormalInfos	array(AbnormalExposure)	C	1..N	Contains the user's abnormal behavior information. Shall be present if the "analyEvent" attribute sets to "ABNORMAL_BEHAVIOR"	Abnormal_Behavior
congestInfos	array(CongestInfo)	C	1..N	Contains the UE's user data congestion information. Shall be present if the "analyEvent" attribute sets to "CONGESTION"	Congestion
qosSustainInfos	array(QosSustainabilityExposure)	C	1..N	Contains the QoS sustainability information. Shall be present if the "analyEvent" attribute is set to "QOS_SUSTAINABILITY"	QoS_Sustainability
suppFeat	SupportedFeatures	M	1	Represents the features supported by the NF service consumer.	

5.6.3.3.15 Type AbnormalExposure

Table 5.6.3.3.15-1: Definition of type AbnormalExposure

Attribute name	Data type	P	Cardinality	Description	Applicability
gpsis	array(Gpsi)	C	1..N	Each element identifies a UE which is affected with the Exception. Shall be present if the subscription request applies to more than one UE.	
excep	Exception	M	1	Contains the exception information.	
ratio	SamplingRatio	C	0..1	This attribute contains the percentage of UEs with same analytics result in the group or among all UEs. Shall be present if the analytics result applies for a group of UEs or any UE.	
confidence	Uinteger	C	0..1	Indicates the confidence of the prediction. (NOTE) Shall be present if the analytics result is a prediction.	
addtMeasInfo	AdditionalMeasurement	O	0..1	Additional measurement.	
NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, a zero confidence shall be returned.					

5.6.3.3.16 Type CongestInfo

Table 5.6.3.3.16-1: Definition of type CongestInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
locArea	LocationArea5G	M	1	Network area of interest	
cngAnas	array(CongestionAnalytics)	M	1..N	Represents data congestion analytics for transfer over the user plane, control plane or both planes.	

5.6.3.3.17 Type CongestionAnalytics

Table 5.6.3.3.17-1: Definition of type CongestionAnalytics

Attribute name	Data type	P	Cardinality	Description	Applicability
cngType	CongestionType	M	1	Represents congestion type.	
tmWdw	TimeWindow	M	1	Represents a start time and a stop time observed for the congestion information.	
nsi	ThresholdLevel	M	1	Represents network congestion level.	
confidence	Uinteger	C	0..1	Indicates the confidence of the prediction. (NOTE) Shall be present if the analytics result is a prediction.	
NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, a zero confidence shall be returned.					

5.6.3.3.18 Type QosSustainabilityExposure

Table 5.6.3.3.18-1: Definition of type QosSustainabilityExposure

Attribute name	Data type	P	Cardinality	Description	Applicability
locArea	LocationArea5G	M	1	Identification(s) of applicable location areas where the analytics result applies.	
startTs	DateTime	M	1	Represents the start time of the applicable observing period.	
endTs	DateTime	M	1	Represents the end time of the applicable observing period.	
qosFlowRetThd	RetainabilityThreshold	O	0..1	The reporting QoS Flow Retainability Threshold that are met or crossed for 5QI of GBR resource type. (NOTE 1)	
ranUeThrouThd	BitRate	O	0..1	The reporting RAN UE Throughput Threshold that are met or crossed for 5QI of non-GBR resource type. (NOTE 1)	
confidence	Uinteger	C	0..1	Indicates the confidence of the prediction. (NOTE 2) Shall be present if the analytics result is a prediction.	

NOTE 1: Either qosFlowRetThd or ranUeThrouThd shall be provided.
NOTE 2: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, a zero confidence shall be returned.

5.6.3.3.19 Type NetworkPerfExposure

Table 5.6.3.3.19-1: Definition of type NetworkPerfExposure

Attribute name	Data type	P	Cardinality	Description	Applicability
locArea	LocationArea5G	M	1	Identification of network area to which the subscription applies.	
nwPerfType	NetworkPerfType	M	1	The type of the network performance	
relativeRatio	SamplingRatio	O	0..1	The reported relative ratio expressed in percentage. (NOTE 1)	
absoluteNum	Uinteger	O	0..1	The reported absolute number (NOTE 1)	
confidence	Uinteger	C	0..1	Indicates the confidence of the prediction. (NOTE 2) Shall be present if the analytics result is a prediction.	

NOTE 1: Either relativeRatio or absoluteNum shall be provided.
NOTE 2: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, a zero confidence shall be returned.

5.6.3.4 Simple data types and enumerations

5.6.3.4.1 Introduction

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

5.6.3.4.2 Simple data types

The simple data types defined in table 5.6.3.4.2-1 shall be supported.

Table 5.6.3.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.6.3.4.3 Enumeration: AnalyticsEvent

The enumeration represents the type of analytics events of which the AF requests to be notified. It shall comply with the provisions defined in table 5.6.3.4.3-1.

Table 5.6.3.4.3-1: Enumeration AnalyticsEvent

Enumeration value	Description	Applicability
UE_MOBILITY	The AF requests to be notified about analytics information of UE mobility.	Ue_Mobility
UE_COMM	The AF requests to be notified about analytics information of UE communication.	Ue_Communication
ABNORMAL_BEHAVIOR	The AF requests to be notified about analytics information of UE's abnormal behavior.	Abnormal_Behavior
CONGESTION	The AF requests to be notified about analytics information of user data congestion information.	Congestion
NETWORK_PERFORMANCE	The AF requests to be notified about analytics information of network performance information.	Network_Performance
QOS_SUSTAINABILITY	The AF requests to be notified about analytics information of QoS sustainability.	QoS_Sustainability

5.6.4 Used Features

The table below defines the features applicable to the AnalyticsExposure API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.6.4-1: Features used by AnalyticsExposure API

Feature number	Feature Name	Description
1	Ue_Mobility	This feature indicates support for the analytics event related to UE mobility.
2	Ue_Communication	This feature indicates support for the analytics event related to UE communication information.
3	Abnormal_Behavior	This feature indicates support for the analytics event related to UE's abnormal behaviour.
4	Congestion	This feature indicates support for the analytics event related to UE's user data congestion information.
5	Network_Performance	This feature indicates support for the analytics event related to network performance.
6	QoS_Sustainability	This feature indicates support for the analytics event related to QoS sustainability.

5.7 5GLANParameterProvision API

5.7.1 Resources

5.7.1.1 Overview

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-5glan-pp/v1/

"apiRoot" is set as described in subclause 5.2.4 in 3GPP TS 29.122 [4]. "apiName" shall be set to "3gpp-5glan-pp" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

This subclause describes the structure for the Resource URIs as shown in figure 5.7.1.1-1 and the resources and HTTP methods used for the 5GLANParameterProvision API.

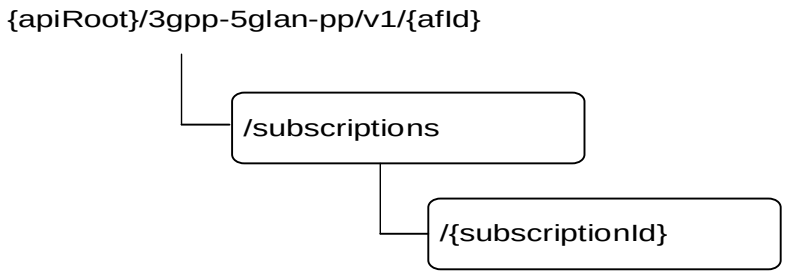

Figure 5.7.1.1-1: Resource URI structure of the 5GLANParameterProvision API

Table 5.7.1.1-1 provides an overview of the resources and HTTP methods applicable for the 5GLANParameterProvision API.

Table 5.7.1.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
5GLAN Parameters Provision Subscriptions	{apiRoot}/3gpp-5glan-pp/v1/{afId}/subscriptions	GET	Read all subscriptions for a given AF
		POST	Create a new subscription to provision parameters
Individual 5GLAN Parameters Provision Subscription	{apiRoot}/3gpp-5glan-pp/v1/{afId}/subscriptions/{subscriptionId}	GET	Read an existing subscription identified by {subscriptionId}
		PUT	Modify all of the properties of an existing subscription identified by {subscriptionId}
		PATCH	Modify some properties of an existing subscription identified by {subscriptionId}
		DELETE	Delete the subscription identified by {subscriptionId}

5.7.1.2 Resource: 5GLAN Parameters Provision Subscriptions

5.7.1.2.1 Introduction

This resource allows a AF to read all active 5GLAN parameters provision subscribtions for the given AF, or create an new individual 5GLAN parameters provision subscription to provision parameters to the NEF.

5.7.1.2.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-5glan-pp/v1/{afId}/subscriptions**

This resource shall support the resource URI variables defined in table 5.7.1.2.2-1.

Table 5.7.1.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.

5.7.1.2.3 Resource Methods

5.7.1.2.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.7.1.2.2.

5.7.1.2.3.2 GET

The GET method allows to read all active subscriptions for a given AF. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.7.1.2.3.2-1.

Table 5.7.1.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.7.1.2.3.2-2 and the response data structures and response codes specified in table 5.7.1.2.3.2-3.

Table 5.7.1.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.7.1.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(5GLanParametersProvision)		0..N	200 OK	All the subscription information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.7.1.2.3.3 POST

The POST method creates a new resource to individual 5GLAN parameters provision subscription for a given AF. The AF shall initiate the HTTP POST request message and the NEF shall respond to the message. The NEF shall construct the URI of the created resource.

This method shall support the request data structures specified in table 5.7.1.2.3.3-1 and the response data structures and response codes specified in table 5.7.1.2.3.3-2.

Table 5.7.1.2.3.3-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
5GLanParametersProvision	M	1	Parameters to create a subscription to provision parameters.

Table 5.7.1.2.3.3-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
5GLanParametersProvision	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 codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.

Table 5.7.1.2.3.3-3: 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}/3gpp-5glan-pp/v1/{afId}/subscriptions/{subscriptionId}

5.7.1.3 Resource: Individual 5GLAN Parameters Provision Subscription

5.7.1.3.1 Introduction

This resource allows a AF to read, update or delete an existing subscription to provision 5GLAN parameters.

5.7.1.3.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-5glan-pp/v1/{afId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.7.1.3.2-1.

Table 5.7.1.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.
subscriptionId	string	Identifier of the subscription resource.

5.7.1.3.3 Resource Methods

5.7.1.3.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.7.1.3.2.

5.7.1.3.3.2 GET

The GET method allows to read the active subscription for a given AF and subscription Id. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.7.1.3.3.2-1.

Table 5.7.1.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.7.1.3.3.2-2 and the response data structures and response codes specified in table 5.7.1.3.3.2-3.

Table 5.7.1.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.7.1.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
5GLanParameter sProvision	M	1	200 OK	The information for the subscription in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.7.1.3.3.3 PUT

The PUT method modifies an existing resource to update a subscription. The AF shall initiate the HTTP PUT request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.7.1.3.3.3-1 and the response data structures and response codes specified in table 5.7.1.3.3.3-2.

Table 5.7.1.3.3.3-1: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
5GLanParameter sProvision	M	1	Modify an existing subscription to provision parameters.

Table 5.7.1.3.3.3-2: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
5GLanParameter sProvision	M	1	200 OK	The subscription was updated successfully.
n/a			204 No Content	The subscription was updated successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.7.1.3.3.4 DELETE

The DELETE method deletes an existing individual 5GLAN parameters provision subscription for a given AF. The AF shall initiate the HTTP DELETE request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.7.1.3.3.4-1.

Table 5.7.1.3.3.4-1: 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 5.7.1.3.3.4-2 and the response data structures and response codes specified in table 5.7.1.3.3.4-3.

Table 5.7.1.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.7.1.3.3.4-3: 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 terminated successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.7.1.3.3.5 PATCH

The PATCH method allows to change some properties of an existing resource to update a subscription. The AF shall initiate the HTTP PATCH request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.7.1.3.3.5-1 and the response data structures and response codes specified in table 5.7.1.3.3.5-2.

Table 5.7.1.3.3.5-1: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
5GLanParameterProvisionPatch	M	1	Modify an existing subscription to provision parameters.

Table 5.7.1.3.3.5-2: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
5GLanParameterProvision	M	1	200 OK	The subscription was updated successfully.
n/a			204 No Content	The subscription was updated successfully.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.7.1a Notifications

Notifications are not applicable to this API.

5.7.2 Data Model

5.7.2.1 General

This subclause specifies the application data model supported by the 5GLANParameterProvision API.

5.7.2.2 Reused data types

The data types reused by the 5GLANParameterProvision API from other specifications are listed in table 5.7.2.2-1.

Table 5.7.2.2-1: Re-used Data Types

Data type	Reference	Comments
ApplicationId	3GPP TS 29.571 [8]	
Dnn	3GPP TS 29.571 [8]	Identifies a DNN.
ExternalGroupId	3GPP TS 29.122 [4]	External Group Identifier for a user group.
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
Ipv4Addr	3GPP TS 29.571 [8]	Identifies an IPv4 address.
Ipv6Addr	3GPP TS 29.571 [8]	Identifies an IPv6 address.
Link	3GPP TS 29.122 [4]	Identifies a referenced resource.
OsId	3GPP TS 29.519 [23]	Operating System.
PduSessionType	3GPP TS 29.571 [8]	PDU session type.
Snssai	3GPP TS 29.571 [8]	Identifies the S-NSSAI.
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.7.3-1.

5.7.2.3 Structured data types

5.7.2.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.7.2.3.2 Type: 5GLanParametersProvision

Table 5.7.2.3.2-1: Definition of type 5GLanParametersProvision

Attribute name	Data type	P	Cardinality	Description	Applicability
self	Link	C	0..1	Identifies the individual parameters provision subscription resource. Shall be present in the HTTP GET response when reading all the subscriptions for an AF.	
5gLanParams	5GLanParameters	M	1	Represents the 5G LAN service related parameters.	
suppFeat	SupportedFeatures	M	1	Indicates the negotiated supported features.	

5.7.2.3.3 Type: 5GLanParameters

This type represents the 5G LAN service related parameters need to be provisioned.

