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Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

In the present document, certain modal verbs have the following meanings:

shall indicates a mandatory requirement to do something

shall not indicates an interdiction (prohibition) to do something

NOTE 1: The constructions "shall" and "shall not" are confined to the context of normative provisions, and do not appear in Technical Reports.

NOTE 2: The constructions "must" and "must not" are not used as substitutes for "shall" and "shall not". Their use is avoided insofar as possible, and they are not used in a normative context except in a direct citation from an external, referenced, non-3GPP document, or so as to maintain continuity of style when extending or modifying the provisions of such a referenced document.

should indicates a recommendation to do something

should not indicates a recommendation not to do something

may indicates permission to do something

need not indicates permission not to do something

NOTE 3: The construction "may not" is ambiguous and is not used in normative elements. The unambiguous constructions "might not" or "shall not" are used instead, depending upon the meaning intended.

can indicates that something is possible

cannot indicates that something is impossible

NOTE 4: The constructions "can" and "cannot" shall not to be used as substitutes for "may" and "need not".

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

will not indicates that something is certain or expected not to happen as a result of action taken by an agency the behaviour of which is outside the scope of the present document

might indicates a likelihood that something will happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

might not indicates a likelihood that something will not happen as a result of action taken by some agency the behaviour of which is outside the scope of the present document

In addition:

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

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

NOTE 5: The constructions "is" and "is not" do not indicate requirements.

1 Scope

The present document specifies the stage 3 protocol and data model for the Nnef southbound Service Based Interface. It provides stage 3 protocol definitions and message flows, and specifies the API for each service offered by the Network Exposure Function (NEF).

The 5G System stage 2 architecture and procedures are specified in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3] and 3GPP TS 23.288 [14].

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

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

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

[6] OpenAPI: "OpenAPI Specification Version 3.0.0", https://spec.openapis.org/oas/v3.0.0.

[7] 3GPP TR 21.900: "Technical Specification Group working methods".

[8] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

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

[10] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[11] IETF RFC 9113: "HTTP/2".

[12] IETF RFC 8259: "The JavaScript Object Notation (JSON) Data Interchange Format".

[13] IETF RFC 9457: "Problem Details for HTTP APIs".

[14] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[15] 3GPP TS 29.522: "5G System; Network Exposure Function Northbound APIs; Stage 3".

[16] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces; Stage 3".

[17] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[18] 3GPP TS 29.517: "5G System; Application Function Event Exposure Service; Stage 3".

[19] 3GPP TS 29.551: "5G System; Packet Flow Description Management Service; Stage 3".

[20] 3GPP TS 29.541: "5G System; Network Exposure (NE) function services for Non-IP Data Delivery (NIDD) and Short Message Services (SMS); Stage 3".

[21] 3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".

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

[23] 3GPP TS 29.256: "Uncrewed Aerial Systems Network Function (UAS-NF); Aerial Management Services; Stage 3".

[24] 3GPP TS 26.531: "Data Collection and Reporting; General Description and Architecture".

[25] 3GPP TS 26.501: "5G Media Streaming (5GMS); General description and architecture".

[26] 3GPP TS 26.512: "5G Media Streaming (5GMS); Protocols".

[27] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

[28] 3GPP TS 29.572: "5G System; Location Management Services; Stage 3".

[29] 3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".

[30] 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".

[31] 3GPP TS 37.355: "LTE Positioning Protocol (LPP)".

[32] 3GPP TS 29.504: "5G System; Unified Data Repository Services; Stage 3".

3 Definitions, symbols and abbreviations

3.1 Definitions

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

3.2 Symbols

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

3.3 Abbreviations

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

5GMS	5G Media Streaming
AF	Application Function
API	Application Programming Interface
ASP	Application Service Provider
DCCF	Data Collection Coordination Function
EAS	Edge Application Server
EHE	Edge Hosting Environment
GMLC	Gateway Mobile Location Centre
GPSI	Generic Public Subscription Identifier
LCS	LoCation Services
LMF	Location Management FunctionMFAFMessaging Framework Adaptor Function
NEF	Network Exposure Function

NF	Network Function
NWDAF	Network Data Analytics Function
SMF	Session Management Function
SUPI	Subscription Permanent Identifier
URI	Uniform Resource Identifier

4 Services offered by the NEF

4.1 Introduction

The NEF offers to other NFs the following southbound services:

- Nnef_EventExposure
- Nnef_PFDManagement
- Nnef_SMContext
- Nnef_SMService
- Nnef_Authentication
- Nnef_EASDeployment
- Nnef_TrafficInfluenceData
- Nnef_ECSAddress
- Nnef_UEId

NOTE 1: The northbound services offered by the NEF are defined in 3GPP TS 29.522 [15], e.g. the northbound requirement of Nnef_EventExposure service or Nnef_EASDeployment.

NOTE 2: The services offered by the NEF (e.g. Nnef_EventExposure service) as specified in the present specification are only applicable for Nnef southbound services.

NOTE 3: The Nnef_PFDManagement service offered by the NEF southbound is defined in 3GPP TS 29.551 [19].

NOTE 4: The Nnef_SMContext service and the Nnef_SMService offered by the NEF southbound is defined in 3GPP TS 29.541 [20].

NOTE 5: The Nnef_Authentication service offered by the NEF southbound is defined in 3GPP TS 29.256 [23].

4.2 Nnef_EventExposure Service

4.2.1 Service Description

4.2.1.1 Overview

The Nnef_EventExposure service, as defined in 3GPP TS 23.502 [3], is provided by the Network Exposure Function (NEF). When the UE Application data is collected via the Data Collection AF, the Application Function Exposure Service, as defined in 3GPP TS 26.531 [24], 3GPP TS 26.501 [25] and 3GPP TS 26.512 [26], is provided by the Data Collection AF instantiated in the 5GMS AF for the Event Consumer AF instantiated in the 5GMS ASP.

This service:

- allows NF service consumers to subscribe to, modify and unsubscribe from application events reporting; and
- notifies NF service consumers with a corresponding subscription about observed events at the NEF.

The types of observed events applicable for the NEF include:

AF application events exposed by an AF:

- Service experience;
- UE mobility;
- UE communication;
- Exceptions;
- User Data Congestion;
- Dispersion;
- Performance Data information;
- Collective Behaviour information;
- GNSS Assistance Data information; and
- Data volume transfer time information.

UE application events exposed via the Data Collection AF:

- Media Streaming QoE metrics;
- Media Streaming Consumption reports;
- Media Streaming Network Assistance invocation;
- Media Streaming Dynamic Policy invocation; and
- Media Streaming access activity.

The target of the event reporting may include one or more UE(s), a group of UEs or any UE (i.e. all UEs). When an event to which the NF service consumer has subscribed occurs, the NEF reports the requested information to the NF service consumer based on the event reporting information definition requested by the NF service consumer.

4.2.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Network Data Analytics Exposure architecture is defined in 3GPP TS 23.288 [14]. The Media Streaming UE application data collection via the Data Collection AF is defined in 3GPP TS 26.531 [24]. The architecture for GNSS Assistance Data Collection for LCS is defined in 3GPP TS 23.273 [27].

The Nnef_EventExposure service is part of the Nnef service-based interface exhibited by the Network Exposure Function (NEF).

Known consumers of the Nnef_EventExposure service are:

- Network Data Analytics Function (NWDAF)
- Data Collection Coordination Function (DCCF)
- Messaging Framework Adaptor Function (MFAF)
- Location Management Function (LMF)
- Event Consumer AF in the 5GMS ASP

The Nnef_EventExposure service is provided by the NEF and consumed by NF service consumers (e.g. NWDAF, LMF, DCCF, MFAF, Event Consumer AF), as shown in figure 4.2.1.2-1 for the SBI representation model and in figure 4.2.1.2-2 for reference point representation model.