Table 5.7.2.3.3-1: Definition of type 5GLanParameters

Attribute name	Data type	P	Cardinality	Description	Applicability
exterGroupId	ExternalGroupId	M	1	Identifies an 5G Virtual Network Group	
gpsis	map(Gpsi)	M	1..N	Represents the list of 5G VN Group members, each member is identified by GPSI	
dnn	Dnn	M	1	DNN for the 5G VN group, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only.	
aaaIpv4Addr	Ipv4Addr	O	1	Identifies the DN-AAA server IPv4 address provided by AF, for the secondary authentication/authorization and/or UE IP address allocation by DN-AAA server.	
aaaIpv6Addr	Ipv6Addr	O	1	Identifies the DN-AAA server IPv6 address provided by AF, for the secondary authentication/authorization and/or UE IP address allocation by DN-AAA server.	
aaaUsgs	array(AaaUsage)	O	1..2	Identifies the usage needs for secondary authentication/authorization and/or UE IP address allocation from the DN-AAA server.	
snssai	Snssai	M	1	S-NSSAI for the 5G VN group	
sessionType	PduSessionType	M	1	PDU Session Type allowed for 5G VN group.	
appDesps	map(AppDescriptor)	M	1..N	Describes the operation systems and the corresponding applications for each operation systems. The key of map is osId.	

5.7.2.3.4 Type: AppDescriptor

Table 5.7.2.3.4-1: Definition of type AppDescriptor

Attribute name	Data type	P	Cardinality	Description	Applicability
osId	OsId	M	1	Identifies an operating system supported by the UE	
appId	map(ApplicationId)	M	1..N	Identifies applications that is running on the UE's operating system.	

5.7.2.3.5 Type: 5GLanParametersProvisionPatch

Table 5.7.2.3.5-1: Definition of type 5GLanParametersProvisionPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
5gLanParamsPatch	5GLanParameters Patch	O	0..1	Represents the 5G LAN servise related parameters.	

5.7.2.3.6 Type: 5GLanParametersPatch

Table 5.7.2.3.6-1: Definition of type 5GLanParametersPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
gpsis	map(GpsiRm)	O	1..N	Represents the list of 5G VN Group members, each member is identified by GPSI	
appDesps	map(AppDescriptorRm)	O	1..N	Describes the operation systems and the corresponding applications for each operation system. The key of map is osId.	

5.7.2.3.7 Type: AppDescriptorRm

Table 5.7.2.3.7-1: Definition of type AppDescriptorRm

Attribute name	Data type	P	Cardinality	Description	Applicability
appIds	map(ApplicationIdRm)	O	1..N	Identifies application(s) on the UE's operating system.	

5.7.2.3.8 Enumeration: AaaUsage

Table 5.7.2.3.8-1: Enumeration DnAaaIndicator

The enumeration AaaUsage represents the usage of the DN-AAA server.

Enumeration value	Description
"AUTH"	Secondary authentication/authorization by DN-AAA server
"IP_ALLOC"	UE IP address allocation by DN-AAA server

5.7.2.4 Simple data types and enumerations

5.7.2.4.1 Introduction

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

5.7.2.4.2 Simple data types

The simple data types defined in table 5.7.2.4.2-1 shall be supported.

Table 5.7.2.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.7.3 Used Features

The table below defines the features applicable to the 5GLANParameterProvision API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.7.3-1: Features used by 5GLANParameterProvision API

Feature number	Feature Name	Description

5.8 ApplyingBdtPolicy API

5.8.1 Resources

5.8.1.1 Overview

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-applying-bdt-policy/v1/

"apiRoot" is set as described in subclause 5.2.4 in 3GPP TS 29.122 [4]. "apiName" shall be set to "3gpp-applying-bdt-policy" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

This subclause describes the structure for the Resource URIs as shown in figure 5.8.1.1-1 and the resources and HTTP methods used for the ApplyingBdtPolicy API.

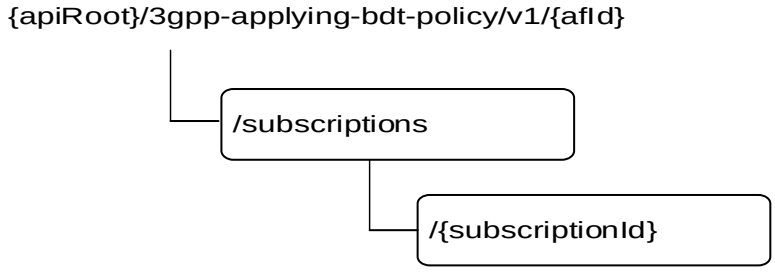

Figure 5.8.1.1-1: Resource URI structure of the ApplyingBdtPolicy API

Table 5.8.1.1-1 provides an overview of the resources and HTTP methods applicable for the ApplyBdtPolicy API.

Table 5.8.1.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
Applied BDT Policy Subscription	{apiRoot}/3gpp-applying-bdt-policy/v1/{afId}/subscriptions	GET	Read all applied BDT policy subscriptions for a given AF.
		POST	Create a new applied policy subscription.
Individual Applied BDT Policy Subscription	{apiRoot}/3gpp-applying-bdt-policy/v1/{afId}/subscriptions/{subscriptionId}	GET	Read the applied BDT policy subscription.
		PATCH	Modify BDT Reference ID of an existing subscription to a BDT policy.
		DELETE	Delete the applied BDT policy subscription

5.8.1.2 Resource: Applied BDT Policy Subscription

5.8.1.2.1 Introduction

This resource allows a AF to read all applied BDT policy subscription for the given AF.

5.8.1.2.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-applying-bdt-policy/v1/{afId}/subscriptions**

This resource shall support the resource URI variables defined in table 5.8.1.2.2-1.

Table 5.8.1.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.

5.8.1.2.3 Resource Methods

5.8.1.2.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.8.1.2.2.

5.8.1.2.3.2 GET

The GET method allows to read all active applied BDT policy subscription for a given AF. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.8.1.2.3.2-1.

Table 5.8.1.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.8.1.2.3.2-2 and the response data structures and response codes specified in table 5.8.1.2.3.2-3.

Table 5.8.1.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.8.1.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(AppliedBdtPolicy)		0..N	200 OK	The applied BDT Policy subscriptions for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.8.1.2.3.3 POST

The POST method creates an applied BDT policy subscription for a given AF. The AF shall initiate the HTTP POST request message and the NEF shall respond to the message. The NEF shall construct the URI of the created resource.

This method shall support the request data structures specified in table 5.8.1.2.3.3-1 and the response data structures and response codes specified in table 5.8.1.2.3.3-2.

Table 5.8.1.2.3.3-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AppliedBdtPolicy	M	1	Parameters to create a subscription of the applied BDT policy.

Table 5.8.1.2.3.3-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AppliedBdtPolicy	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 codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

Table 5.8.1.2.3.3-3: 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}/3gpp-applying-bdt-policy/v1/{afId}/subscriptions/{SubscriptionId}

5.8.1.3 Resource: Individual Applied BDT Policy Subscription

5.8.1.3.1 Introduction

This resource allows a AF to read or delete an active subscription of applied BDT policy.

5.8.1.3.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-applying-bdt-policy/v1/{afId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.8.1.3.2-1.

Table 5.8.1.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.
subscriptionId	string	Identifier of the subscription resource.

5.8.1.3.3 Resource Methods

5.8.1.3.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.8.1.3.2.

5.8.1.3.3.2 GET

The GET method allows to read the active applied BDT policy for a given AF and subscription Id. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.8.1.3.3.2-1.

Table 5.8.1.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.8.1.3.3.2-2 and the response data structures and response codes specified in table 5.8.1.3.3.2-3.

Table 5.8.1.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.8.1.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AppliedBdtPolicy	M	1	200 OK	The subscription information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.8.1.3.3 PATCH

The PATCH method allows to change some properties of an existing applying BDT policy subscription. The AF shall initiate the HTTP PATCH request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.8.1.3.3.3-1 and the response data structures and response codes specified in table 5.8.1.3.3.3-2.

Table 5.8.1.3.3.3-1: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
AppliedBdtPolicyPatch	M	1	Partial update of a subscription to applying BDT policy subscritpion.

Table 5.8.1.3.3.3-2: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AppliedBdtPolicy	M	1	200 OK	The subscription was modified successfully.
n/a			204 No Content	The subscription was modified successfully.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.8.1.3.4 DELETE

The DELETE method deletes the applying BDT policy subscription for a given AF. The AF shall initiate the HTTP DELETE request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.8.1.3.3.4-1.

Table 5.8.1.3.3.4-1: 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 5.8.1.3.3.4-2 and the response data structures and response codes specified in table 5.8.1.3.3.4-3.

Table 5.8.1.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.8.1.3.3.4-3: 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 terminated successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.8.2 Notifications

Notifications are not applicable to this API.

5.8.3 Data Model

5.8.3.1 General

This subclause specifies the application data model supported by the ApplyingBdtPolicy API.

5.8.3.2 Reused data types

The data types reused by the ApplyingBdtPolicy API from other specifications are listed in table 5.8.3.2-1.

Table 5.8.3.2-1: Re-used Data Types

Data type	Reference	Comments
BdtReferenceId	3GPP TS 29.122 [4]	Identifier of a selected BDT policy.
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
ExternalGroupId	3GPP TS 29.122 [4]	External Group Identifier for a user group.
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.8.4-1.

5.8.3.3 Structured data types

5.8.3.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.8.3.3.2 Type: AppliedBdtPolicy

This type represents an applied BDT policy which is sent from the AF to the NEF.

Table 5.8.3.3.2-1: Definition of type AppliedBdtPolicy

Attribute name	Data type	P	Cardinality	Description	Applicability (NOTE)
bdtRefId	BdtReferenceId	M	1	Identifies a selected policy of background data transfer.	
gpsi	Gpsi	C	0..1	Identifies a user.	
externalGroupId	ExternalGroupId	C	0..1	Identifies a user group.	
suppFeat	SupportedFeatures	M	1	Indicates the list of Supported features used as described in subclause 5.8.4. This attribute shall be provided in the POST request and in the response of successful resource creation	
self	Link	C	0..1	Identifies the Individual Applied BDT Policy Subscription resource. Shall be present in the HTTP GET response when reading all the subscriptions for an AF.	
NOTE: Only one of the properties "gpsi" or "externalGroupId" shall be included.					

5.8.3.3.3 Type: AppliedBdtPolicyPatch

This type represents a subscription of applied BDT policy parameters provided by the AF to the NEF. The structure is used for HTTP PATCH request.

Table 5.8.3.3.2-1: Definition of type AppliedBdtPolicyPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
bdtRefId	BdtReferenceId	M	1	Identifies a selected policy of background data transfer.	

5.8.3.4 Simple data types and enumerations

5.8.3.4.1 Introduction

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

5.8.3.4.2 Simple data types

The simple data types defined in table 5.8.3.4.2-1 shall be supported.

Table 5.8.3.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.8.4 Used Features

The table below defines the features applicable to the ApplyingBdtPolicy API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.8.4-1: Features used by ApplyingBdtPolicy API

Feature number	Feature Name	Description

5.9 IPTVConfiguration API

5.9.1 Resources

5.9.1.1 Overview

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-iptvconfiguration/v1/

"apiRoot" is set as described in subclause 5.2.4 in 3GPP TS 29.122 [4]. "apiName" shall be set to "3gpp-iptvconfiguration" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

This subclause describes the structure for the Resource URIs as shown in figure 5.9.1.1-1 and the resources and HTTP methods used for the IPTVConfiguration API.

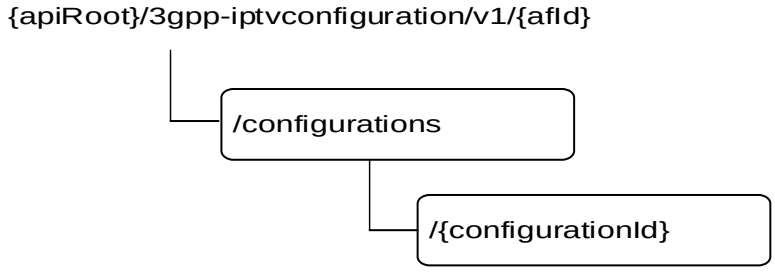

Figure 5.9.1.1-1: Resource URI structure of the IPTVConfiguration API

Table 5.9.1.1-1 provides an overview of the resources and HTTP methods applicable for the IPTVConfiguration API.

Table 5.9.1.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
IPTV Configurations	{apiRoot}/3gpp-iptvconfiguration/v1/{afId}/configurations	GET	Read all configurations for a given AF
		POST	Create a new IPTV configuration
Individual IPTV Configuration	{apiRoot}/3gpp-iptvconfiguration/v1/{afId}/configurations/{configurationId}	GET	Read an existing configuration identified by {configurationId}
		PUT	Modify all of the properties of an existing configuration identified by **{**configurationId**}**
		PATCH	Modify some of the properties of an existing configuration identified by {configurationId}
		DELETE	Delete the configuration identified by **{**configurationId**}**

5.9.1.2 Resource: IPTV Configurations

5.9.1.2.1 Introduction

This resource allows a AF to read all active IPTV configurations for the given AF, or create an new individual IPTV configuration in the NEF.

5.9.1.2.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-iptvconfiguration/v1/{afId}/configurations**

This resource shall support the resource URI variables defined in table 5.9.1.2.2-1.

Table 5.9.1.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.

5.9.1.2.3 Resource Methods

5.9.1.2.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.9.1.2.2.

5.9.1.2.3.2 GET

The GET method allows to read all active configurations for a given AF. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.9.1.2.3.2-1.

Table 5.9.1.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.9.1.2.3.2-2 and the response data structures and response codes specified in table 5.9.1.2.3.2-3.

Table 5.9.1.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.9.1.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(IptvConfigData)	M	0..N	200 OK	All the configuration information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.9.1.2.3.3 POST

The POST method creates a new resource to individual IPTV configuration for a given AF. The AF shall initiate the HTTP POST request message and the NEF shall respond to the message. The NEF shall construct the URI of the created resource.

This method shall support the request data structures specified in table 5.9.1.2.3.3-1 and the response data structures and response codes specified in table 5.9.1.2.3.3-2.

Table 5.9.1.2.3.3-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
IptvConfigData	M	1	Parameters to create an IPTV Configuration resource.

Table 5.9.1.2.3.3-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
IptvConfigData	M	1	201 Created	The configuration resource was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

Table 5.9.1.2.3.3-3: 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}/3gpp-iptvconfiguration/v1/{afId}/configurations/{configurationId}

5.9.1.3 Resource: Individual IPTV Configuration

5.9.1.3.1 Introduction

This resource allows a AF to read, update or delete an existing IPTV Configuration.

5.9.1.3.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-iptvconfiguration/v1/{afId}/configurations/{configurationId}**

This resource shall support the resource URI variables defined in table 5.9.1.3.2-1.

Table 5.9.1.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.
configurationId	string	Identifier of the configuration resource.

5.9.1.3.3 Resource Methods

5.9.1.3.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.9.1.3.2.

5.9.1.3.3.2 GET

The GET method allows to read the active configuration for a given AF and subscription Id. The AF shall initiate the HTTP GET request message and theNEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.9.1.3.3.2-1.

Table 5.9.1.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.9.1.3.3.2-2 and the response data structures and response codes specified in table 5.9.1.3.3.2-3.

Table 5.9.1.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.9.1.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
IptvConfigData	M	1	200 OK	The information for the configuration in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.9.1.3.3.3 PUT

The PUT method modifies an existing resource to update a configuration. The AF shall initiate the HTTP PUT request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.9.1.3.3.3-1 and the response data structures and response codes specified in table 5.9.1.3.3.3-2.

Table 5.9.1.3.3.3-1: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
IptvConfigData	M	1	Modify an existing configuration.

Table 5.9.1.3.3.3-2: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
IptvConfigData	M	1	200 OK	The configuration resource was updated successfully.
n/a			204 No Content	The configuration resource was updated successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.9.1.3.3.4 DELETE

The DELETE method deletes an existing individual configuration for a given AF. The AF shall initiate the HTTP DELETE request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.9.1.3.3.4-1.

Table 5.9.1.3.3.4-1: 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 5.9.1.3.3.4-2 and the response data structures and response codes specified in table 5.9.1.3.3.4-3.

Table 5.9.1.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.9.1.3.3.4-3: 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 resource was terminated successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.9.1.3.3.5 PATCH

The PATCH method allows to change some properties of an existing resource to update a configuration. The AF shall initiate the HTTP PATCH request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.9.1.3.3.5-1 and the response data structures and response codes specified in table 5.9.1.3.3.5-2.

Table 5.9.1.3.3.5-1: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
IptvConfigDataPatch	M	1	Partial update an existing configuration.

Table 5.9.1.3.3.5-2: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
IptvConfigData	M	1	200 OK	The configuration resource was updated successfully.
n/a			204 No Content	The configuration resource was updated successfully.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.9.1A Notifications

Notifications are not applicable to this API.

5.9.2 Data Model

5.9.2.1 General

This subclause specifies the application data model supported by the IPTVConfiguration API.

5.9.2.2 Reused data types

The data types reused by the IPTVConfiguration API from other specifications are listed in table 5.9.2.2-1.

Table 5.9.2.2-1: Re-used Data Types

Data type	Reference	Comments
Dnn	3GPP TS 29.571 [8]	Identifies a DNN.
ExternalGroupId	3GPP TS 29.122 [4]	External Group Identifier for a user group.
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
Ipv4Addr	3GPP TS 29.571 [8]	Identifies an IPv4 address.
Ipv6Addr	3GPP TS 29.571 [8]	Identifies an IPv6 address.
Link	3GPP TS 29.122 [4]	
Snssai	3GPP TS 29.571 [8]	Identifies the S-NSSAI.
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.9.3-1.

5.9.2.3 Structured data types

5.9.2.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.9.2.3.2 Type: IptvConfigData

Table 5.9.2.3.2-1: Definition of type IptvConfigData

Attribute name	Data type	P	Cardinality	Description	Applicability
self	Link	C	0..1	Identifies the individual IPTV configuration resource URI. Shall be present in the HTTP GET response when reading all the configurations for an AF.	
gpsi	Gpsi	C	0..1	Identifies GPSI.(NOTE)	
exterGroupId	ExternalGroupId	C	0..1	Represents a group of users. (NOTE)	
afAppId	string	M	1	Identifies an application.	
dnn	Dnn	O	0..1	Identifies a DNN, 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 an S-NSSAI.	
multiAccCtrls	map(MulticastAccessControl)	M	1..N	Identifies a list of multicast address access control information.	
suppFeat	SupportedFeatures	M	1	Indicates the negotiated supported features.	
NOTE: Only one of the "gpsi" or "exterGroupId" attribute shall be provided.					

5.9.2.3.3 Type: MulticastAccessControl

Table 5.9.2.3.3-1: Definition of type MulticastAccessControl

Attribute name	Data type	P	Cardinality	Description	Applicability
srcIpv4Addr	Ipv4Addr	O	0..1	Identifies the source IPv4 address of IPTV multicast channel.	
srcIpv6Addr	Ipv6Addr	O	0..1	Identifies the source IPv6 address of IPTV multicast channel.	
multicastV4Addr	Ipv4Addr	O	0..1	Identifies the multicast IPv4 address of IPTV multicast channel. (NOTE)	
multicastV6Addr	Ipv6Addr	O	0..1	Identifies the multicast IPv6 address of IPTV multicast channel. (NOTE)	
accStatus	AccessRightStatus	M	1	Represents access right status of the multicast channel.	
NOTE: At least one of the "multicastV4Addr" or "multicastV6Addr" attribute shall be provided.					

5.9.2.3.4 Type: IptvConfigDataPatch

Table 5.9.2.3.4-1: Definition of type IptvConfigDataPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
multiAccCtrls	map(MulticastAccessControl)	O	1..N	Identifies a list of multicast address access control information.	

5.9.2.4 Simple data types and enumerations

5.9.2.4.1 Introduction

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

5.9.2.4.2 Simple data types

The simple data types defined in table 5.9.2.4.2-1 shall be supported.

Table 5.9.2.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.9.2.4.3 Enumeration: AccessRightStatus

The enumeration AccessRightStatus represents the parameters provision type of which the AF requests to provision. It shall comply with the provisions defined in table 5.9.2.4.3-1.

Table 5.9.2.4.3-1: Enumeration ProvisionType

Enumeration value	Description
FULLY_ALLOWED	The User is fully allowed to access to the channel.
PREVIEW_ALLOWED	The User is preview allowed to access to the channel.
NO_ALLOWED	The User is not allowed to access to the channel.

5.9.3 Used Features

The table below defines the features applicable to the IPTVConfiguration API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.9.3-1: Features used by IPTVConfiguration API

Feature number	Feature Name	Description

5.10 LpiParameterProvision API

5.10.1 Resources

5.10.1.1 Overview

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-lpi-pp/v1/

"apiRoot" is set as described in subclause 5.2.4 in 3GPP TS 29.122 [4]. "apiName" shall be set to "3gpp-lpi-pp" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

This subclause describes the structure for the Resource URIs as shown in figure 5.10.1.1-1 and the resources and HTTP methods used for the LpiParameterProvision API.

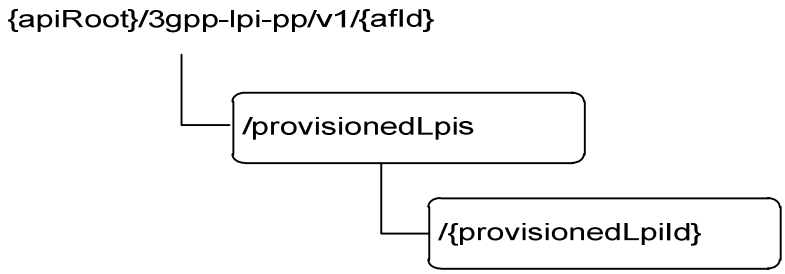

Figure 5.10.1.1-1: Resource URI structure of the LpiParameterProvision API

Table 5.10.1.1-1 provides an overview of the resources and HTTP methods applicable for the LpiParameterProvision API.

Table 5.10.1.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
LPI Parameters Provisionings	{apiRoot}/3gpp-lpi-pp/v1/{afId}/provisionedLpis	GET	Read all LPI Parameters Provisioningresources for a given AF
		POST	Create a new Individual LPI Parameters Provisioning resource
Individual LPI Parameters Provisioning	{apiRoot}/3gpp-lpi-pp/v1/{afId}/provisionedLpis/{provisionedLpiId}	GET	Read an existing Individual LPI Parameters Provisioning resource identified by {provisionedLpiId}
		PUT	Modify all of the properties of an existing Individual LPI Parameters Provisioning resource identified by {provisionedLpiId}
		DELETE	Delete the existing Individual LPI Parameters Provisioning resource identified by {provisionedLpiId}

5.10.1.2 Resource: LPI Parameters Provisionings

5.10.1.2.1 Introduction

This resource allows a AF to read all active LPI Parameters Provisionings for the given AF, or create an new individual LPI Parameters Provisioning resource to provision parameters to the NEF.

5.10.1.2.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-lpi-pp/v1/{afId}/provisionedLpis**

This resource shall support the resource URI variables defined in table 5.10.1.2.2-1.

Table 5.10.1.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.

5.10.1.2.3 Resource Methods

5.10.1.2.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.10.1.2.3.

5.10.1.2.3.2 GET

The GET method allows to read all active provisioned LPIs for a given AF. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.10.1.2.3.2-1.

Table 5.10.1.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.10.1.2.3.2-2 and the response data structures and response codes specified in table 5.10.1.2.3.2-3.

Table 5.10.1.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.10.1.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(LpiParametersProvision)	M	0..N	200 OK	All the LPI Parameters Provisioning information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.10.1.2.3.3 POST

The POST method creates a new resource to LPI Parameters Provisionings for a given AF. The AF shall initiate the HTTP POST request message and the NEF shall respond to the message. The NEF shall construct the URI of the created resource.

This method shall support the request data structures specified in table 5.10.1.2.3.3-1 and the response data structures and response codes specified in table 5.10.1.2.3.3-2.

Table 5.10.1.2.3.3-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
LpiParametersProvision	M	1	Parameters to create an LPI Parameters Provisionings resource to provision parameters.

Table 5.10.1.2.3.3-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
LpiParametersProvision	M	1	201 Created	The resource was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

Table 5.10.1.2.3.3-3: 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}/3gpp-lpi-pp/v1/{afId}/provisionedLpis/{provisionedLpiId}

5.10.1.3 Resource: Individual LPI Parameters Provisioning

5.10.1.3.1 Introduction

This resource allows a AF to read, update or delete an existing provisioned LPI parameters resource.

5.10.1.3.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-lpi-pp/v1/{afId}/provisionedLpis/{provisionedLpiId}**

This resource shall support the resource URI variables defined in table 5.10.1.3.2-1.

Table 5.10.1.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.
provisionedLpiId	string	Identifier of the provisioning resource.

5.10.1.3.3 Resource Methods

5.10.1.3.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.10.1.3.3.

5.10.1.3.3.2 GET

The GET method allows to read an active providedLpis for a given AF and provisionedLpiId. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.10.1.3.3.2-1.

Table 5.10.1.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.10.1.3.3.2-2 and the response data structures and response codes specified in table 5.10.1.3.3.2-3.

Table 5.10.1.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.10.1.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
LpiParametersProvision	M	1	200 OK	The information for the source in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.10.1.3.3.3 PUT

The PUT method modifies an existing resource to update an existing individual LPI Parameters Provisioning resource. The AF shall initiate the HTTP PUT request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.10.1.3.3.3-1 and the response data structures and response codes specified in table 5.10.1.3.3.3-2.

Table 5.10.1.3.3.3-1: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
LpiParametersProvision	M	1	Modify an existing individual LPI Parameters Provisioning resource to provision parameters.

Table 5.10.1.3.3.3-2: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
LpiParametersProvision	M	1	200 OK	The resource was updated successfully.
n/a			204 No Content	The resource was updated successfully and no additional content is sent in the response message.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.10.1.3.4 DELETE

The DELETE method deletes an existing individual LPI Parameters Provisioning resource for a given AF. The AF shall initiate the HTTP DELETE request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.10.1.3.3.4-1.

Table 5.10.1.3.3.4-1: 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 5.10.1.3.3.4-2 and the response data structures and response codes specified in table 5.10.1.3.3.4-3.

Table 5.10.1.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.10.1.3.3.4-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
N/A			204 No Content	The resource was removed successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.10.2 Data Model

5.10.2.1 General

This subclause specifies the application data model supported by the LpiParameterProvision API.

5.10.2.2 Reused data types

The data types reused by the LpiParameterProvision API from other specifications are listed in table 5.10.2.2-1.

Table 5.10.2.2-1: Re-used Data Types

Data type	Reference	Comments
ExternalGroupId	3GPP TS 29.122 [4]	External Group Identifier for a user group.
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
Link	3GPP TS 29.122 [4]	Identifies a referenced resource.
Lpi	3GPP TS 29.503 [17]	Identifies the Location Privacy Indication information.
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.10.3-1.

5.10.2.3 Structured data types

5.10.2.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.10.2.3.2 Type: LpiParametersProvision

Table 5.10.2.3.2-1: Definition of type LpiParametersProvision

Attribute name	Data type	P	Cardinality	Description	Applicability
self	Link	C	0..1	Identifies the individual parameters provisioning resource. This attribute shall be supplied by the NEF in HTTP responses that include an object of LpiParametersProvision type.	
exterGroupId	ExternalGroupId	O	0..1	Identifies a group of UEs. (NOTE)	
gpsi	Gpsi	O	0..1	Identifies an UE with GPSI. (NOTE)	
lpi	Lpi	M	1	Location Privacy Indication parameters	
suppFeat	SupportedFeatures	M	1	Indicates the negotiated supported features.	
NOTE: Only one of the "gpsi" or "exterGroupId" attribute shall be provided.					

5.10.2.4 Simple data types and enumerations

5.10.2.4.1 Introduction

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

5.10.2.4.2 Simple data types

The simple data types defined in table 5.10.2.4.2-1 shall be supported.