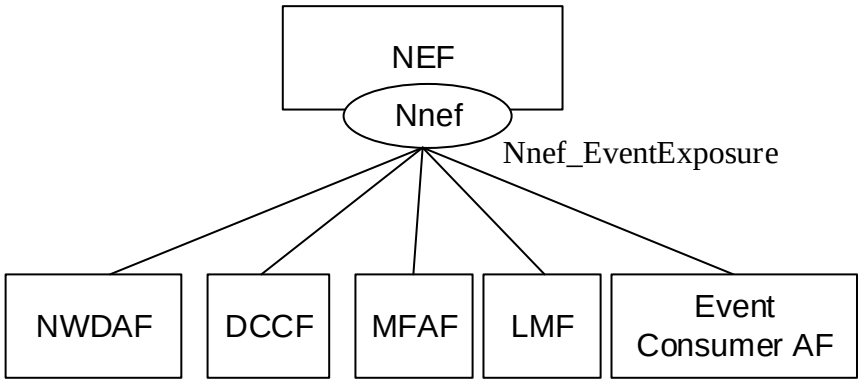

Figure 4.2.1.2-1: Reference Architecture for the Nnef_EventExposure Service; SBI representation

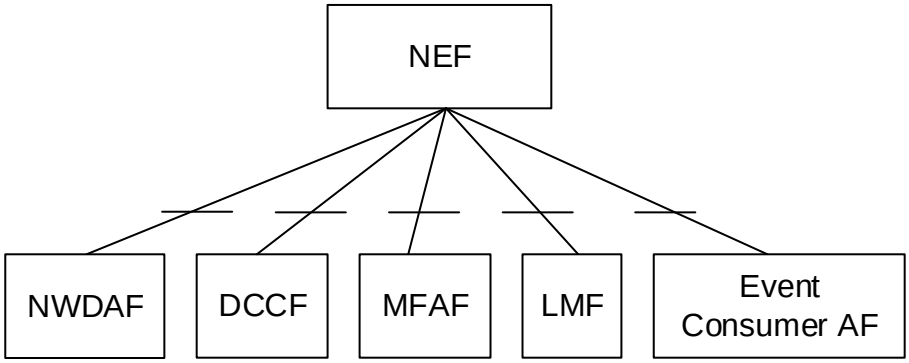

Figure 4.2.1.2-2: Reference Architecture for the Nnef_EventExposure Service: reference point representation

4.2.1.3 Network Functions

4.2.1.3.1 Network Exposure Function (NEF)

The Network Exposure Function (NEF) is a functional element that provides application or user related information to the NF service consumers as defined in this specification.

The NEF allows the NF consumer(s) to (un)subscribe to notifications of monitoring observed event, and sends the notification to the NF consumer(s) when a subscribed event is detected.

4.2.1.3.2 NF Service Consumers

The known NF service consumers are as follows:

The Network Data Analytics Function (NWDAF), the Data Collection Coordination Function (DCCF), the Messaging Framework Adaptor Function (MFAF) or the Location Management Function (LMF):

- supports (un)subscribing to notifications of subscribed event(s) from the NEF;
- supports receiving the notifications of subscribed event(s) from the NEF.

The Event Consumer Application Function (Event Consumer AF):

- supports (un)subscribing to notifications of service experience information from the NEF;
- supports receiving the notifications of subscribed event(s) from the NEF.

4.2.2 Service Operations

4.2.2.1 Introduction

Service operations defined for the Nnef_EventExposure Service are shown in table 4.2.2.1-1.

Table 4.2.2.1-1: Nnef_EventExposure Service Operations

Service Operation Name	Description	Initiated by
Nnef_EventExposure_Subscribe	This service operation is used by an NF service consumer to subscribe to, or modify a subscription in the NEF for event notifications on a specified application or user related event.	NF service consumer
Nnef_EventExposure_Unsubscribe	This service operation is used by an NF service consumer to unsubscribe from event notifications.	NF service consumer
Nnef_EventExposure_Notify	This service operation is used by the NEF to report application or user related event(s) to the NF service consumer which has subscribed to the event report service.	NEF

4.2.2.2 Nnef_EventExposure_Subscribe service operation

4.2.2.2.1 General

This service operation is used by an NF service consumer to subscribe to notifications on specified event(s) or modify an existing subscription.

The following are the types of events for which a subscription to notifications can be created by the NWDAF, the DCCF, or the MFAF as the NF service consumer:

- Service experience;
- UE mobility;
- UE communication;
- Exceptions;
- User Data Congestion;
- Dispersion;
- Performance Data information; and
- Collective Behaviour information.

The following are the types of events for which a subscription can be made by the NWDAF, DCCF, MFAF, or Event Consumer AF as the NF service consumer:

- Media Streaming QoE metrics;

The following are the types of events for which a subscription to notifications can be created by the LMF as the NF service consumer:

- GNSS Assistance Data information.

The following are the types of events for which a subscription can be made by the Event Consumer AF as the NF service consumer:

- Media Streaming Consumption reports;
- Media Streaming Network Assistance invocation;

- Media Streaming Dynamic Policy invocation; and
- Media Streaming access activity.

The following procedures using the Nnef_EventExposure_Subscribe service operation are supported:

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

4.2.2.2.2 Creating a new subscription

Figure 4.2.2.2.2-1 illustrates the creation of a Network Exposure Event Subscription.

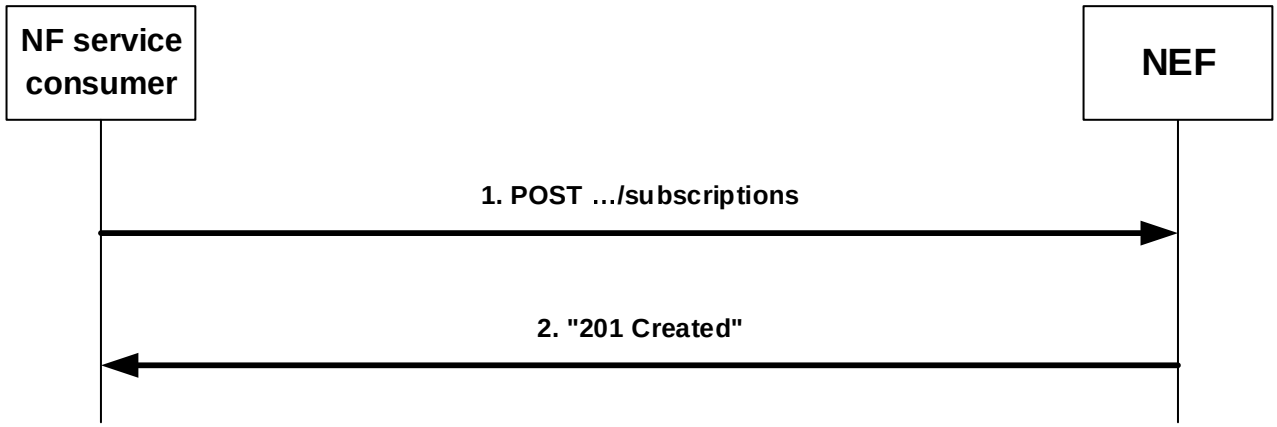

Figure 4.2.2.2.2-1: Creation of a subscription

To subscribe to event notifications, the NF service consumer shall send an HTTP POST request to the NEF with: "{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions" as request URI as shown in step 1 of figure 4.2.2.2.2-1, and the "NefEventExposureSubsc" data structure as request body.

The "NefEventExposureSubsc" data structure shall include:

- a URI where to receive the requested notifications as "notifUri" attribute;
- a Notification Correlation Identifier assigned by the NF service consumer for the requested notifications as "notifId" attribute; and
- description of subscribed event information as "eventsSubs" attribute by using one or more "NefEventSubs" data.

The "NefEventExposureSubsc" data structure may also include:

- the description of the event reporting information as "eventsRepInfo" attribute.
- a specific Authorization AS provisioned Data Access Profile Identifier as "dataAccProfId" attribute, if the feature "DataAccProfileId" is supported and the subscribed events including "MS_QOE_METRICS", "MS_CONSUMPTION", "MS_NET_ASSIST_INVOCATION", "MS_DYN_POLICY_INVOCATION", and/or "MS_ACCESS_ACTIVITY".

NOTE: The optional Data Access Profile Identifier provisioned by the Authorization AS procedures are specified in clause 5.8 of 3GPP TS 26.531 [28].

The "NefEventSubs" data structure shall include:

- an event to subscribe to as a "event" attribute; and
- event filter information as "eventFilter" attribute associated with the event;

and may include:

- event-specific reporting information, within the "eventRepInfo" attribute, if the "PerEventRepReq" feature is supported.

The "eventsRepInfo" attribute may include:

- event notification method (periodic, one time, on event detection) as "notifMethod" attribute;
- Maximum Number of Reports as "maxReportNbr" attribute;
- Monitoring Duration as "monDur" attribute;
- repetition period for periodic reporting as "repPeriod" attribute;
- immediate reporting indication as "immRep" attribute;
- sampling ratio as "sampRatio" attribute;
- partitioning criteria for partitioning the UEs before performing sampling as "partitionCriteria" attribute if the EneNA feature is supported;
- group reporting guard time as "grpRepTime" attribute;
- a notification flag as "notifFlag" attribute if the EneNA feature is supported; and/or
- notification muting exception instructions within the "notifFlagInstruct" attribute, if the EnhDataMgmt feature is supported and the "notifFlag" attribute is provided and set to "DEACTIVATE".

When the "PerEventRepReq" feature is supported and the "eventsRepInfo" attribute is present, the common events reporting requirements provided within the "eventsRepInfo" attribute shall apply to a subscribed event only when no event-specific reporting requirements are provided within the "eventsSubs" attribute via the "eventRepInfo" attribute of the NefEventSubs data structure for this subscribed event, as specified above.

If the NEF cannot successfully fulfil the received HTTP POST request due to an internal error or an error in the HTTP POST request, the NEF shall send an HTTP error response as specified in clause 5.1.7.