Table 5.10.2.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.10.3 Used Features

The table below defines the features applicable to the LpiParameterProvision API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.10.3-1: Features used by LpiParameterProvision API

Feature number	Feature Name	Description

5.11 ServiceParameter API

5.11.1 Resources

5.11.1.1 Overview

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-service-parameter/v1/

"apiRoot" is set as described in subclause 5.2.4 in 3GPP TS 29.122 [4]. "apiName" shall be set to "3gpp-service-parameter" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

This subclause describes the structure for the Resource URIs as shown in figure 5.11.1.1-1 and the resources and HTTP methods used for the ServiceParameter API.

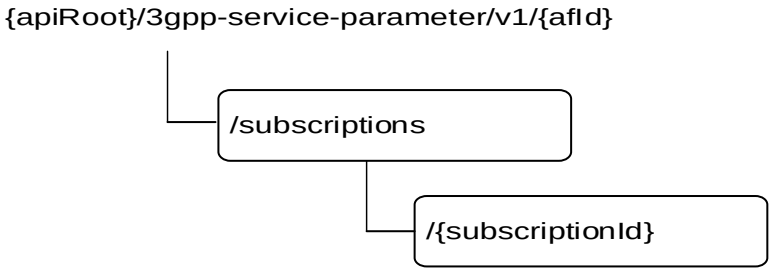

Figure 5.9.1.1-1: Resource URI structure of the ServiceParameter API

Table 5.11.1.1-1 provides an overview of the resources and HTTP methods applicable for the ServiceParameter API.

Table 5.9.1.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
Service Parameter Subscripions	{apiRoot}/3gpp-service-parameter/v1/{afId}/subscriptions	GET	Read all subscriptions for a given AF.
		POST	Create a new service parameter subscription.
Individual Service Parameter Subscripion	{apiRoot}/3gpp-service-parameter/v1/{afId}/subscriptions/{subscriptionId}	GET	Read an existing subscription identified by {subscriptionId}
		PUT	Modify all of the properties of an existing subscription. identified by {subscriptionId}
		PATCH	Modify some of the properties of an existing subscription identified by {subscriptionId}
		DELETE	Delete the subscription identified by {subscriptionId}

5.11.1.2 Resource: Service Parameter Subscriptions

5.11.1.2.1 Introduction

This resource allows a AF to read all active Service Parameter Subscriptions for the given AF, or create an new individual service parameter subscription in the NEF.

5.11.1.2.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-service-parameter/v1/{afId}/subscriptions**

This resource shall support the resource URI variables defined in table 5.11.1.2.2-1.

Table 5.11.1.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.

5.11.1.2.3 Resource Methods

5.11.1.2.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.11.1.2.3.

5.11.1.2.3.2 GET

The GET method allows to read all active subscriptions for a given AF. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.11.1.2.3.2-1.

Table 5.11.1.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.11.1.2.3.2-2 and the response data structures and response codes specified in table 5.11.1.2.3.2-3.

Table 5.11.1.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.11.1.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(ServiceParameterData)	M	0..N	200 OK	All the subscription information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.11.1.2.3.3 POST

The POST method creates a new resource to individual service parameter subscription for a given AF. The AF shall initiate the HTTP POST request message and the NEF shall respond to the message. The NEF shall construct the URI of the created resource.

This method shall support the request data structures specified in table 5.11.1.2.3.3-1 and the response data structures and response codes specified in table 5.11.1.2.3.3-2.

Table 5.11.1.2.3.3-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
ServiceParameterData	M	1	Parameters to create a service parameter subscription resource.

Table 5.11.1.2.3.3-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceParameterData	M	1	201 Created	The subscription resource was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

Table 5.11.1.2.3.3-3: 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}/3gpp-service-parameter/v1/{afId}/subscriptions/{subscriptionId}

5.11.1.3 Resource: Individual Service Parameter Subscription

5.11.1.3.1 Introduction

This resource allows a AF to read, update or delete an existing service parameter subscription.

5.11.1.3.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-service-parameter/v1/{afId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.9.1.3.2-1.

Table 5.11.1.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	string	Identifier of the AF.
subscriptionId	string	Identifier of the subscription resource.

5.11.1.3.3 Resource Methods

5.11.1.3.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.11.1.3.3.

5.11.1.3.3.2 GET

The GET method allows to read the active subscription for a given AF and subscription Id. The AF shall initiate the HTTP GET request message and theNEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.11.1.3.3.2-1.

Table 5.11.1.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.11.1.3.3.2-2 and the response data structures and response codes specified in table 5.11.1.3.3.2-3.

Table 5.11.1.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.11.1.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceParameterData	M	1	200 OK	The information for the subscription in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.11.1.3.3.3 PUT

The PUT method modifies an existing resource to update a configuration. The AF shall initiate the HTTP PUT request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.9.1.3.3.3-1 and the response data structures and response codes specified in table 5.9.1.3.3.3-2.

Table 5.11.1.3.3.3-1: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
ServiceParameterData	M	1	Modify an existing subscription.

Table 5.11.1.3.3.3-2: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceParameterData	M	1	200 OK	The subscription resource was updated successfully.
n/a			204 No Content	The subscription resource was updated successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.11.1.3.3.4 DELETE

The DELETE method deletes an existing individual subscription for a given AF. The AF shall initiate the HTTP DELETE request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.11.1.3.3.4-1.

Table 5.11.1.3.3.4-1: 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 5.11.1.3.3.4-2 and the response data structures and response codes specified in table 5.11.1.3.3.4-3.

Table 5.11.1.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.11.1.3.3.4-3: 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 resource was terminated successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.11.1.3.3.5 PATCH

The PATCH method allows to change some properties of an existing resource to update a subscription. The AF shall initiate the HTTP PATCH request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.11.1.3.3.5-1 and the response data structures and response codes specified in table 5.11.1.3.3.5-2.

Table 5.9.1.3.3.5-1: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
ServiceParameterDataPatch	M	1	Partial update an existing subscription.

Table 5.9.1.3.3.5-2: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
ServiceParameterDataPatch	M	1	200 OK	The subscription resource was updated successfully.
n/a			204 No Content	The subscription resource was updated successfully.
NOTE: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.11.2 Data Model

5.11.2.1 General

This subclause specifies the application data model supported by the ServiceParameter API.

5.11.2.2 Reused data types

The data types reused by the ServiceParameter API from other specifications are listed in table 5.9.2.2-1.

Table 5.11.2.2-1: Re-used Data Types

Data type	Reference	Comments
Dnn	3GPP TS 29.571 [8]	Identifies a DNN.
ExternalGroupId	3GPP TS 29.122 [4]	External Group Identifier for a user group.
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
IPv4Addr	3GPP TS 29.571 [8]	Identifies an IPv4 address.
IPv6Addr	3GPP TS 29.571 [8]	Identifies an IPv6 address.
Link	3GPP TS 29.122 [4]	
MacAddr48	3GPP TS 29.571 [8]	Identifies an MAC address.
Snssai	3GPP TS 29.571 [8]	Identifies the S-NSSAI.
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.11.3-1.

5.11.2.3 Structured data types

5.11.2.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.11.2.3.2 Type: ServiceParameterData

Table 5.11.2.3.2-1: Definition of type ServiceParameterData

Attribute name	Data type	P	Cardinality	Description	Applicability
self	Link	C	0..1	Identifies the individual service parameter subscription resource URI. Shall be present by the NEF in HTTP responses that include an object of ServiceParameterData type.	
dnn	Dnn	O	0..1	Identifies a DNN.	
snssai	Snssai	O	0..1	Identifies an S-NSSAI.	
afServiceId	string	O	0..1	Identifies a service on behalf of which the AF is issuing the request.	
appId	string	O	0..1	Identifies an application identifier.	
gpsi	Gpsi	O	0..1	Identifies GPSI.	
ueIpv4	Ipv4Addr	O	0..1	The IPv4 address of the served UE.	
ueIpv6	Ipv6Addr	O	0..1	The IPv6 address of the served UE.	
ueMac	MacAddr48	O	0..1	The MAC address of the served UE.	
exterGroupId	ExternalGroupId	O	0..1	Represents a group of users.	
anyUeInd	boolean	O	0..1	Identifies whether the service parameters applies to any UE. This attribute shall set to "true" if applicable for any UE, otherwise, set to "false".	
paramOverPc5	ParameterOverPc5	O	0..1	Contains the service parameter used over PC5	
paramOverUu	ParameterOverUu	O	0..1	Contains the service parameter used over Uu	
suppFeat	SupportedFeatures	C	0..1	Indicates the list of Supported features used as described in subclause 5.11.3. This attribute shall be provided in the POST request and in the response of successful resource creation.	
NOTE 1: One of individual UE identifier (i.e. "gpsi", "ueIpv4", "ueIpv6" or "ueMac" attribute), External Group Identifier (i.e. "exterGroupId" attribute) or any UE indication (i.e. "anyUeInd" attribute) shall be included. NOTE 2: Either the "afServiceId" attribute, "appId" attribute or the combination of "snssai" and "dnn" attributes shall be provided.					

5.11.2.3.3 Type: ServiceParameterDataPatch

Table 5.11.2.3.3-1: Definition of type ServiceParameterDataPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
paramOverPc5	ParameterOverPc5Rm	O	0..1	Contains the service parameter used over PC5	
paramOverUu	ParameterOverUuRm	O	0..1	Contains the service parameter used over Uu	

5.11.2.4 Simple data types and enumerations

5.11.2.4.1 Introduction

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

5.11.2.4.2 Simple data types

The simple data types defined in table 5.11.2.4.2-1 shall be supported.

Table 5.11.2.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
ParameterOverPc5	string	Configuration parameters for V2X communication over PC5. Its encoding shall comply with the UE policies for V2X communication over PC5 as defined in subclause 5.3 of 3GPP TS 24.588 [33]	
ParameterOverPc5Rm	string	This data type is defined in the same way as the "ParameterOverPc5" data type, but with the OpenAPI "nullable: true" property.	
ParameterOverUu	string	Configuration parameters for V2X communication over Uu. Its encoding shall comply with the UE policies for V2X communication over Uu as defined in subclause 5.4 of 3GPP TS 24.588 [33]	
ParameterOverUuRm	string	This data type is defined in the same way as the "ParameterOverUu" data type, but with the OpenAPI "nullable: true" property.	

5.11.3 Used Features

The table below defines the features applicable to the ServiceParameter API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.11.3-1: Features used by ServiceParameter API

Feature number	Feature Name	Description

5.12 ACSParameterProvision API

5.12.1 Resources

5.12.1.1 Overview

All resource URIs of this API should have the following root:

{apiRoot}/3gpp-acs-pp/v1/

"apiRoot" is set as described in subclause 5.2.4 in 3GPP TS 29.122 [4]. "apiName" shall be set to "3gpp-acs-pp" and "apiVersion" shall be set to "v1" for the current version defined in the present document. All resource URIs in the subclauses below are defined relative to the above root URI.

This subclause describes the structure for the Resource URIs as shown in figure 5.12.1.1-1 and the resources and HTTP methods used for the ACSParameterProvision API.

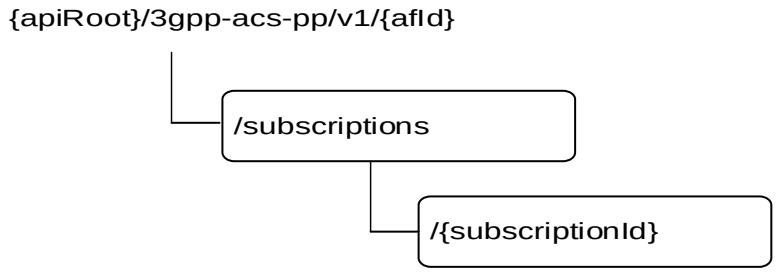

Figure 5.12.1.1-1: Resource URI structure of the ACSParameterProvision API

Table 5.12.1.1-1 provides an overview of the resources and HTTP methods applicable for the ACSParameterProvision API.

Table 5.12.1.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method	Description
ACS Configuration Subscripions	{apiRoot}/3gpp-acs-pp/v1/{afId}/subscriptions	GET	Read all subscriptions for a given AF.
		POST	Create a new ACS configuration subscription.
Individual ACS Configuration Subscripion	{apiRoot}/3gpp-acs-pp/v1/{afId}/subscriptions/{subscriptionId}	GET	Read an existing subscription identified by {subscriptionId}
		PUT	Modify all of the properties of an existing subscription. identified by {subscriptionId}
		DELETE	Delete the subscription identified by {subscriptionId}

5.12.1.2 Resource: ACS Configuration Subscriptions

5.12.1.2.1 Introduction

This resource allows a AF to read all active ACS Configuration Subscriptions for the given AF, or create an new individual ACS Configuration subscription in the NEF.

5.12.1.2.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-acs-pp/v1/{afId}/subscriptions**

This resource shall support the resource URI variables defined in table 5.12.1.2.2-1.

Table 5.12.1.2.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	Identifier of the AF of type string.

5.12.1.2.3 Resource Methods

5.12.1.2.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.12.1.2.3.

5.12.1.2.3.2 GET

The GET method allows to read all active subscriptions for a given AF. The AF shall initiate the HTTP GET request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.12.1.2.3.2-1.

Table 5.12.1.2.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.12.1.2.3.2-2 and the response data structures and response codes specified in table 5.12.1.2.3.2-3.

Table 5.12.1.2.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.12.1.2.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
array(AcsConfigurationData)	M	0..N	200 OK	All the subscription information for the AF in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.12.1.2.3.3 POST

The POST method creates a new resource to individual ACS Configuration subscription for a given AF. The AF shall initiate the HTTP POST request message and the NEF shall respond to the message. The NEF shall construct the URI of the created resource.

This method shall support the request data structures specified in table 5.12.1.2.3.3-1 and the response data structures and response codes specified in table 5.12.1.2.3.3-2.

Table 5.12.1.2.3.3-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
AcsConfigurationData	M	1	Parameters to create an individual ACS Configuration subscription resource.

Table 5.12.1.2.3.3-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AcsConfigurationData	M	1	201 Created	The subscription resource was created successfully. The URI of the created resource shall be returned in the "Location" HTTP header.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

Table 5.12.1.2.3.3-3: 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}/3gpp-acs-pp/v1/{afId}/subscriptions/{subscriptionId}

5.12.1.3 Resource: Individual ACS Configuration Subscription

5.12.1.3.1 Introduction

This resource allows a AF to read, update or delete an existing ACS Configuration subscription.

5.12.1.3.2 Resource Definition

Resource URI: **{apiRoot}/3gpp-acs-pp/v1/{afId}/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.9.1.3.2-1.

Table 5.12.1.3.2-1: Resource URI variables for this resource

Name	Definition
apiRoot	Subclause 5.2.4 of 3GPP TS 29.122 [4].
afId	Identifier of the AF of type string.
subscriptionId	Identifier of the subscription resource of type string.

5.12.1.3.3 Resource Methods

5.12.1.3.3.1 General

The following subclauses specify the resource methods supported by the resource as described in subclause 5.12.1.3.3.

5.12.1.3.3.2 GET

The GET method allows to read the active subscription for a given AF and subscription Id. The AF shall initiate the HTTP GET request message and theNEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.12.1.3.3.2-1.

Table 5.12.1.3.3.2-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description
N/A				

This method shall support the request data structures specified in table 5.12.1.3.3.2-2 and the response data structures and response codes specified in table 5.12.1.3.3.2-3.

Table 5.12.1.3.3.2-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.12.1.3.3.2-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AcsConfiguration Data	M	1	200 OK	The information for the subscription in the request URI are returned.
NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.12.1.3.3.3 PUT

The PUT method modifies an existing resource to update a configuration. The AF shall initiate the HTTP PUT request message and the NEF shall respond to the message.

This method shall support the request data structures specified in table 5.9.1.3.3.3-1 and the response data structures and response codes specified in table 5.9.1.3.3.3-2.

Table 5.12.1.3.3.3-1: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
AcsConfiguration Data	M	1	Modify an existing subscription.

Table 5.12.1.3.3.3-2: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
AcsConfiguration Data	M	1	200 OK	The subscription resource was updated successfully.
n/a			204 No Content	The subscription resource was updated successfully.
NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.12.1.3.3.4 DELETE

The DELETE method deletes an existing individual subscription for a given AF. The AF shall initiate the HTTP DELETE request message and the NEF shall respond to the message.

This method shall support the URI query parameters specified in table 5.12.1.3.3.4-1.

Table 5.12.1.3.3.4-1: 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 5.12.1.3.3.4-2 and the response data structures and response codes specified in table 5.12.1.3.3.4-3.

Table 5.12.1.3.3.4-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
N/A			

Table 5.12.1.3.3.4-3: 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 resource was terminated successfully.
NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.12.2 Data Model

5.12.2.1 General

This subclause specifies the application data model supported by the ACSParameterProvision API.

5.12.2.2 Reused data types

The data types reused by the ACSParameterProvision API from other specifications are listed in table 5.12.2.2-1.

Table 5.12.2.2-1: Re-used Data Types

Data type	Reference	Comments
AcsInfo	3GPP TS 29.571 [8]	Contains the information of ACS
ExternalGroupId	3GPP TS 29.122 [4]	External Group Identifier for a user group.
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
Link	3GPP TS 29.122 [4]	
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.9.4-1.

5.12.2.3 Structured data types

5.12.2.3.1 Introduction

This clause defines the structured data types to be used in resource representations.

5.12.2.3.2 Type: AcsConfigurationData

Table 5.12.2.3.2-1: Definition of type AcsConfigurationData

Attribute name	Data type	P	Cardinality	Description	Applicability
self	Link	C	0..1	Identifies the individual service parameter subscription resource URI. Shall be present by the NEF in HTTP responses that include an object of AcsConfigurationData Data type.	
gpsi	Gpsi	O	0..1	Identifies GPSI.	
exterGroupId	ExternalGroupId	O	0..1	Represents a group of users.	
acsInfo	AcsInfo	M	1	Contains the information of ACS.	
suppFeat	SupportedFeatures	M	1	Indicates the list of Supported features used as described in subclause 5.12.3. This parameter shall be supplied by the NF service consumer in the POST request that requested the creation of an individual ACS configuration Subscription resource.	

5.12.2.4 Simple data types and enumerations

5.12.2.4.1 Introduction

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

5.12.2.4.2 Simple data types

The simple data types defined in table 5.12.2.4.2-1 shall be supported.

Table 5.12.2.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.12.3 Used Features

The table below defines the features applicable to the ACSParameterProvision API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.12.3-1: Features used by ACSParameterProvision API

Feature number	Feature Name	Description

5.13 MoLcsNotify API

5.13.1 Resources

There is no resource defined for this API.

5.13.2 Notifications

5.13.2.1 Introduction

Upon receipt of a UE location information update notification from the GMLC or the AMF or the UDM, the NEF shall send an HTTP POST message in order to notify the AF of the updated UE location information.

5.13.2.2 Event Notification

URI: **{notificationDestination}**

The operation shall support the URI variables defined in table 5.13.2.2-1.

Table 5.13.2.2-1: URI variables

Name	Definition
notificationDestination	A URI indicating the notification destination where N33 notification requests shall be delivered to. This URI shall be preconfigured in the NEF.

5.13.2.3 Operation Definition

5.13.2.3.1 Notification via HTTP POST

This method shall support the request data structures specified in table 5.13.2.3.1-1 and the response data structures and response codes specified in table 5.13.2.3.1-2.

Table 5.13.2.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
LocUpdateData	M	1	Delivers UE location to AF during MO-LR procedure

Table 5.13.2.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
LocUpdateDataReply	M	1	200 OK	The notification is received successfully.
NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.6-1 of 3GPP TS 29.122 [4] also apply.				

5.13.3 Data Model

5.13.3.1 General

This subclause specifies the application data model supported by the MoLcsNotify API.

5.13.3.2 Reused data types

The data types reused by the MoLcsNotify API from other specifications are listed in table 5.13.3.2-1.

Table 5.13.3.2-1: Re-used Data Types

Data type	Reference	Comments
SupportedFeatures	3GPP TS 29.571 [8]	Used to negotiate the applicability of the optional features defined in table 5.13.4-1.
Gpsi	3GPP TS 29.571 [8]	Identifies a GPSI.
LocationInfo	3GPP TS 29.122 [4]	Represent user location information for exposure.
LcsQosClass	3GPP TS 29.572 [34]	LCS QoS Class.
ServiceIdentity	3GPP TS 29.515 [35]	Service identity

5.13.3.3 Structured data types

5.13.3.3.1 Introduction

This clause defines the structured data types to be used by the MoLcsNotify API.

5.13.3.3.2 Type: LocUpdateData

This type represents a UE updated location information from the NEF to the AF.

Table 5.13.3.3.2-1: Definition of type LocUpdateData

Attribute name	Data type	P	Cardinality	Description	Applicability
gpsi	Gpsi	M	1	Generic Public Subscription identifier	
locInfo	LocationInfo	M	1	Represent user location information for exposure.	
lcsQosClass	LcsQosClass	M	1	LCS QoS Class.	
svcId	ServiceIdentity	O	0..1	Service Identity may be specified by the UE for LCS request.	
suppFeat	SupportedFeatures	M	1	Indicates the list of Supported features used as described in subclause 5.13.4.	

5.13.3.3.3 Type: LocUpdateDataReply

This data type represents a reply to a MO LCS notification and is sent from the AF to the NEF.

Table 5.13.3.3.3-1: Definition of type LocUpdateDataReply

Attribute name	Data type	P	Cardinality	Description	Applicability
suppFeat	SupportedFeatures	M	1	Indicates the list of Supported features used as described in subclause 5.13.4.	

5.13.3.4 Simple data types and enumerations

5.13.3.4.1 Introduction

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

5.13.3.4.2 Simple data types

The simple data types defined in table 5.13.3.4.2-1 shall be supported.

Table 5.13.3.4.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.13.4 Used Features

The table below defines the features applicable to the MoLcsNotify API. Those features are negotiated as described in subclause 5.2.7 of 3GPP TS 29.122 [4].

Table 5.13.4-1: Features used by MoLcsNotify API

Feature number	Feature Name	Description

6 Security

TLS (IETF RFC 5246 [16]) shall be used to support the security communication between the NEF and the AF over NEF Northbound interface as defined in subclause 12 of 3GPP TS 33.501 [6]. The access to the SCEF northbound APIs shall be authorized by means of OAuth2 protocol (see IETF RFC 6749 [13]), based on local configuration, using the "Client Credentials" authorization grant. If OAuth2 is used, a client, prior to consuming services offered by the NEF Northbound APIs, shall obtain a "token" from the authorization server.

7 Using Common API Framework

7.1 General

When CAPIF is used with an NEF that is used for external exposure, the NEF shall support the following as defined in 3GPP TS 29.222 [12]:

- the API exposing function and related APIs over CAPIF-2/2e and CAPIF-3 reference points;
- the API publishing function and related APIs over CAPIF-4 reference point;

- the API management function and related APIs over CAPIF-5 reference point; and
- at least one of the security methods for authentication and authorization, and related security mechanisms.

In a centralized deployment as defined in 3GPP TS 23.222 [11], where the CAPIF core function and API provider domain functions are co-located, the interactions between the CAPIF core function and API provider domain functions may be independent of CAPIF-3, CAPIF-4 and CAPIF-5 reference points.

7.2 Security

When CAPIF is used for external exposure, before invoking the API exposed by the NEF, the AF as API invoker shall negotiate the security method (PKI, TLS-PSK or OAUTH2) with CAPIF core function and ensure the NEF has enough credential to authenticate the AF (see 3GPP TS 29.222 [12], subclause 5.6.2.2 and subclause 6.2.2.2).

If PKI or TLS-PSK is used as the selected security method between the AF and the NEF, upon API invocation, the NEF shall retrieve the authorization information from the CAPIF core function as described in 3GPP TS 29.222 [12], subclause 5.6.2.4.

As indicated in 3GPP TS 33.122 [14], the access to the NEF northbound APIs may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [13]), using the "Client Credentials" authorization grant, where the CAPIF core function (see 3GPP TS 29.222 [12]) plays the role of the authorization server.

NOTE 1: In this release, only "Client Credentials" authorization grant is supported.

If OAuth2 is used as the selected security method between the AF and the NEF, the AF, prior to consuming services offered by the NEF northbound APIs, shall obtain a "token" from the authorization server, by invoking the Obtain_Authorization service, as described in 3GPP TS 29.222 [12], subclause 5.6.2.3.2.

The NEF northbound APIs do not define any scopes for OAuth2 authorization. It is the NEF responsibility to check whether the AF is authorized to use an API based on the "token". Once the NEF verifies the "token", it shall check whether the NEF identifier in the "token" matches its own published identifier, and whether the API name in the "token" matches its own published API name. If those checks are passed, the AF has full authority to access any resource or operation for the invoked API.

NOTE 2: For aforementioned security methods, the NEF needs to apply admission control according to access control policies after performing the authorization checks.

NOTE 3: The security requirement in the current subclause does not apply for the NiddConfigurationTrigger and the MsisdnLessMoSms APIs since they are the NEF initiated interaction with the AF. How the security scheme works for the NiddConfigurationTrigger and MsisdnLessMoSms APIs is left to configuration.

Annex A (normative): OpenAPI representation for NEF Northbound APIs

A.1 General

This Annex is based on the OpenAPI 3.0.0 specification [5] and provides corresponding representations of all APIs defined in the present specification.

NOTE 1: An OpenAPIs representation embeds JSON Schema representations of HTTP message bodies.

This Annex shall take 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 2: 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 hosted in ETSI Forge, that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [21] and subclause 5.3.1 of the 3GPP TS 29.501 [32] for further information).