Upon successful reception of an HTTP POST request with "{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions" as request URI and "NefEventExposureSubsc" data structure as request body, the NEF shall create a new "Individual Network Exposure Event Subscription" resource, store the subscription and send an HTTP "201 Created" response, as shown in step 2 of figure 4.2.2.2.2-1. The NEF shall include in the "201 Created" response:

- a Location header field; and
- an "NefEventExposureSubsc" data type in the content.

The Location header field shall contain the URI of the created individual application session context resource i.e. "{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions/{subscriptionId}".

The "NefEventExposureSubsc" data type content shall contain the representation of the created "Individual Network Exposure Event Subscription".

When the "monDur" attribute is included in the response by the NEF, it represents NEF selected expiry time that is equal or less than the expiry time received in the request.

When the "immRep" attribute is included and set to "true" in the subscription and the subscribed events are available, the NEF shall include the reports of the events subscribed, if available, in the HTTP POST response.

When the sampling ratio attribute, as "sampRatio", is included in the subscription without a "partitionCriteria" attribute, the NEF shall select a random subset of UEs among the target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs. If the "partitionCriteria" attribute is additionally included, then the NEF shall first partition the UEs according to the value of the "partitionCriteria" attribute and then select a random subset of UEs from each partition according to the sampling ratio and only report the event(s) related to the selected subsets of UEs.

When the group reporting guard time, as "grpRepTime" attribute, is included in the subscription, the NEF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then, the NEF shall notify the NF service consumer using the Nnef_EventExposure_Notify service operation, as described in clause 4.2.2.4.

When the "notifFlag" attribute is included and set to "DEACTIVATE" in the request, the NEF shall mute the event notification and store the available events until the NF service consumer requests to retrieve them by setting the "notifFlag" attribute to "RETRIEVAL" or until a muting exception occurs (e.g. full buffer). When a muting exception occurs, the NEF may consider the contents of the "notifFlagInstruct" attribute (if provided) and/or local configuration to determine its actions.

If the EnhDataMgmt feature is supported and the NEF accepts the muting instructions provided in the "notifFlag" and/or the "notifFlagInstruct" attributes, it may indicate the applied muting notification settings within the "mutingSetting" attribute in the response. If the NEF does not accept the muting instructions provided in the "notifFlag" and/or the "notifFlagInstruct" attributes, it shall send an HTTP "403 Forbidden" error response including the "cause" attribute set to "MUTING_INSTR_NOT_ACCEPTED".

4.2.2.2.3 Modifying an existing subscription

Figure 4.2.2.2.3-1 illustrates the modification of an existing subscription.

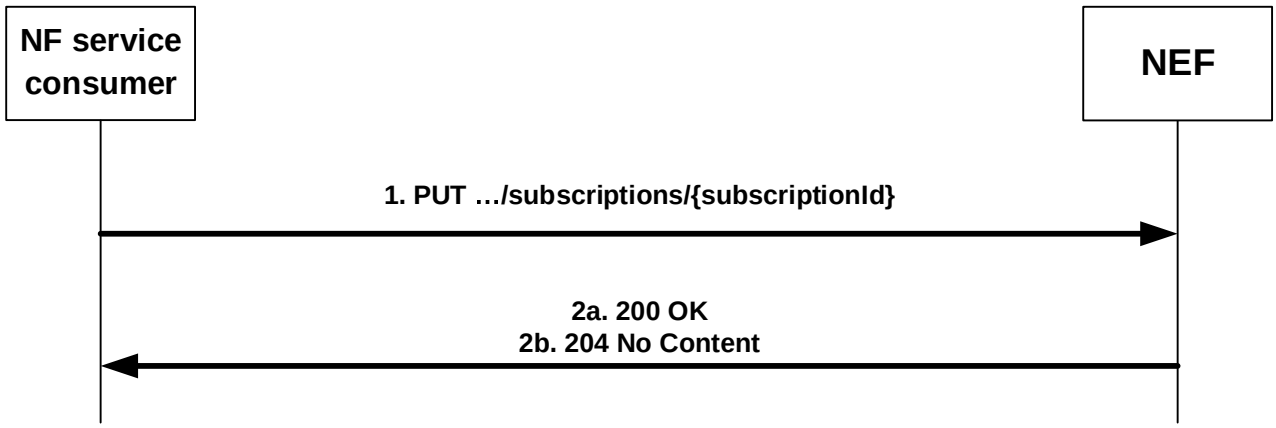

Figure 4.2.2.2.3-1: Modification of an existing subscription

To modify an existing subscription to event notifications, the NF service consumer shall send an HTTP PUT request with: "{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of figure 4.2.2.2.3-1, where "{subscriptionId}" is the subscription correlation ID of the existing subscription. The "NefEventExposureSubsc" data structure is included as request body as described in clause 4.2.2.2.2.

NOTE 1: An alternate NF service consumer than the one that requested the generation of the subscription resource can send the PUT request.

NOTE 2: The "notifUri" attribute within the NefEventExposureSubsc data structure can be modified to request that subsequent notifications are sent to a new NF service consumer.

NOTE 3: The "monDur" attribute within the NefEventExposureSubsc data structure can be modified to extend the expiry time to keep receiving notifications.

If the NEF cannot successfully fulfil the received HTTP PUT request due to an internal error or an error in the HTTP PUT request, the NEF shall send an HTTP error response as specified in clause 5.1.7.

If the feature "ES3XX" is supported, and the NEF determines the received HTTP PUT request needs to be redirected, the NEF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

Upon successful reception of an HTTP PUT request with: "{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions/{subscriptionId}" as request URI and "NefEventExposureSubsc" data structure as request body, the NEF shall update the subscription and send an HTTP "200 OK" response with the "NefEventExposureSubsc" data structure as response body containing the representation of the modified "Individual Network Exposure Event Subscription", or an HTTP "204 No Content" response, as shown in step 2 of figure 4.2.2.2.3-1.

When the "monDur" attribute is included in the response by the NEF, it represents NEF selected expiry time that is equal or less than the expiry time received in the request.

When the "immRep" attribute is included and sets to "true" in the subscription and the subscribed events are available, the NEF shall include the reports of the events subscribed, if available, in the HTTP PUT response.

When the sampling ratio, as "sampRatio" attribute, is included in the subscription without a "partitionCriteria" attribute, the NEF shall select a random subset of UEs among the target UEs according to the sampling ratio and only report the event(s) related to the selected subset of UEs. If the "partitionCriteria" attribute is additionally included, then the NEF shall first partition the UEs according to the value of the "partitionCriteria" attribute and then select a random subset of UEs from each partition according to the sampling ratio and only report the event(s) related to the selected subsets of UEs.

When the group reporting guard time, as "grpRepTime" attribute, is included in the subscription, the NEF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then, the NEF shall notify the NF service consumer using the Nnef_EventExposure_Notify service operation, as described in clause 4.2.2.4.

When the "notifFlag" attribute is included, and set to "DEACTIVATE" in the request, the NEF shall mute the event notification and store the available events until the NF service consumer requests to retrieve them by setting the "notifFlag" attribute to "RETRIEVAL" or until a muting exception occurs (e.g. full buffer). When a muting exception occurs, the NEF may consider the contents of the "notifFlagInstruct" attribute (if provided) and/or local configuration to determine its actions; if the "notifFlag" attribute is set to "RETRIEVAL" in the request, the NEF shall send the stored events to the NF service consumer, and mute the event notification again and store available events; if the "notifFlag" attribute is set to "ACTIVATE" and the event notifications are muted (due to a previously received "DECATIVATE" value), the NEF shall unmute the event notification, i.e. start sending again notifications for available events.

If the EnhDataMgmt feature is supported and the NEF accepts the muting instructions provided in the "notifFlag" and/or the "notifFlagInstruct" attributes, it may indicate the applied muting notification settings within the "mutingSetting" attribute in the response. If the NEF does not accept the muting instructions provided in the "notifFlag" and/or the "notifFlagInstruct" attributes, it shall send an HTTP "403 Forbidden" error response including the "cause" attribute set to "MUTING_INSTR_NOT_ACCEPTED".

4.2.2.3 Nnef_EventExposure_Unsubscribe service operation

4.2.2.3.1 General

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

The following procedure using the Nnef_EventExposure_Unsubscribe service operation is supported:

- unsubscription from event notifications.

4.2.2.3.2 Unsubscription from event notifications

Figure 4.2.2.3.2-1 illustrates the unsubscription from event notifications.

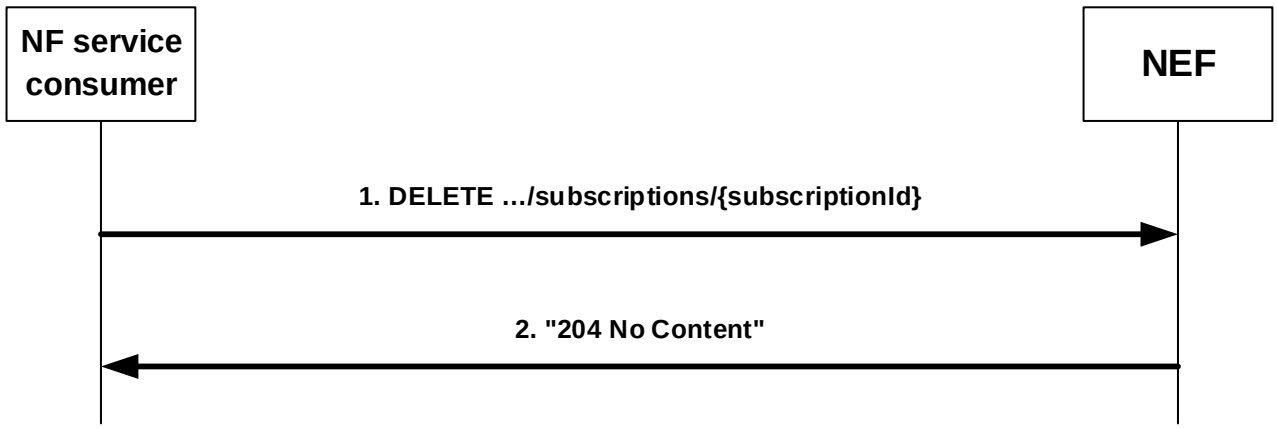

Figure 4.2.2.3.2-1: Unsubscription from event notifications

To unsubscribe from event notifications, the NF service consumer shall send an HTTP DELETE request with "{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of

figure 4.2.2.3.2-1, where "{subscriptionId}" is the subscription correlation identifier of the existing subscription resource that is to be deleted.

If the NEF cannot successfully fulfil the received HTTP DELETE request due to an internal error or an error in the HTTP DELETE request, the NEF shall send an HTTP error response as specified in clause 5.1.7.

If the feature "ES3XX" is supported, and the NEF determines the received HTTP DELETE request needs to be redirected, the NEF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

Upon successful reception of an HTTP DELETE request with: "{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions/{subscriptionId}" as request URI, the NEF shall remove the corresponding subscription and send an HTTP "204 No Content" response, as shown in step 2 of figure 4.2.2.3.2-1.

4.2.2.4 Nnef_EventExposure_Notify service operation

4.2.2.4.1 General

The Nnef_EventExposure_Notify service operation enables the NEF to notify the NF service consumer(s) that the previously subscribed application related event occurred.

The following procedure using the Nnef_EventExposure_Notify service operation is supported:

- notification about subscribed events.

4.2.2.4.2 Notification about subscribed events

Figure 4.2.2.4.2-1 illustrates the notification about subscribed events.

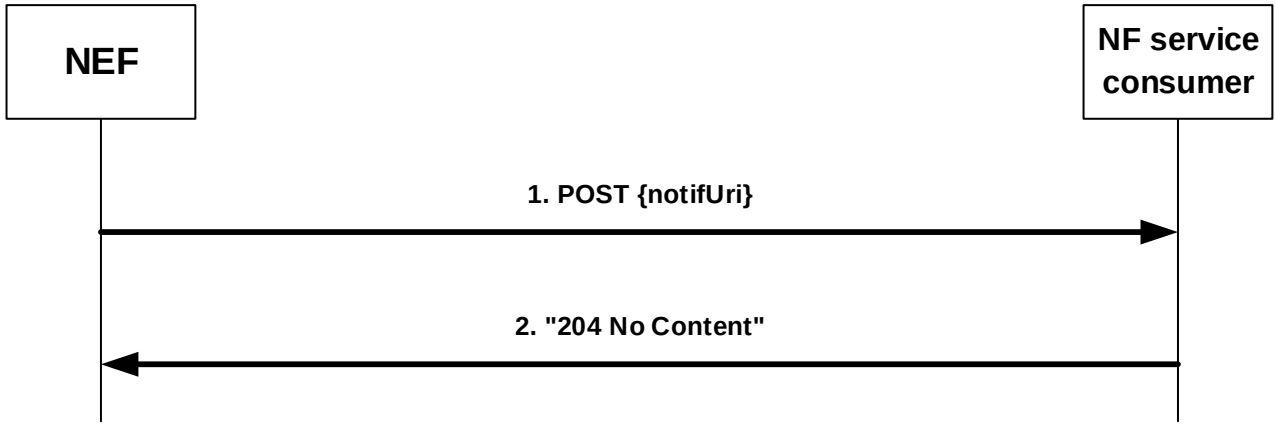

Figure 4.2.2.4.2-1: Notification about subscribed events

If the NEF observes application related event(s) for which an NF service consumer has subscribed, the NEF shall send an HTTP POST request as shown in step 1 of figure 4.2.2.4.2-1, with the "{notifUri}" as request URI containing the value previously provided by the NF service consumer within the corresponding subscription, and the "NefEventExposureNotif" data structure.

The "NefEventExposureNotif" data structure shall include:

- notification correlation ID provided by the NF service consumer during the subscription as "notifId" attribute; and
- information about the observed event(s) within the "eventNotifs" attribute that shall contain for each observed event an "NefEventNotification" data structure that shall include:
  - the application related event as "event" attribute;
  - the time at which the event was observed encoded as "timeStamp" attribute;

- if the "event" attribute is "SVC_EXPERIENCE", service experience information about the application involved in the reported event in the "svcExprcInfos" attribute;
- if the "event" attribute is "UE_MOBILITY", UE mobility information assoicated with the application as "ueMobilityInfos" attribute;
- if the "event" attribute is "UE_COMM", UE communication information assoicated with the application as "ueCommInfos" attribute;
- if the "event" attribute is "EXCEPTIONS", exceptions information associated with a service flow as "excepInfos" attribute;
- if the "event" attribute is "PERF_DATA", Performance Data Analytics related information as "perfDataInfos" attribute;
- if the "event" attribute is "COLLECTIVE_BEHAVIOUR", collective behaviour information associated with the UEs and its applications as "collBhvrInfs" attribute;
- if the "event" attribute is "USER_DATA_CONGESTION", user data congestion information collected for an AF application as "congestionInfos" attribute;
- if the "event" attribute is "DISPERSION", UE dispersion information collected for an AF as "dispersionInfos" attribute;
- if the "event" attribute is "MS_QOE_METRICS",
  - Media Streaming QoE metrics information collected for an UE application via the Data Collection AF as "msQoeMetrInfos" attribute; This attribute is deprecated; the attribute "msQoeMetrics" should be used instead;
  - if the "MSEventExposure" feature is supported, the Media Streaming QoE metrics information collected for an UE application via the Data Collection AF as "msQoeMetrics" attribute;
- if the "event" attribute is "MS_CONSUMPTION",
  - Media Streaming Consumption reports information collected for an UE application via the Data Collection AF as "msConsumpInfos" attribute; This attribute is deprecated; the attribute "msConsumpReports" should be used instead;
  - if the "MSEventExposure" feature is supported, the Media Streaming Consumption reports collected for an UE application via the Data Collection AF as "msConsumpReports" attribute;
- if the "event" attribute is "MS_NET_ASSIST_INVOCATION",
  - Media Streaming Network Assistance invocation information collected for an UE application via the Data Collection AF as "msNetAssInvInfos" attribute; This attribute is deprecated; the attribute "msNetAssistInvocation" should be used instead;
  - if the "MSEventExposure" feature is supported, the Media Streaming Network Assistance invocation collected for an UE application via the Data Collection AF as "msNetAssistInvocation" attribute;
- if the "event" attribute is "MS_DYN_POLICY_INVOCATION",
  - Media Streaming Dynamic Policy invocations information collected for an UE application via the Data Collection AF as "msDynPlyInvInfos" attribute; This attribute is deprecated; the attribute "msDynPlyInvocation" should be used instead;
  - if the "MSEventExposure" feature is supported, the Media Streaming Dynamic Policy invocation collected for an UE application via the Data Collection AF as "msDynPlyInvocation" attribute;
- if the "event" attribute is "MS_ACCESS_ACTIVITY",
  - Media Streaming access activity information collected for an UE application via the Data Collection AF as "msAccActInfos" attribute; This attribute is deprecated; the attribute "msAccess" should be used instead.

- if the "MSEventExposure" feature is supported, the Media Streaming access activity collected for an UE application via the Data Collection AF as "msAccess" attribute; and

- if the "event" attribute is "GNSS_ASSISTANCE_DATA", GNSS Assistance Data information within the "gnssAssistDataInfo" attribute;

- if the "event" attribute is "DATA_VOLUME_TRANSFER_TIME", data volume transfer time information assoicated with the application as "datVolTransTimeInfos" attribute.

If the NF service consumer cannot successfully fulfil the received HTTP POST request due to an internal error or an error in the HTTP POST request, the NF service consumer shall send an HTTP error response as specified in clause 5.1.7.

If the feature "ES3XX" is supported, and the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [4].