A.2 TrafficInfluence API

```
openapi: 3.0.0
info:
  title: 3gpp-traffic-influence
  version: 1.1.0
  description: |
    API for AF traffic influence
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.4.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-traffic-influence/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.

paths:
  /{afId}/subscriptions:
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
    get:
      summary: read all of the active subscriptions for the AF
      tags:
        - Traffic Influence Subscription
      responses:
        '200':
          description: OK.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/TrafficInfluSub'
        '400':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  post:
    summary: Creates a new subscription resource
    tags:
      - Traffic Influence Subscription
    requestBody:
      description: Request to create a new subscription resource
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/TrafficInfluSub'
    callbacks:
      notificationDestination:
        '{request.body#/notificationDestination}':
          post:
            requestBody:  # contents of the callback message
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/EventNotification'
            callbacks:
              afAcknowledgement:
                '{request.body#/afAckUri}':
                  post:
                    requestBody:  # contents of the callback message
                      required: true
                      content:
                        application/json:
                          schema:
                            $ref: '#/components/schemas/AfAckInfo'
                    responses:
                      '204':
                        description: No Content (successful acknowledgement)
                      '400':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                      '401':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                      '403':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                      '404':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                      '411':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                      '413':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                      '415':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                      '429':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                      '500':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                      '503':
                        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                      default:
                        $ref: 'TS29122_CommonData.yaml#/components/responses/default'
            responses:
              '204':
                description: No Content (successful notification)
              '400':
```

```
                $ref: 'TS29122_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29122_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29122_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29122_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29122_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29122_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29122_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29122_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29122_CommonData.yaml#/components/responses/500'
              '503':
                $ref: 'TS29122_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    responses:
      '201':
        description: Created (Successful creation of subscription)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TrafficInfluSub'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource'
            required: true
            schema:
              type: string
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{afId}/subscriptions/{subscriptionId}:
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
      - name: subscriptionId
        in: path
        description: Identifier of the subscription resource
        required: true
        schema:
          type: string
    get:
      summary: read an active subscriptions for the SCS/AS and the subscription Id
      tags:
        - Individual Traffic Influence Subscription
      responses:
        '200':
          description: OK (Successful get the active subscription)
```

```
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TrafficInfluSub'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  put:
    summary: Updates/replaces an existing subscription resource
    tags:
      - Individual Traffic Influence Subscription
    requestBody:
      description: Parameters to update/replace the existing subscription
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/TrafficInfluSub'
    responses:
      '200':
        description: OK (Successful update of the subscription)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TrafficInfluSub'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  patch:
    summary: Updates/replaces an existing subscription resource
    tags:
      - Individual Traffic Influence Subscription
    requestBody:
      required: true
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/TrafficInfluSubPatch'
    responses:
      '200':
        description: OK. The subscription was modified successfully.
        content:
```

```
            application/json:
              schema:
                $ref: '#/components/schemas/TrafficInfluSub'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Deletes an already existing subscription
      tags:
        - Individual Traffic Influence Subscription
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    TrafficInfluSub:
      type: object
      properties:
        afServiceId:
          type: string
          description: Identifies a service on behalf of which the AF is issuing the request.
        afAppId:
          type: string
          description: Identifies an application.
        afTransId:
          type: string
          description: Identifies an NEF Northbound interface transaction, generated by the AF.
        appReloInd:
          type: boolean
          description: Identifies whether an application can be relocated once a location of the
application has been selected.
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        snssai:
```

```
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        anyUeInd:
          type: boolean
          description: Identifies whether the AF request applies to any UE. This attribute shall set
to "true" if applicable for any UE, otherwise, set to "false".
        subscribedEvents:
          type: array
          items:
            $ref: '#/components/schemas/SubscribedEvent'
          minItems: 1
          description: Identifies the requirement to be notified of the event(s).
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        ipv4Addr:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4Addr'
        ipv6Addr:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv6Addr'
        macAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
        dnaiChgType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DnaiChangeType'
        notificationDestination:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        requestTestNotification:
          type: boolean
          description: Set to true by the SCS/AS to request the NEF to send a test notification as
defined in subclause 5.2.5.3. Set to false or omitted otherwise.
        websockNotifConfig:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/WebsockNotifConfig'
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        trafficFilters:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
          minItems: 1
          description: Identifies IP packet filters.
        ethTrafficFilters:
          type: array
          items:
            $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
          minItems: 1
          description: Identifies Ethernet packet filters.
        trafficRoutes:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
          minItems: 1
          description: Identifies the N6 traffic routing requirement.
        tfcCorrInd:
          type: boolean
        tempValidities:
          type: array
          items:
            $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/TemporalValidity'
        validGeoZoneIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Identifies a geographic zone that the AF request applies only to the traffic
of UE(s) located in this specific zone.
        afAckInd:
          type: boolean
        addrPreserInd:
          type: boolean
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      allOf:
        - oneOf:
          - required: [afAppId]
          - required: [trafficFilters]
          - required: [ethTrafficFilters]
        - oneOf:
          - required: [ipv4Addr]
          - required: [ipv6Addr]
```

```
          - required: [macAddr]
          - required: [gpsi]
          - required: [externalGroupId]
          - required: [anyUeInd]
      anyOf:
        - not:
            required: [subscribedEvents]
        - required: [notificationDestination]
    TrafficInfluSubPatch:
      type: object
      properties:
        appReloInd:
          type: boolean
          description: Identifies whether an application can be relocated once a location of the
application has been selected.
          nullable: true
        trafficFilters:
          type: array
          items:
            $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
          minItems: 1
          description: Identifies IP packet filters.
        ethTrafficFilters:
          type: array
          items:
            $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'
          minItems: 1
          description: Identifies Ethernet packet filters.
        trafficRoutes:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
          minItems: 1
          description: Identifies the N6 traffic routing requirement.
        tfcCorrInd:
          type: boolean
          nullable: true
        tempValidities:
          type: array
          items:
            $ref: 'TS29514_Npcf_PolicyAuthorization.yaml#/components/schemas/TemporalValidity'
          minItems: 1
          nullable: true
        validGeoZoneIds:
          type: array
          items:
            type: string
          minItems: 1
          description: Identifies a geographic zone that the AF request applies only to the traffic
of UE(s) located in this specific zone.
          nullable: true
        afAckInd:
          type: boolean
          nullable: true
        addrPreserInd:
          type: boolean
          nullable: true
    EventNotification:
      type: object
      properties:
        afTransId:
          type: string
          description: Identifies an NEF Northbound interface transaction, generated by the AF.
        dnaiChgType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DnaiChangeType'
        sourceTrafficRoute:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
        subscribedEvent:
          $ref: '#/components/schemas/SubscribedEvent'
        targetTrafficRoute:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
        sourceDnai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
        targetDnai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        srcUeIpv4Addr:
```

```
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4Addr'
        srcUeIpv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        tgtUeIpv4Addr:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Ipv4Addr'
        tgtUeIpv6Prefix:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Prefix'
        ueMac:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
        afAckUri:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
      required:
        - dnaiChgType
        - subscribedEvent
    AfResultInfo:
      type: object
      properties:
        afStatus:
          $ref: '#/components/schemas/AfResultStatus'
        trafficRoute:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/RouteToLocation'
      required:
        - afStatus
    AfAckInfo:
      type: object
      properties:
        afTransId:
          type: string
        ackResult:
          $ref: '#/components/schemas/AfResultInfo'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      required:
        - ackResult
    SubscribedEvent:
      anyOf:
      - type: string
        enum:
          - UP_PATH_CHANGE
      - type: string
      description: >
        Possible values are
        - UP_PATH_CHANGE: The AF requests to be notified when the UP path changes for the PDU
session.
    AfResultStatus:
      anyOf:
        - type: string
          enum:
            - SUCCESS
            - TEMPORARY_CONGESTION
            - RELOC_NO_ALLOWED
            - OTHER
        - type: string
      description: >
        Possible values are
        - SUCCESS: The application layer is ready or the relocation is completed.
        - TEMPORARY_CONGESTION: The application relocation fails due to temporary congestion.
        - RELOC_NO_ALLOWED: The application relocation fails because application relocation is not
allowed.
        - OTHER: The application relocation fails due to other reason.
```

A.3 NiddConfigurationTrigger API

```
openapi: 3.0.0
info:
  title: 3gpp-nidd-configuration-trigger
  version: 1.0.0
  description: |
    API for NIDD Configuration Trigger.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.4.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
```

```
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /:
    post:
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NiddConfigurationTrigger'
      responses:
        '200':
          description: Success
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/NiddConfigurationTriggerReply'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    NiddConfigurationTrigger:
      type: object
      properties:
        afId:
          type: string
          description: Identifies the trigger receiving entity.
        nefId:
          type: string
          description: Identifies the trigger sending entity.
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - afId
        - nefId
        - gpsi
        - suppFeat
    NiddConfigurationTriggerReply:
      type: object
      properties:
```

```
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - suppFeat
```

A.4 AnalyticsExposure API

```
openapi: 3.0.0
info:
  title: 3gpp-analyticsexposure
  version: 1.0.1
  description: |
    API for Analytics Exposure.
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    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.5.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-analyticsexposure/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{afId}/subscriptions:
    get:
      summary: read all of the active subscriptions for the AF
      tags:
        - Analytics Exposure Subscriptions
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: supp-feat
          in: query
          description: Features supported by the NF service consumer
          required: false
          schema:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      responses:
        '200':
          description: OK (Successful get all of the active subscriptions for the AF)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/AnalyticsExposureSubsc'
                minItems: 0
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

```
    post:
      summary: Creates a new subscription resource
      tags:
        - Analytics Exposure Subscriptions
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
      requestBody:
        description: new subscription creation
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AnalyticsExposureSubsc'
      callbacks:
        notification:
          '{request.body#/notifUri}':
            post:
              requestBody:  # contents of the callback message
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/AnalyticsEventNotification'
              responses:
                '204':
                  description: No Content (successful notification)
                '400':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/400'
                '401':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/401'
                '403':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/403'
                '404':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/404'
                '411':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/411'
                '413':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/413'
                '415':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/415'
                '429':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/429'
                '500':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/500'
                '503':
                  $ref: 'TS29122_CommonData.yaml#/components/responses/503'
                default:
                  $ref: 'TS29122_CommonData.yaml#/components/responses/default'
      responses:
        '201':
          description: Created (Successful creation)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AnalyticsExposureSubsc'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
        '204':
          description: Successful case. The resource has been successfully created and no additional
content is to be sent in the response message.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

/{afId}/subscriptions/{subscriptionId}:
  get:
    summary: read an active subscription for the AF and the subscription Id
    tags:
      - Individual Analytics Exposure Subscription
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
      - name: subscriptionId
        in: path
        description: Identifier of the subscription resource
        required: true
        schema:
          type: string
      - name: supp-feat
        in: query
        description: Features supported by the NF service consumer
        required: false
        schema:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    responses:
      '200':
        description: OK (Successful get the active subscription)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AnalyticsExposureSubsc'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  put:
    summary: Updates/replaces an existing subscription resource
    tags:
      - Individual Analytics Exposure Subscription
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
      - name: subscriptionId
        in: path
        description: Identifier of the subscription resource
```

```
          required: true
          schema:
            type: string
      requestBody:
        description: Parameters to update/replace the existing subscription
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AnalyticsExposureSubsc'
      responses:
        '200':
          description: OK (Successful deletion of the existing subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AnalyticsExposureSubsc'
        '204':
          description: Successful case. The resource has been successfully updated and no additional
content is to be sent in the response message.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Deletes an already existing subscription
      tags:
        - Individual Analytics Exposure Subscription
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
```

```
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{afId}/fetch:
    post:
      summary: Fetch analytics information
      tags:
        - AnalyticsExposure API Fetch analytics information
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AnalyticsRequest'
      responses:
        '200':
          description: The requested information was returned successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AnalyticsData'
        '204':
          description: No Content (The requested Analytics data does not exist)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    AnalyticsExposureSubsc:
      type: object
      properties:
        analyEventsSubs:
          type: array
          items:
            $ref: '#/components/schemas/AnalyticsEventSubsc'
          minItems: 1
        analyRepInfo:
          $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        notifId:
          type: string
        eventNotifis:
          type: array
          items:
```

```
        $ref: '#/components/schemas/AnalyticsEventNotif'
      minItems: 1
    suppFeat:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    self:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
  required:
    - analyEventsSubs
    - notifUri
    - notifId
AnalyticsEventNotification:
  type: object
  properties:
    notifId:
      type: string
    analyEventNotifs:
      type: array
      items:
        $ref: '#/components/schemas/AnalyticsEventNotif'
      minItems: 1
  required:
    - notifId
    - analyEventNotifs
AnalyticsEventNotif:
  type: object
  properties:
    analyEvent:
      $ref: '#/components/schemas/AnalyticsEvent'
    expiry:
      $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
    timeStamp:
      $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
    ueMobilityInfos:
      type: array
      items:
        $ref: '#/components/schemas/UeMobilityExposure'
      minItems: 1
    ueCommInfos:
      type: array
      items:
        $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/UeCommunication'
      minItems: 1
    abnormalInfos:
      type: array
      items:
        $ref: '#/components/schemas/AbnormalExposure'
      minItems: 1
    congestInfos:
      type: array
      items:
        $ref: '#/components/schemas/CongestInfo'
      minItems: 1
    nwPerfInfos:
      type: array
      items:
        $ref: '#/components/schemas/NetworkPerfExposure'
      minItems: 1
    qosSustainInfos:
      type: array
      items:
        $ref: '#/components/schemas/QosSustainabilityExposure'
      minItems: 1
  required:
    - analyEvent
    - timeStamp
AnalyticsEventSubsc:
  type: object
  properties:
    analyEvent:
      $ref: '#/components/schemas/AnalyticsEvent'
    analyEventFilter:
      $ref: '#/components/schemas/AnalyticsEventFilterSubsc'
    tgtUe:
      $ref: '#/components/schemas/TargetUeId'
  required:
    - analyEvent
AnalyticsEventFilterSubsc:
  type: object
```

```
      properties:
        nwPerfReqs:
          type: array
          items:
            $ref:
'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NetworkPerfRequirement'
          minItems: 1
        locArea:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
        appIds:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
          minItems: 1
        excepRequs:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/Exception'
          minItems: 1
        exptAnaType:
          $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/ExpectedAnalyticsType'
        exptUeBehav:
          $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ExpectedUeBehaviourData'
        reptThlds:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/ThresholdLevel'
          minItems: 1
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        qosReq:
          $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/QosRequirement'
        qosFlowRetThds:
          type: array
          items:
            $ref:
'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/RetainabilityThreshold'
          minItems: 1
        ranUeThrouThds:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
          minItems: 1
        extraReportReq:
          $ref:
'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/EventReportingRequirement'
    TargetUeId:
      type: object
      properties:
        anyUeInd:
          type: boolean
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        exterGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
    UeMobilityExposure:
      type: object
      properties:
        ts:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        recurringTime:
          $ref: 'TS29122_CpProvisioning.yaml#/components/schemas/ScheduledCommunicationTime'
        duration:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DurationSec'
        durationVariance:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Float'
        locInfo:
          type: array
          items:
            $ref: '#/components/schemas/UeLocationInfo'
          minItems: 1
      required:
        - duration
        - locInfo
    UeLocationInfo:
      type: object
      properties:
        loc:
```

```
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
        ratio:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
        confidence:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      required:
        - loc
    AnalyticsRequest:
      type: object
      properties:
        analyEvent:
          $ref: '#/components/schemas/AnalyticsEvent'
        analyEventFilter:
          $ref: '#/components/schemas/AnalyticsEventFilter'
        analyRep:
          $ref:
'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/EventReportingRequirement'
        tgtUe:
          $ref: '#/components/schemas/TargetUeId'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - analyEvent
        - suppFeat
    AnalyticsEventFilter:
      type: object
      properties:
        locArea:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        nwPerfTypes:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NetworkPerfType'
          minItems: 1
        appIds:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
          minItems: 1
        excepIds:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/ExceptionId'
          minItems: 1
        exptAnaType:
          $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/ExpectedAnalyticsType'
        exptUeBehav:
          $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/ExpectedUeBehaviourData'
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        qosReq:
          $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/QosRequirement'
    AnalyticsData:
      type: object
      properties:
        expiry:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        ueMobilityInfos:
          type: array
          items:
            $ref: '#/components/schemas/UeMobilityExposure'
          minItems: 1
        ueCommInfos:
          type: array
          items:
            $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/UeCommunication'
          minItems: 1
        nwPerfInfos:
          type: array
          items:
            $ref: '#/components/schemas/NetworkPerfExposure'
          minItems: 1
        abnormalInfos:
          type: array
          items:
            $ref: '#/components/schemas/AbnormalExposure'
```