Upon successful reception of an HTTP POST request with "{notifUri}" as request URI and "NefEventExposureNotif" data structure as request body, the NF service consumer shall send an HTTP "204 No Content" response, as shown in step 2 of figure 4.2.2.4.2-1, in case of a successful processing.

4.3 Nnef_EASDeployment Service

4.3.1 Service Description

4.3.1.1 Overview

The Nnef_EASDeployment service, as defined in 3GPP TS 23.502 [3], is provided by the Network Exposure Function (NEF). This service allows the SMF to subscribe/unsubscribe the notification of AF provisioned EAS Deployment information, and for the NEF to notify the AF provisioned EAS Deployment information to the subscribed SMF.

4.3.1.2 Service Architecture

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

The Nnef_EASDeployment service is part of the Nnef service-based interface exhibited by the Network Exposure Function (NEF).

Known consumer of the Nnef_EASDeployment service is:

- Session Management Function (SMF)

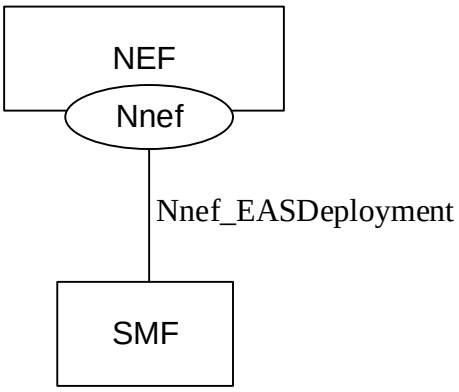

Figure 4.3.1.2-1: Reference Architecture for the Nnef_EASDeployment Service; SBI representation

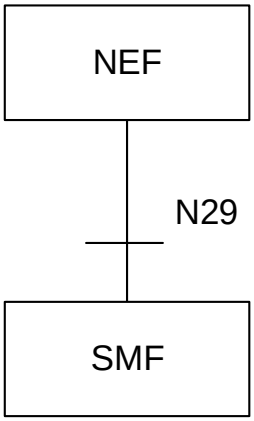

Figure 4.3.1.2-2: Reference Architecture for the Nnef_EASDeployment Service: reference point representation

4.3.1.3 Network Functions

4.3.1.3.1 Network Exposure Function (NEF)

The Network Exposure Function (NEF) is a functional element that support for the NF service consumer (i.e SMF) subscribing to the notification of the AF provisioned EAS Deployment Information and provide EAS Deployment Information change notification to the NF service consumer as defined in this specification.

4.3.1.3.2 NF Service Consumers

The known NF service consumers are as follows:

The Session Management Function (SMF):

- supports (un)subscribing to notifications of subscribed event(s) from the NEF.
- supports receiving the notifications of subscribed event(s) from the NEF.

4.3.2 Service Operations

4.3.2.1 Introduction

Service operations defined for the Nnef_EASDeployment Service are shown in table 4.3.2.1-1.

Table 4.3.2.1-1: Nnef_EASDeployment Service Operations

Service Operation Name	Description	Initiated by
Nnef_EASDeployment_Subscribe	This service operation is used by an NF service consumer to explicitly subscribe the notification of changes of EAS Deployment Information.	NF service consumer
Nnef_EASDeployment_Unsubscribe	This service operation is used by an NF service consumer to explicitly unsubscribe the notification of changes of EAS Deployment Information.	NF service consumer
Nnef_EASDeployment_Notify	This service operation is used by the NEF to provide subscribed event information, e.g.updated EAS Deployment Information to the NF service consumer.	NEF

4.3.2.2 Nnef_EASDeployment_Subscribe service operation

4.3.2.2.1 General

This service operation is provided by the NEF for NF consumers to explicitly subscribe the notification of changes of EAS Deployment Information.

4.3.2.2.2 Creating a new subscription

In order to subscribe to EAS Deployment Information change event, the SMF shall send an HTTP POST request message to the NEF for the "EAS Deployment Event Subscriptions" resource. The HTTP POST message shall include EasDeploySubData data structure as request body. The EasDeploySubData data structure shall include:

- Event Id in the "eventId" attribute;
- An notification correlation ID provided by the NF service consumer during the subscription as "notifId" attribute; and
- An URI to receive the subscribed EAS Deployment information change notifications as "notifUri" attribute.

and may include:

- an indicator to immediately report the current status of EAS Deployment Information if available, as "immRep" attribute;
- (list of) DNN and/or S-NSSAI combination as "dnnSnssaiInfos" attribute;
- identification of an application as "appId" attribute; and/or
- an internal Group Identifier as "interGroupId" attribute.

Upon receipt of the HTTP request from the SMF, if the SMF is validated, the NEF shall interact with the UDR by invoking the Nudr_DataRepository service as described in 3GPP TS 29.504 [32] to fetch the EAS Deployment Information in the application data in the UDR.

After receiving a successful response from the UDR, the NEF shall create a new subscription and assign a subscription identifier for the "Individual EAS Deployment Event Subscription" resource. Then the NEF shall send a HTTP "201 Created" response with EASDeploySubData data structure as response body and a Location header field containing the URI of the created individual subscription resource to the NF service consumer. If the immediate report indicator is included in the subscription request, the NEF shall include in the response body the currently available EAS Deployment Information that match the subscription.

NOTE: When the "targetAfId" attribute is included in the EAS Deployment Information, then all DNAI(s) correspond to the same EHE provider. The "targetAfId" attribute can be used in case of AF(s) involving different EHE providers, and the source EHE is unaware of other/target EHE specific deployment details.

If the NEF receives an error code from the UDR, the NEF shall take proper error handling actions and shall respond to the SMF with a proper error status code.

4.3.2.3 Nnef_EASDeployment_Unsubscribe service operation

4.3.2.3.1 General

This service operation is used by an NF service consumer (i.e. SMF) to explicitly unsubscribe the notification of changes of EAS Deployment Information.

The following procedure using the Nnef_EASDeployment_Unsubscribe service operation is supported:

- unsubscription from the notification of changes of EAS Deployment Information.

4.3.2.3.2 Unsubscription of notification of changes of EAS Deployment Information

In order to delete an existing subscription to EAS Deployment Information change event, the NF service consumer shall send an HTTP DELETE request message to the individual resource URI "{apiRoot}/nnef-eas-deployment/<apiVersion>/subscriptions/{subscriptionId}" in which the "{subscriptionId}" is the subscription correlation identifier of the existing subscription resource that is to be deleted.

The NEF shall delete the individual resource and shall respond to the NF service consumer with an HTTP "204 No Content" response message.

If the NEF cannot delete the individual resource, shall take proper error handling actions and shall respond to the NF service consumer with a proper error status code.

4.3.2.4 Nnef_EASDeployment_Notify service operation

4.3.2.4.1 General

The Nnef_EASDeployment_Notify service operation enables the NEF to notify the subscribed event information, e.g. updated EAS Deployment Information to the NF Consumer.

The following procedure using the Nnef_EASDeployment_Notify service operation is supported:

- notification about subscribed EAS Deployment Information change.

4.3.2.4.2 Notification of changes of EAS Deployment Information

When the EAS Deployment information is changed, the NEF shall provide a notification to the subscribed NF service consumer by sending an HTTP POST message that include the EasDeployInfoNotif data structure in the request body to notify the EAS Deployment information changes to the NF service consumer.

The EasDeployInfoNotif data structure shall include the subscribed Event ID and the EAS Deployment Information.

NOTE: When the "targetAfId" attribute is included in the EAS Deployment Information, then all DNAI(s) correspond to the same EHE provider. The "targetAfId" attribute can be used in case of AF(s) involving different EHE providers, and the source EHE is unaware of other/target EHE specific deployment details.

Upon receipt of the EAS Deployment event notification, the NF service consumer shall respond with a "204 No Content" status code to confirm the received notification.

4.4 Nnef_TrafficInfluenceData Service

4.4.1 Service Description

4.4.1.1 Overview

The Nnef_TrafficInfluenceData service, as defined in 3GPP TS 23.502 [3], is provided by the Network Exposure Function (NEF). This service allows the NF service consumer (e.g., V-SMF) supporting HR-SBO to subscribe/unsubscribe the notification of Traffic Influence from AF in VPLMN, and for the V-NEF to notify the Traffic Influence to the subscribed NF service consumer (e.g., V-SMF).

4.4.1.2 Service Architecture

The Nnef_TrafficInfluenceData service is part of the Nnef service-based interface exhibited by the Network Exposure Function (NEF).

Known NF service consumer of the Nnef_TrafficInfluenceData service is:

- Session Management Function (SMF)

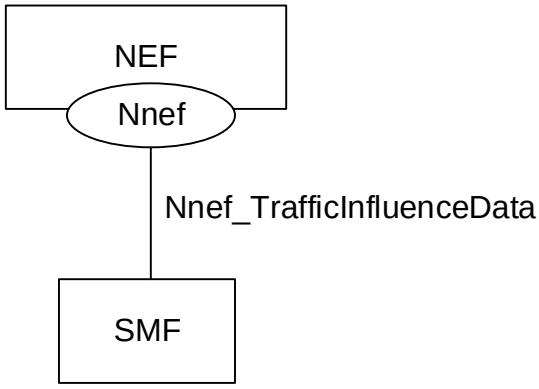

Figure 4.4.1.2-1: Reference Architecture for the Nnef_TrafficInfluenceData Service; SBI representation

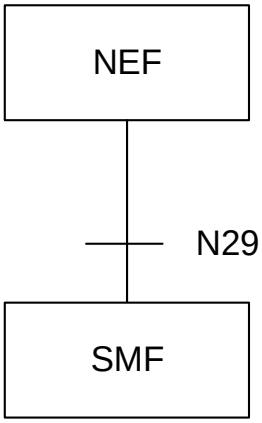

Figure 4.4.1.2-2: Reference Architecture for the Nnef_TrafficInfluenceData Service: reference point representation

4.4.1.3 Network Functions

4.4.1.3.1 Network Exposure Function (NEF)

The Network Exposure Function (NEF) allows the NF service consumer to subscribe to and unsubscribe from the NEF for the Traffic Influence Data from AF.

4.4.1.3.2 NF Service Consumers

The known NF service consumers are as follows:

The Session Management Function (SMF):

- supports (un)subscribing to notifications of Traffic Influence Data from the NEF.
- supports receiving the notifications of Traffic Influence Data from the NEF.

4.4.2 Service Operations

4.4.2.1 Introduction

Service operations defined for the Nnef_TrafficInfluenceData Service are shown in table 4.4.2.1-1.

Table 4.4.2.1-1: Nnef_TrafficInfluenceData Service Operations

Service Operation Name	Description	Initiated by
Nnef_TrafficInfluenceData_Subscribe	This service operation is used by an NF service consumer to explicitly subscribe the notification of Traffic Influence Data.	NF service consumer
Nnef_TrafficInfluenceData_Unsubscribe	This service operation is used by an NF service consumer to explicitly unsubscribe the notification of Traffic Influence Data.	NF service consumer
Nnef_TrafficInfluenceData_Notify	This service operation is used by the NEF to provide Traffic Influence Data to the NF service consumer.	NEF

4.4.2.2 Nnef_TrafficInfluenceData_Subscribe service operation

4.4.2.2.1 General

This service operation is provided by the NEF for NF service consumers to explicitly subscribe the notification of Traffic Influence Data.

4.4.2.2.2 Creating a new subscription

Figure 4.4.2.2.2-1 illustrates the creation of a Individual Traffic Influence Data Subscription.

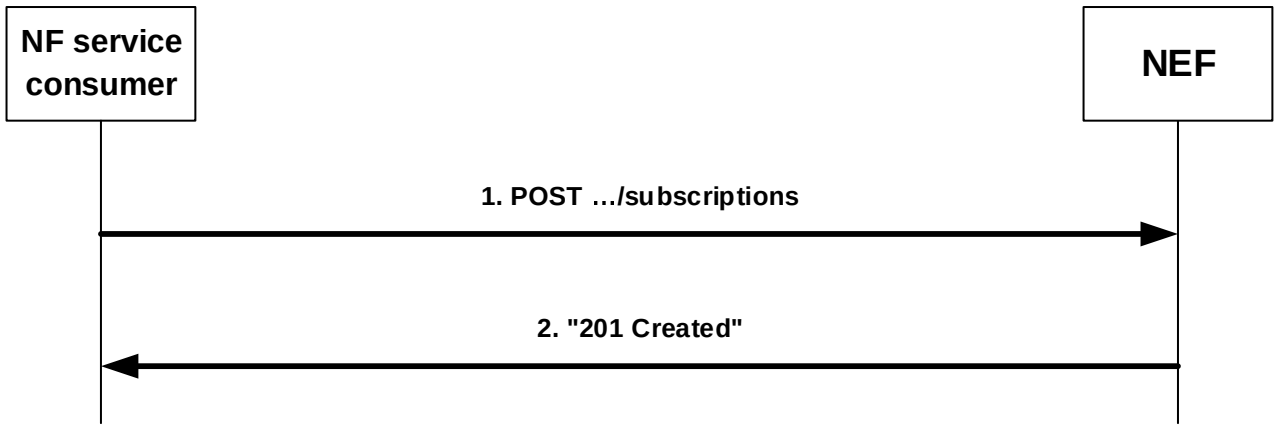

Figure 4.4.2.2.2-1: Creation of a subscription

In order to subscribe to Traffic Influence Data, the NF service consumer (e.g., SMF) shall send a Nnef_TrafficInfluenceData_Subscribe request using the HTTP POST method to the NEF with "{apiRoot}/nnef-traffic-influence-data/<apiVersion>/subscriptions" as request URI as shown in step 1 of figure 4.4.2.2.2-1. The HTTP POST message shall include TrafficInfluDataSub data structure as request body. The TrafficInfluDataSub data structure shall include:

- the notification URI in the "notifUri" attribute;
- the notification correlation identifier in the "notifCorrId" attribute;
- the identifications of DNN in the "dnns" attribute and/or the identifications of network slice in the "snssais" attribute;

and may include:

- the identification(s) of target UE(s) in the "supis" attribute;
- the any UE indication in the "anyUe" attribute;
- the identification(s) of the HPLMN in the "hplmnId" attribute;
- the UE address(es) either in the "ipv4Addrs" attribute or in the "ipv6Addrs" attribute;

- the reporting requirements of the subscription in "rptInfo" attribute.

Upon receipt of the HTTP request from the NF service consumers (e.g., SMF), the NEF shall interact with the UDR by invoking the Nudr_DataRepository service as described in 3GPP TS 29.504 [20] to retrieve and subscribe to the Traffic Influence Data in the application data in the UDR.

After receiving a successful response from the UDR, the NEF shall create a new subscription and assign a subscription identifier for the "Individual Traffic Influence Data Subscription" resource. Then the NEF shall send an HTTP "201 Created" response with TrafficInfluDataSub data structure as response body and a Location header field containing the URI of the created individual subscription resource to the NF service consumer.

If the immediate report indication is included in the subscription request, the NEF shall include the currently available Traffic Influence Data in the response body.

If errors occur when processing the HTTP POST request or receiving an error code from the UDR, the NEF shall send an HTTP error response as specified in clause 5.3.7.

4.4.2.2.3 Modifying an existing subscription

Figure 4.4.2.2.3-1 illustrates the modification of an existing subscription.

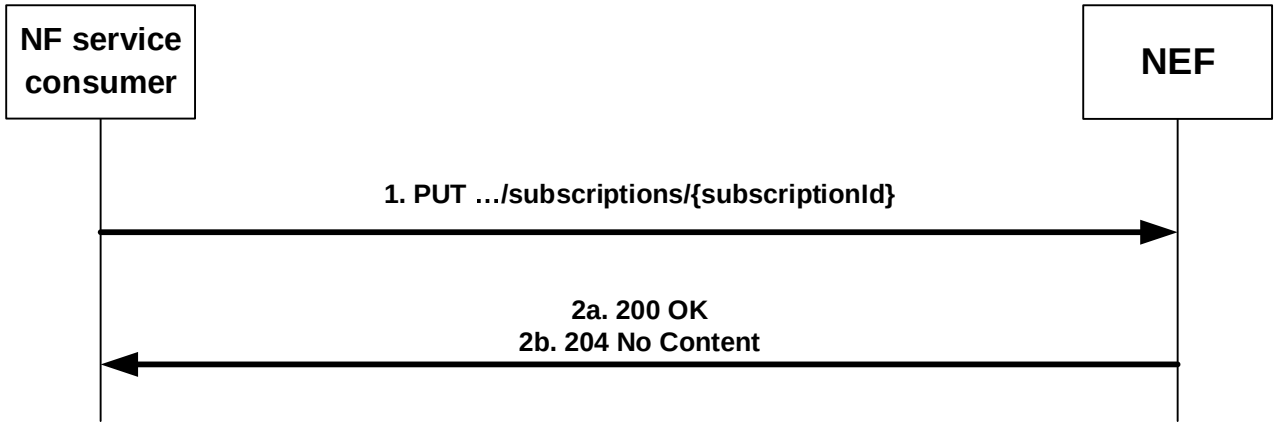

Figure 4.4.2.2.3-1: Modification of an existing subscription

To modify an existing subscription to event notifications, the NF service consumer shall send an HTTP PUT request with: "{apiRoot}/nnef-traffic-influence-data/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of figure 4.4.2.2.3-1, where "{subscriptionId}" is the subscription ID of the existing subscription. The TrafficInfluDataSub data structure is included as request body as described in clause 4.4.2.2.2.

Upon successful reception of an HTTP PUT request with: "{apiRoot}/nnef-traffic-influence-data/<apiVersion>/subscriptions/{subscriptionId}" as request URI and TrafficInfluDataSub data structure as request body, the NEF shall interact with the UDR by invoking the Nudr_DataRepository service as described in 3GPP TS 29.504 [20] to retrieve and subscribe to the Traffic Influence Data in the application data in the UDR.