```
        minItems: 1
      congestInfos:
        type: array
        items:
          $ref: '#/components/schemas/CongestInfo'
        minItems: 1
      qosSustainInfos:
        type: array
        items:
          $ref: '#/components/schemas/QosSustainabilityExposure'
        minItems: 1
      suppFeat:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - suppFeat
  NetworkPerfExposure:
    type: object
    properties:
      locArea:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
      nwPerfType:
        $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/NetworkPerfType'
      relativeRatio:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
      absoluteNum:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      confidence:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
    required:
      - locArea
      - nwPerfType
  AbnormalExposure:
    type: object
    properties:
      gpsis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        minItems: 1
      excep:
        $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/Exception'
      ratio:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SamplingRatio'
      confidence:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      addtMeasInfo:
        $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/AdditionalMeasurement'
    required:
      - excep
  CongestInfo:
    type: object
    properties:
      locArea:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
      cngAnas:
        type: array
        items:
          $ref: '#/components/schemas/CongestionAnalytics'
        minItems: 1
    required:
      - locArea
      - cngAnas
  CongestionAnalytics:
    type: object
    properties:
      cngType:
        $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/CongestionType'
      tmWdw:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/TimeWindow'
      nsi:
        $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/ThresholdLevel'
      confidence:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
    required:
      - cngType
      - tmWdw
      - nsi
  QosSustainabilityExposure:
```

```
      type: object
      properties:
        locArea:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/LocationArea5G'
        startTs:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        endTs:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/DateTime'
        qosFlowRetThd:
          $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/RetainabilityThreshold'
        ranUeThrouThd:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/BitRate'
        confidence:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      required:
        - locArea
        - startTs
        - endTs
    AnalyticsEvent:
      anyOf:
      - type: string
        enum:
          - UE_MOBILITY
          - UE_COMM
          - ABNORMAL_BEHAVIOR
          - CONGESTION
          - NETWORK_PERFORMANCE
          - QOS_SUSTAINABILITY
      - type: string
        description: >
          This string provides forward-compatibility with future
          extensions to the enumeration but is not used to encode
          content defined in the present version of this API.
      description: >
        Possible values are
        - UE_MOBILITY: The AF requests to be notified about analytics information of UE mobility.
        - UE_COMM: The AF requests to be notified about analytics information of UE communication.
        - ABNORMAL_BEHAVIOR: The AF requests to be notified about analytics information of UE's
abnormal behavior.
        - CONGESTION: The AF requests to be notified about analytics information of user data
congestion information.
        - NETWORK_PERFORMANCE: The AF requests to be notified about analytics information of network
performance.
        - QOS_SUSTAINABILITY: The AF requests to be notified about analytics information of QoS
sustainability.
```

A.5 5GLANParameterProvision API

```
openapi: 3.0.0
info:
  title: 3gpp-5glan-pp
  version: 1.0.0
  description: |
    API for 5G LAN Parameter Provision.
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    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.4.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-5glan-pp/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{afId}/subscriptions:
    get:
      summary: read all of the active subscriptions for the AF
      tags:
        - 5GLAN Parameters Provision Subscriptions
      parameters:
```

```
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
    responses:
      '200':
        description: OK (Successful get all of the active subscriptions for the AF)
        content:
          application/json:
            schema:
              type: array
              items:
                $ref: '#/components/schemas/5GLanParametersProvision'
              minItems: 0
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  post:
    summary: Creates a new subscription resource
    tags:
      - 5GLAN Parameters Provision Subscriptions
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
    requestBody:
      description: new subscription creation
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/5GLanParametersProvision'
    responses:
      '201':
        description: Created (Successful creation)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/5GLanParametersProvision'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource'
            required: true
            schema:
              type: string
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
```

```
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{afId}/subscriptions/{subscriptionId}:
    get:
      summary: read an active subscription for the AF and the subscription Id
      tags:
        - Individual 5GLAN Parameters Provision Subscription
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get the active subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/5GLanParametersProvision'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Updates/replaces an existing subscription resource
      tags:
        - Individual 5GLAN Parameters Provision Subscription
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      requestBody:
        description: Parameters to update/replace the existing subscription
        required: true
        content:
          application/json:
            schema:
```

```
              $ref: '#/components/schemas/5GLanParametersProvision'
      responses:
        '200':
          description: OK (Successful deletion of the existing subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/5GLanParametersProvision'
        '204':
          description: Successful case. The resource has been successfully updated and no additional
content is to be sent in the response message.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary: Partial updates an existing subscription resource
      tags:
        - Individual 5GLAN Parameters Provision Subscription
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      requestBody:
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/5GLanParametersProvisionPatch'
      responses:
        '200':
          description: OK. The subscription was modified successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/5GLanParametersProvision'
        '204':
          description: Successful case. The resource has been successfully updated and no additional
content is to be sent in the response message.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
```

```
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Deletes an already existing subscription
      tags:
        - Individual 5GLAN Parameters Provision Subscription
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    5GLanParametersProvision:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        5gLanParams:
          $ref: '#/components/schemas/5GLanParameters'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - 5gLanParams
        - suppFeat
    5GLanParametersProvisionPatch:
      type: object
      properties:
        5gLanParamsPatch:
          $ref: '#/components/schemas/5GLanParametersPatch'
    5GLanParameters:
      type: object
      properties:
        exterGroupId:
```

```
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        gpsis:
          type: object
          additionalProperties:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
          minProperties: 1
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        aaaIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        aaaIpv6Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        aaaUsgs:
          type: array
          items:
            $ref: '#/components/schemas/AaaUsage'
          minItems: 1
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        sessionType:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/PduSessionType'
        appDesps:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/AppDescriptor'
          minProperties: 1
      required:
        - exterGroupId
        - gpsis
        - dnn
        - snssai
        - sessionType
        - appDesps
    5GLanParametersPatch:
      type: object
      properties:
        gpsis:
          type: object
          additionalProperties:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/GpsiRm'
          minProperties: 1
        appDesps:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/AppDescriptorRm'
          minProperties: 1
    AppDescriptor:
      type: object
      properties:
        osId:
          $ref: 'TS29519_Policy_Data.yaml#/components/schemas/OsId'
        appIds:
          type: object
          additionalProperties:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
          minProperties: 1
      required:
        - osId
        - appIds
    AppDescriptorRm:
      type: object
      properties:
        appIds:
          type: object
          additionalProperties:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationIdRm'
          minProperties: 1
    AaaUsage:
      anyOf:
      - type: string
        enum:
          - AUTH
          - IP_ALLOC
      - type: string
        description: >
          This string identifies the usage of secondary authentication/authorization, and/or UE IP
address allocation from the DN-AAA server.
      description: >
```

```
        Possible values are
          - AUTH: secondary authentication/authorization needed from DN-AAA server
          - IP_ALLOC: UE IP address allocation needed from DN-AAA server
```

A.6 ApplyingBdtPolicy API

```
openapi: 3.0.0
info:
  title: 3gpp-applying-bdt-policy
  version: 1.0.1
  description: |
    API for applying BDT policy
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.5.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-applying-bdt-policy/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.

paths:
  /{afId}/subscriptions:
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
    get:
      summary: read all of the active subscriptions for the AF
      tags:
        - Applied BDT Policy Subscription
      responses:
        '200':
          description: OK.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/AppliedBdtPolicy'
                minItems: 0
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary: Creates a new subscription resource
      tags:
        - Applied BDT Policy Subscription
      requestBody:
        description: Request to create a new subscription resource
```

```
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/AppliedBdtPolicy'
    responses:
      '201':
        description: Created (Successful creation of subscription)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AppliedBdtPolicy'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource'
            required: true
            schema:
              type: string
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{afId}/subscriptions/{subscriptionId}:
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
      - name: subscriptionId
        in: path
        description: Identifier of the subscription resource
        required: true
        schema:
          type: string
    get:
      summary: read an active subscriptions for the SCS/AS and the subscription Id
      tags:
        - Individual Applied BDT Policy Subscription
      responses:
        '200':
          description: OK (Successful get the active subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AppliedBdtPolicy'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
```

```
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary: Updates/replaces an existing subscription resource
      tags:
        - Individual Applied BDT Policy Subscription
      requestBody:
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/AppliedBdtPolicyPatch'
      responses:
        '200':
          description: OK. The subscription was modified successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AppliedBdtPolicy'
        '204':
          description: No content. The subscription was modified successfully.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
    delete:
      summary: Deletes an already existing subscription
      tags:
        - Individual Applied BDT Policy Subscription
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
```

```
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    AppliedBdtPolicy:
      type: object
      properties:
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        bdtRefId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/BdtReferenceId'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
      required:
        - bdtRefId
        - suppFeat
      oneOf:
        - required: [gpsi]
        - required: [externalGroupId]
    AppliedBdtPolicyPatch:
      type: object
      properties:
        bdtRefId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/BdtReferenceId'
      required:
        - bdtRefId
```

A.7 IPTVConfiguration API

```
openapi: 3.0.0
info:
  title: 3gpp-iptvconfiguration
  version: 1.0.0
  description: |
    API for IPTV configuration.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.4.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-iptvconfiguration/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{afId}/configurations:
    get:
      summary: read all of the active configurations for the AF
      tags:
        - IPTV Configurations
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get all of the active configurations for the AF)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/IptvConfigData'
```

```
              minItems: 0
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29122_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  post:
    summary: Creates a new configuration resource
    tags:
      - IPTV Configurations
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
    requestBody:
      description: new configuration creation
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/IptvConfigData'
    responses:
      '201':
        description: Created (Successful creation of configuration)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/IptvConfigData'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource'
            required: true
            schema:
              type: string
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

/{afId}/configurations/{configurationId}:
  get:
    summary: read an active configuration for the AF and the configuration Id
    tags:
```

```
        - Individual IPTV Configuration
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: configurationId
          in: path
          description: Identifier of the configuration resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get the active configuration)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/IptvConfigData'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Updates/replaces an existing configuration resource
      tags:
        - Individual IPTV Configuration
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: configurationId
          in: path
          description: Identifier of the configuration resource
          required: true
          schema:
            type: string
      requestBody:
        description: Parameters to update/replace the existing configuration
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/IptvConfigData'
      responses:
        '200':
          description: OK (Successful deletion of the existing configuration)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/IptvConfigData'
        '204':
          description: Successful case. The resource has been successfully updated and no additional
content is to be sent in the response message.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
```

```
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    patch:
      summary: Partial updates an existing configuration resource
      tags:
        - Individual IPTV Configuration
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: configurationId
          in: path
          description: Identifier of the configuration resource
          required: true
          schema:
            type: string
      requestBody:
        required: true
        content:
          application/merge-patch+json:
            schema:
              $ref: '#/components/schemas/IptvConfigDataPatch'
      responses:
        '200':
          description: OK. The configuration was modified successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/IptvConfigData'
        '204':
          description: Successful case. The resource has been successfully updated and no additional
content is to be sent in the response message.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Deletes an already existing configuration
      tags:
```

```
        - Individual IPTV Configuration
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: configurationId
          in: path
          description: Identifier of the configuration resource
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing configuration)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    IptvConfigData:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        exterGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        afAppId:
          type: string
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        multiAccCtrls:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/MulticastAccessControl'
          minProperties: 1
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - afAppId
        - multiAccCtrls
        - suppFeat
    IptvConfigDataPatch:
      type: object
      properties:
        multiAccCtrls:
          type: object
          additionalProperties:
            $ref: '#/components/schemas/MulticastAccessControl'
          minProperties: 1
    MulticastAccessControl:
      type: object
```

```
      properties:
        srcIpv4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        srcIpv6Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        multicastV4Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        multicastV6Addr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        accStatus:
          $ref: '#/components/schemas/AccessRightStatus'
      required:
        - accStatus
    AccessRightStatus:
      anyOf:
        - type: string
          enum:
            - FULLY_ALLOWED
            - PREVIEW_ALLOWED
            - NO_ALLOWED
        - type: string
      description: >
        Possible values are
        - FULLY_ALLOWED: The User is fully allowed to access to the channel.
        - PREVIEW_ALLOWED: The User is preview allowed to access to the channel.
        - NO_ALLOWED: The User is not allowed to access to the channel.
```

A.8 LpiParameterProvision API

```
openapi: 3.0.0
info:
  title: 3gpp-lpi-pp
  version: 1.0.0
  description: |
    API for Location Privacy Indication Parameters Provisioning.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.4.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-lpi-pp/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{afId}/provisionedLpis:
    get:
      summary: read all of the active LPI Parameters Provisioning resources for the AF
      tags:
        - LPI Parameters Provisionings
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get all of the active resources for the AF)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/LpiParametersProvision'
                minItems: 1
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
```

```
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary: Creates a new LPI Parameters Provisioning resource
      tags:
        - LPI Parameters Provisionings
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
      requestBody:
        description: new resource creation
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/LpiParametersProvision'
      responses:
        '201':
          description: Created (Successful creation)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/LpiParametersProvision'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{afId}/provisionedLpis/{provisionedLpiId}:
    get:
      summary: read an active LPI Parameters Provisioning resource for the AF and the provisioned
LPI Id
      tags:
        - Individual LPI Parameters Provisioning
      parameters:
        - name: afId
```

```
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: provisionedLpiId
          in: path
          description: Identifier of the provisioned LPI parameter resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get the active resource)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/LpiParametersProvision'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Updates/replaces an existing LPI Parameters Provisioning resource
      tags:
        - Individual LPI Parameters Provisioning
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: provisionedLpiId
          in: path
          description: Identifier of the provisioned LPI parameter resource
          required: true
          schema:
            type: string
      requestBody:
        description: Parameters to update/replace the existing resource
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/LpiParametersProvision'
      responses:
        '200':
          description: OK (Successful update of the existing resource)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/LpiParametersProvision'
        '204':
          description: Successful case. The resource has been successfully updated and no additional
content is sent in the response message.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
```

```
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Deletes an already existing LPI Parameters Provisioning resource
      tags:
        - Individual LPI Parameters Provisioning
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: provisionedLpiId
          in: path
          description: Identifier of the provisioned LPI parameter resource
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing resource)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    LpiParametersProvision:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        exterGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        lpi:
          $ref: 'TS29503_Nudm_SDM.yaml#/components/schemas/Lpi'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - lpi
        - suppFeat
```

A.9 ServiceParameter API