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

- send HTTP "200 OK" response (as shown in figure 4.4.2.2.3-1, step 2a) with a response body containing a representation of the updated subscription in the TrafficInfluDataSub data type; or

- send HTTP "204 No Content" response (as shown in figure 4.4.2.2.3-1, step 2b).

If the immediate report indication is included in the subscription request, the NEF shall include the currently available Traffic Influence Data in the response body.

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

If errors occur when processing the HTTP PUT request or receiving an error code from the UDR, the NEF shall send an HTTP error response as specified in clause 5.3.7.

4.4.2.3 Nnef_TrafficInfluenceData_Unsubscribe service operation

4.4.2.3.1 General

This service operation is used by an NF service consumer to explicitly unsubscribe the notification of Traffic Influence Data.

The following procedure using the Nnef_TrafficInfluenceData_Unsubscribe service operation is supported:

- unsubscription from the notification of Traffic Influence Data.

4.4.2.3.2 Unsubscription of notification of Traffic Influence Data

Figure 4.4.2.3.2-1 illustrates the unsubscription of event notifications from NEF.

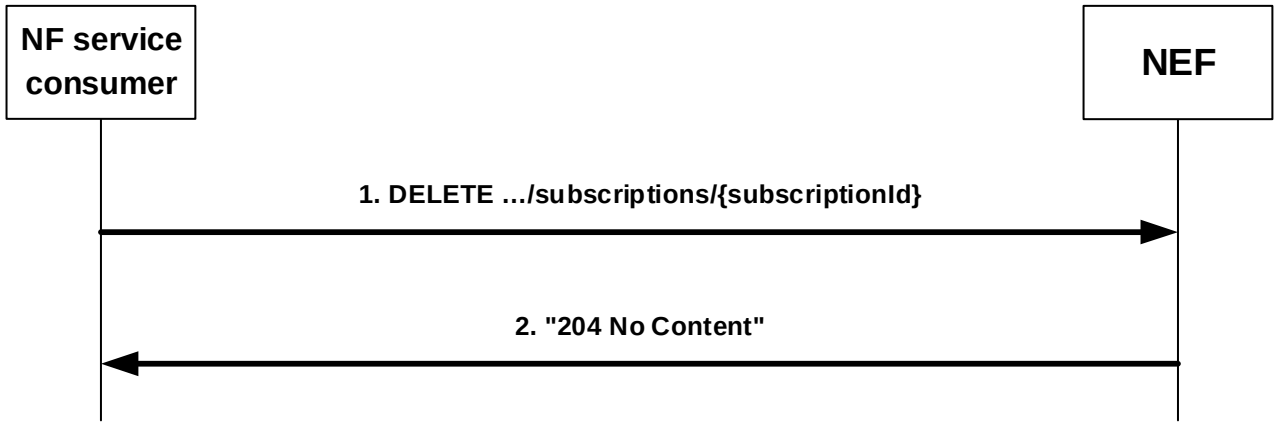

Figure 4.4.2.3.2-1: NF service consumer unsubscribes from notifications

In order to delete an existing subscription to Traffic Influence Data, the NF service consumer shall send an HTTP DELETE request message with "{apiRoot}/nnef-traffic-influence-data/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of figure 4.4.2.3.2-1, where "{subscriptionId}" is the subscription identifier of the existing subscription resource that is to be deleted.

Upon successful reception of an HTTP DELETE, the NEF shall delete the individual resource and shall respond to the NF service consumer with an HTTP "204 No Content" response message, as shown in step 2 of figure 4.4.2.3.2-1.

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

If errors occur when processing the HTTP DELETE request, the NEF shall send an HTTP error response as specified in clause 5.3.7.

4.4.2.4 Nnef_TrafficInfluenceData_Notify service operation

4.4.2.4.1 General

The Nnef_TrafficInfluenceData_Notify service operation enables the NEF to notify the Traffic Influence Data to the NF service consumer.

The following procedure using the Nnef_TrafficInfluenceData_Notify service operation is supported:

- notification about subscribed Traffic Influence Data.

4.4.2.4.2 Notification of changes of Traffic Influence Data

Figure 4.4.2.4.2-1 illustrates the notification about Traffic Influence Data.

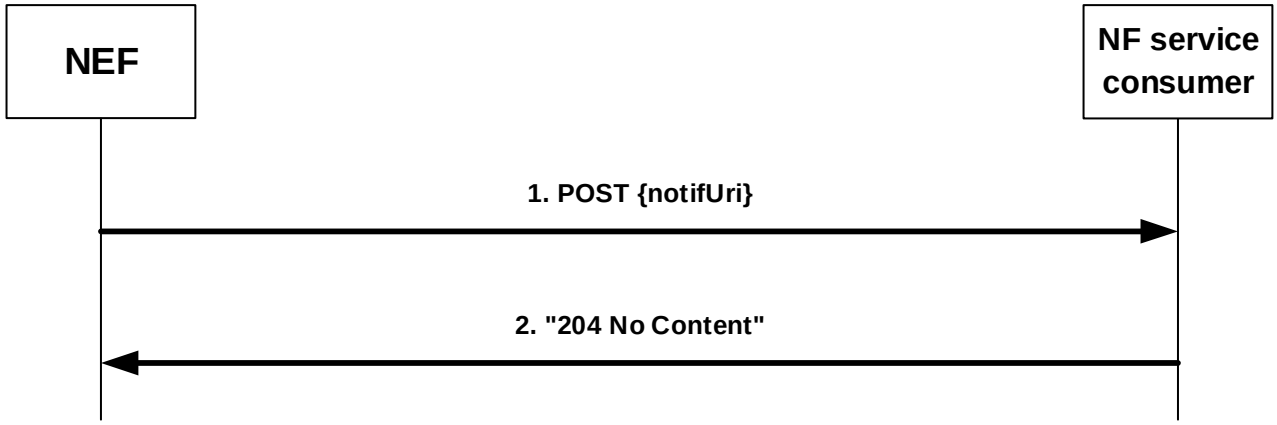

Figure 4.4.2.4.2-1: Notification about Traffic Influence Data

If the NEF observes Traffic Influence Data that an NF service consumer has subscribed, the NEF shall send an HTTP POST request as shown in step 1 of figure 4.4.2.4.2-1, with the "{notifUri}" as request URI containing the value previously provided by the NF service consumer within the corresponding subscription, and the TrafficInfluDataNotify data structure as request body.

The TrafficInfluDataNotify data structure shall include:

- the notification correlation identifier in the "notifCorrId" attribute;
- Traffic Influence Data within the "eventNotifications" attribute. When the AF request is for subscribing to UP path change events of the HR-SBO PDU session, the NEF shall include the "upPathChgNotifUri" and "upPathChgNotifCorreId" attributes of the TrafficInfluData data structure defined in 3GPP TS 29.519 [30].

Upon successful reception of an HTTP POST request with "{notifUri}" as request URI and TrafficInfluDataNotify data structure as request body, the NF service consumer shall send an HTTP "204 No Content" response, as shown in step 2 of figure 4.4.2.4.2-1.

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

4.5 Nnef_ECSAddress Service

4.5.1 Service Description

4.5.1.1 Overview

The Nnef_ECSAddress service, as defined in 3GPP TS 23.502 [3], is provided by the Network Exposure Function (NEF). This service allows the NF service consumer (e.g., V-SMF)to subscribe/unsubscribe the notification of ECS Address Configuration Information from AF in VPLMN, and for the V-NEF to notify the ECS Address Configuration Information to the subscribed NF service consumer (e.g., V-SMF).

4.5.1.2 Service Architecture

The Nnef_ECSAddress service is part of the Nnef service-based interface exhibited by the Network Exposure Function (NEF).

Known NF service consumer of the Nnef_ECSAddress service is:

- Session Management Function (SMF)

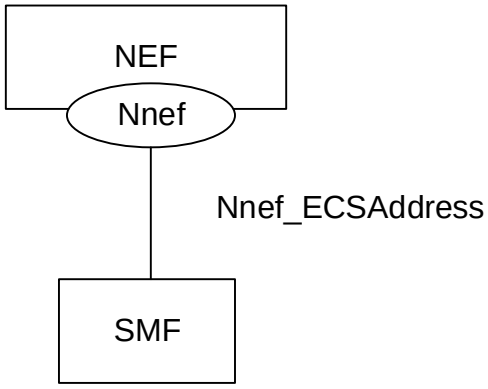

Figure 4.5.1.2-1: Reference Architecture for the Nnef_ECSAddress Service; SBI representation

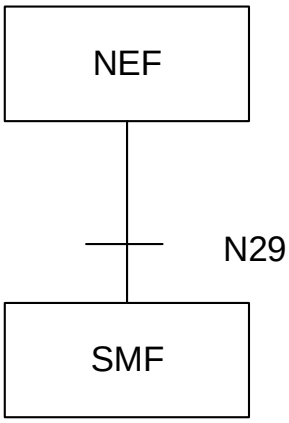

Figure 4.5.1.2-2: Reference Architecture for the Nnef_ECSAddress Service: reference point representation

4.5.1.3 Network Functions

4.5.1.3.1 Network Exposure Function (NEF)

The Network Exposure Function (NEF) allows the NF service consumer to subscribe to and unsubscribe from the NEF for the ECS Address Configuration Information from the AF.