```
openapi: 3.0.0
info:
  title: 3gpp-service-parameter
  version: 1.0.0
  description: |
    API for AF service paramter
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.4.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-service-parameter/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.

paths:
  /{afId}/subscriptions:
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
    get:
      summary: read all of the active subscriptions for the AF
      tags:
        - Service Parameter Subscriptions
      responses:
        '200':
          description: OK.
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/ServiceParameterData'
                minItems: 0
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary: Creates a new subscription resource
      tags:
        - Service Parameter Subscriptions
      requestBody:
        description: Request to create a new subscription resource
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ServiceParameterData'
```

```
    responses:
      '201':
        description: Created (Successful creation of subscription)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ServiceParameterData'
        headers:
          Location:
            description: 'Contains the URI of the newly created resource'
            required: true
            schema:
              type: string
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{afId}/subscriptions/{subscriptionId}:
    parameters:
      - name: afId
        in: path
        description: Identifier of the AF
        required: true
        schema:
          type: string
      - name: subscriptionId
        in: path
        description: Identifier of the subscription resource
        required: true
        schema:
          type: string
    get:
      summary: read an active subscriptions for the SCS/AS and the subscription Id
      tags:
        - Individual Service Parameter Subscription
      responses:
        '200':
          description: OK (Successful get the active subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/ServiceParameterData'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
```

```
      $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  put:
    summary: Updates/replaces an existing subscription resource
    tags:
      - Individual Service Parameter Subscription
    requestBody:
      description: Parameters to update/replace the existing subscription
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/ServiceParameterData'
    responses:
      '200':
        description: OK (Successful update of the subscription)
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ServiceParameterData'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
      '503':
        $ref: 'TS29122_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  patch:
    summary: Updates/replaces an existing subscription resource
    tags:
      - Individual Service Parameter Subscription
    requestBody:
      required: true
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/ServiceParameterDataPatch'
    responses:
      '200':
        description: OK. The subscription was modified successfully.
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/ServiceParameterData'
      '400':
        $ref: 'TS29122_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29122_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29122_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29122_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29122_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29122_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29122_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29122_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29122_CommonData.yaml#/components/responses/500'
```

```
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    delete:
      summary: Deletes an already existing subscription
      tags:
        - Individual Service Parameter Subscription
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    ServiceParameterData:
      type: object
      properties:
        afServiceId:
          type: string
          description: Identifies a service on behalf of which the AF is issuing the request.
        appId:
          type: string
          description: Identifies an application.
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        externalGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        anyUeInd:
          type: boolean
          description: Identifies whether the AF request applies to any UE. This attribute shall set
to "true" if applicable for any UE, otherwise, set to "false".
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        ueIpv4:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        ueIpv6:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        ueMac:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/MacAddr48'
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        paramOverPc5:
          $ref: '#/components/schemas/ParameterOverPc5'
        paramOverUu:
          $ref: '#/components/schemas/ParameterOverUu'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    ServiceParameterDataPatch:
      type: object
      properties:
        paramOverPc5:
          $ref: '#/components/schemas/ParameterOverPc5Rm'
```

```
        ParamOverUu:
          $ref: '#/components/schemas/ParameterOverUuRm'
    ParameterOverPc5:
      type: string
    ParameterOverPc5Rm:
      type: string
      nullable: true
    ParameterOverUu:
      type: string
    ParameterOverUuRm:
      type: string
      nullable: true
```

A.10 ACSParameterProvision API

```
openapi: 3.0.0
info:
  title: 3gpp-acs-pp
  version: 1.0.0
  description: |
    API for 5G ACS Parameter Provision.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.4.0; 5G System; Network Exposure Function Northbound APIs.
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-acs-pp/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /{afId}/subscriptions:
    get:
      summary: read all of the active subscriptions for the AF
      tags:
        - ACS Configuration Subscriptions
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get all of the active subscriptions for the AF)
          content:
            application/json:
              schema:
                type: array
                items:
                  $ref: '#/components/schemas/AcsConfigurationData'
                minItems: 0
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
```

```
        $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    post:
      summary: Creates a new subscription resource
      tags:
        - ACS Configuration Subscriptions
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
      requestBody:
        description: new subscription creation
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AcsConfigurationData'
      responses:
        '201':
          description: Created (Successful creation)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AcsConfigurationData'
          headers:
            Location:
              description: 'Contains the URI of the newly created resource'
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

  /{afId}/subscriptions/{subscriptionId}:
    get:
      summary: read an active subscription for the AF and the subscription Id
      tags:
        - Individual ACS Configuration Subscription
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK (Successful get the active subscription)
          content:
```

```
            application/json:
              schema:
                $ref: '#/components/schemas/AcsConfigurationData'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29122_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'

    put:
      summary: Updates/replaces an existing subscription resource
      tags:
        - Individual ACS Configuration Subscription
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      requestBody:
        description: Parameters to update/replace the existing subscription
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/AcsConfigurationData'
      responses:
        '200':
          description: OK (Successful update of the existing subscription)
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/AcsConfigurationData'
        '204':
          description: Successful case. The resource has been successfully updated and no additional
content is to be sent in the response message.
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
```

```
    delete:
      summary: Deletes an already existing subscription
      tags:
        - Individual ACS Configuration Subscription
      parameters:
        - name: afId
          in: path
          description: Identifier of the AF
          required: true
          schema:
            type: string
        - name: subscriptionId
          in: path
          description: Identifier of the subscription resource
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content (Successful deletion of the existing subscription)
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    AcsConfigurationData:
      type: object
      properties:
        self:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/Link'
        exterGroupId:
          $ref: 'TS29122_CommonData.yaml#/components/schemas/ExternalGroupId'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        acsInfo:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/AcsInfo'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - acsInfo
        - suppFeat
```

A.11 MoLcsNotify API

```
openapi: 3.0.0
info:
  title: 3gpp-mo-lcs-notify
  version: 1.0.0
  description: |
    API for UE updated location information notification.
    © 2020, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: 3GPP TS 29.522 V16.4.0; 5G System; Network Exposure Function Northbound APIs.
```

```
  url: 'http://www.3gpp.org/ftp/Specs/archive/29_series/29.522/'
security:
  - {}
  - oAuth2ClientCredentials: []
servers:
  - url: '{apiRoot}/3gpp-mo-lcs-notify/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in subclause 5.2.4 of 3GPP TS 29.122.
paths:
  /:
    post:
      summary: UE location information update notification
      tags:
        - AF level UE location update notification operation
      requestBody:
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/LocUpdateData'
        required: true
      responses:
        '200':
          description: Success
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/LocUpdateDataReply'
        '400':
          $ref: 'TS29122_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29122_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29122_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29122_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29122_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29122_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29122_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29122_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29122_CommonData.yaml#/components/responses/500'
        '503':
          $ref: 'TS29122_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29122_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{tokenUrl}'
          scopes: {}
  schemas:
    LocUpdateData:
      type: object
      properties:
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        locInfo:
          $ref: 'TS29122_MonitoringEvent.yaml#/components/schemas/LocationInfo'
        lcsQosClass:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/LcsQosClass'
        svcId:
          $ref: 'TS29515_Ngmlc_Location.yaml#/components/schemas/ServiceIdentity'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - gpsi
        - lcsQosClass
        - locInfo
        - suppFeat
```

```
    LocUpdateDataReply:
      type: object
      properties:
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - suppFeat
```

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc.	CR	Rev	Cat	Subject/Comment	New
2018-03	CT3#95					TS Skeleton	0.0.0
2018-03	CT3#95					Inclusion of C3-181332 and TS skeleton of Network Exposure Function Northbound APIs in C3-181362.	0.1.0
2018-04	CT3#96					Inclusion of C3-182407, C3-182408, C3-182504, C3-182418, C3-182505, C3-182443, C3-182421, C3-182422, C3-182501 and editorial changes from Rapporteur.	0.2.0
2018-05	CT3#97					Inclusion of C3-183187, C3-183773, C3-183774, C3-183553, C3-183826, C3-183329, C3-183776, C3-183827, C3-183778, C3-183605 and editorial changes from Rapporteur.	0.3.0
2018-06	CT#80					TS sent to plenary for approval	1.0.0
2018-06	CT#80					TS approved by plenary	15.0.0
2018-09	CT#81	CP-182015	0001	1	F	DNAI change notification type	15.1.0
2018-09	CT#81	CP-182015	0002	-	F	Corrections on NEF Northbound interface	15.1.0
2018-09	CT#81	CP-182015	0003	1	F	TrafficInfluence API OpenAPI schema	15.1.0
2018-09	CT#81	CP-182015	0004	1	F	AF influence traffic routing cleanup	15.1.0
2018-09	CT#81	CP-182031	0005	1	F	Definition of Changing the Chargeable Party procedures and API	15.1.0
2018-09	CT#81	CP-182031	0006	1	F	Definition of setting up an AS session with required QoS procedure and API	15.1.0
2018-09	CT#81	CP-182015	0007	2	F	Resource structure update	15.1.0
2018-09	CT#81	CP-182015	0008	-	F	Procedures for monitoring – Reference	15.1.0
2018-09	CT#81	CP-182015	0009	-	F	Ethernet packet filter for AF traffic influence API	15.1.0
2018-09	CT#81	CP-182015	0010	3	F	Removable attribute definition for AF traffic influence	15.1.0
2018-09	CT#81	CP-182015	0011	-	F	Supported feature for AF traffic influence	15.1.0
2018-09	CT#81	CP-182015	0012	-	F	Version numbering change	15.1.0
2018-09	CT#81	CP-182015	0013	-	F	Removal of externaldocs field	15.1.0
2018-09	CT#81	CP-182035	0014	1	F	PFD Management Service Operation	15.1.0
2018-12	CT#82	CP-183205	0015	2	F	ExternalDocs field	15.2.0
2018-12	CT#82	CP-183205	0019	-	F	Default value for apiRoot	15.2.0
2018-12	CT#82	CP-183205	0021	4	F	Correct traffic route and Ethernet flow data type	15.2.0
2018-12	CT#82	CP-183205	0022	1	F	Event correction for AF influence traffic routing	15.2.0
2018-12	CT#82	CP-183205	0024	1	F	Supporting Ethernet UE in Chargeable Party and AF session with QoS	15.2.0
2018-12	CT#82	CP-183205	0025	1	F	Add AF application ID for traffic influence	15.2.0
2018-12	CT#82	CP-183205	0026	1	F	Add BSF interaction for Chargeable Party and Required QoS	15.2.0
2018-12	CT#82	CP-183205	0028	2	F	Security field	15.2.0
2018-12	CT#82	CP-183205	0029	1	F	Corrections on subscribed event	15.2.0
2018-12	CT#82	CP-183205	0030	1	F	Status code update for TrafficInfluence API	15.2.0
2018-12	CT#82	CP-183205	0031	3	F	UE information during notification	15.2.0

2018-12	CT#82	CP-183205	0017	2	F	Error status codes for HTTP response	15.2.0
2018-12	CT#82	CP-183205	0016	3	F	Support of 5G location requirement	15.2.0
2018-12	CT#82	CP-183205	0023	2	F	Correction to the AF influence traffic steering control	15.2.0
2018-12	CT#82	CP-183205	0032	-	F	Location header	15.2.0
2018-12	CT#82	CP-183205	0033	1	F	API Version Update	15.2.0
2018-12	CT#82	CP-183205	0034	1	F	Support of 5G SUPI-PEI association	15.2.0
2018-12	CT#82	CP-183205	0035	1	F	Clarification of default value for boolean data type	15.2.0
2018-12	CT#82	CP-183205	0027	2	F	Security adaptation for Nnef northbound APIs with CAPIF	15.2.0
2019-03	CT#83	CP-190116	0037	2	F	Event notification	15.3.0
2019-03	CT#83	CP-190116	0038	1	F	Correction on MacAddr48 and RouteToLocation data type reference in the OpenAPI file	15.3.0
2019-03	CT#83	CP-190116	0040	1	F	Correction on mandatory 5G features	15.3.0
2019-03	CT#83	CP-190116	0041	-	F	OpenAPI Version number update	15.3.0
2019-06	CT#84	CP-191080	0042	4	F	Resource structure and AF Identifier	15.4.0
2019-06	CT#84	CP-191080	0048	2	F	UDM interaction for AF influence traffic	15.4.0
2019-06	CT#84	CP-191080	0049	2	F	Correct condition for DNAI in UP path change	15.4.0
2019-06	CT#84	CP-191080	0053	1	F	Precedence of OpenAPI file	15.4.0
2019-06	CT#84	CP-191080	0059	1	F	Copyright Note in YAML file	15.4.0
2019-06	CT#84	CP-191090	0047	1	B	Support of external group Id	16.0.0
2019-06	CT#84	CP-191070	0043	2	B	Nnef_MSISDN-less_MO_SMS service	16.0.0
2019-06	CT#84	CP-191070	0044	2	B	Application function notification of downlink data delivery status	16.0.0
2019-06	CT#84	CP-191070	0045	2	B	Availability after DDN failure notification for multiple Afs	16.0.0
2019-06	CT#84	CP-191070	0050	2	B	Network parameter provisioning support	16.0.0
2019-06	CT#84	CP-191070	0051	3	B	NIDD configuration and delivery in 5G	16.0.0
2019-06	CT#84	CP-191229	0054	5	B	AF acknowledgement of UP path event notification	16.0.0
2019-06	CT#84	CP-191071	0055	2	B	UE IP address preservation indication	16.0.0
2019-06	CT#84	CP-191104	0056	1	B	PFD management notification	16.0.0
2019-06	CT#84	CP-191100	0057	1	B	NEF stored exposure data	16.0.0
2019-06	CT#84	CP-191105	0058	1	B	BDT Warning Notification Support	16.0.0
2019-06	CT#84	CP-191101	0061	1	F	API version update	16.0.0
2019-09	CT#85	CP-192137	0063	1	F	Resolving EN in NIDD	16.1.0
2019-09	CT#85	CP-192156	0064	1	B	Support a set of MAC addresses in traffic filter	16.1.0
2019-09	CT#85	CP-192165	0066	1	B	Support parameter provisioning in RACS	16.1.0
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