4.5.1.3.2 NF Service Consumers

The known NF service consumers are as follows:

The Session Management Function (SMF):

- supports (un)subscribing to notifications of ECS Address Configuration Information from the NEF.
- supports receiving the notifications of ECS Address Configuration Information from the NEF.

4.5.2 Service Operations

4.5.2.1 Introduction

Service operations defined for the Nnef_ECSAddress Service are shown in table 4.5.2.1-1.

Table 4.5.2.1-1: Nnef_ECSAddress Service Operations

Service Operation Name	Description	Initiated by
Nnef_ECSAddress_Subscribe	This service operation is used by an NF service consumer to explicitly subscribe the notification of ECS Address Configuration Information.	NF service consumer
Nnef_ECSAddress_Unsubscribe	This service operation is used by an NF service consumer to explicitly unsubscribe the notification of ECS Address Configuration Information.	NF service consumer
Nnef_ECSAddress_Notify	This service operation is used by the NEF to provide ECS Address Configuration Information to the NF service consumer.	NEF

4.5.2.2 Nnef_ECSAddress_Subscribe service operation

4.5.2.2.1 General

This service operation is provided by the NEF for NF service consumers to explicitly subscribe the notification of ECS Address Configuration Information.

4.5.2.2.2 Creating a new subscription

Figure 4.5.2.2.2-1 illustrates the creation of a Individual ECS Address Configuration Information Subscription.

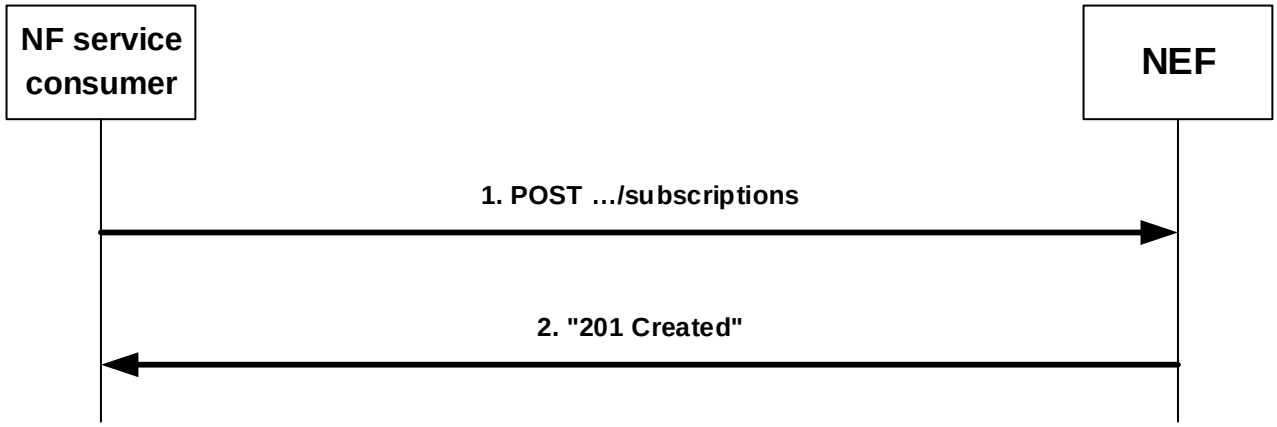

Figure 4.5.2.2.2-1: Creation of a subscription

In order to subscribe to ECS Address Configuration Information, the NF service consumersshall send an Nnef_ECSAddress_Subscribe request using the HTTP POST method to the NEF with "{apiRoot}/nnef-ecs-addr-cfg-info/<apiVersion>/subscriptions" as request URI as shown in step 1 of figure 4.5.2.2.2-1. The HTTP POST message shall include EcsAddrCfgInfoSub data structure as request body. The EcsAddrCfgInfoSub data structure shall include:

- the notification URI in the "notifUri" attribute;
- the notification correlation identifier in the "notifCorrId" attribute;

and may include:

- the identification(s) of DNN in "dnns" attribute;
- the identification(s) of network slice in "snssais" attribute;
- an indicator to immediately report the currently available ECS Address Configuration Information in "immRepInd" attribute;

Upon receipt of the HTTP request from the NF service consumers, the NEF shall interact with the UDR by invoking the Nudr_DataRepository service as described in 3GPP TS 29.504 [20] to retrieve and subscribethe ECS Address Configuration Information in the application data in the UDR.

After receiving a successful response from the UDR, the NEF shall create a new subscription and assign a subscription identifier for the "Individual ECS Address Configuration Information Subscription" resource. Then the NEF shall send an HTTP "201 Created" response with EcsAddrCfgInfoSub data structure as response body and a Location header field containing the URI of the created individual subscription resource to the NF service consumer.

If the immediate report indication is included in the subscription request, the NEF shall include the currently available ECS Address Configuration Information in "immReports" attribute in the response body.

If errors occur when processing the HTTP POST request or receiving an error code from the UDR, the NEF shall send an HTTP error response as specified in clause 5.47.

4.5.2.2.3 Modifying an existing subscription

Figure 4.5.2.2.3-1 illustrates the modification of an existing subscription.

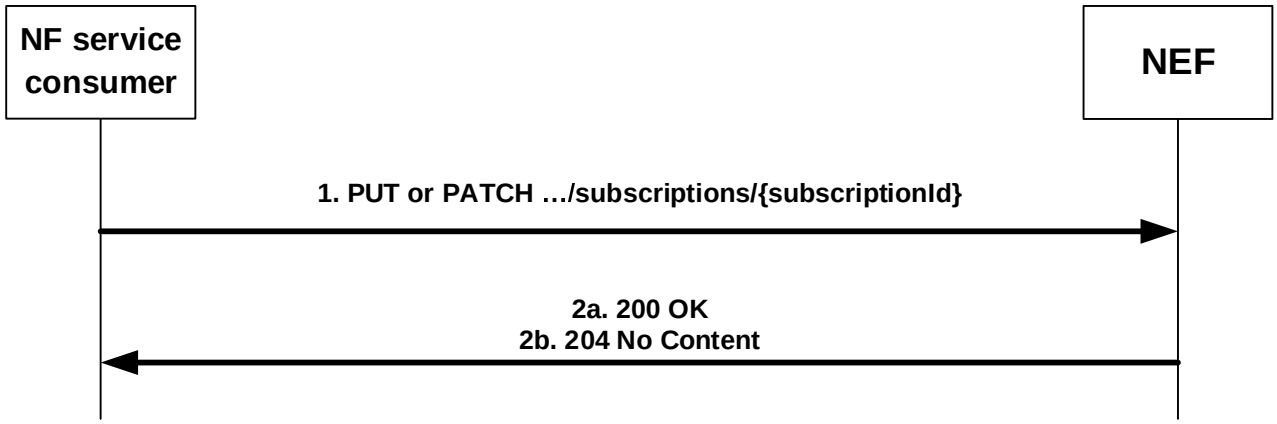

Figure 4.5.2.2.3-1: Modification of an existing subscription

To modify an existing subscription to event notifications, the NF service consumer shall send an HTTP PUT/PATCH request with: "{apiRoot}/nnef-ecs-addr-cfg-info/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of figure 4.5.2.2.3-1, where "{subscriptionId}" is the subscription ID of the existing subscription. The EcsAddrCfgInfoSub data structure is included as PUT request body as described in clause 4.5.2.2.2 or the EcsAddrCfgInfoSubPatch data structure is included as PATCH request body as defined in clause 5.4.6.2.4.

Upon successful reception of an HTTP PUT/PATCH request with: "{apiRoot}/nnef-ecs-addr-cfg-info/<apiVersion>/subscriptions/{subscriptionId}" as request URI and EcsAddrCfgInfoSub/EcsAddrCfgInfoSubPatch data structure as request body, the NEF shall interact with the UDR by invoking the Nudr_DataRepository service as described in 3GPP TS 29.504 [20] to retrieve and subscribethe ECS Address Configuration Information in the application data in the UDR.

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

- send HTTP "200 OK" response (as shown in figure 4.5.2.2.3-1, step 2a) with a response body containing a representation of the updated subscription in the EcsAddrCfgInfoSub data type; or
- send HTTP "204 No Content" response (as shown in figure 4.5.2.2.3-1, step 2b).

If the immediate report indication is included in the subscription request, the NEF shall include the current available ECS Address Configuration Information in the response body.

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

If errors occur when processing the HTTP PUT/PATCH request or receiving an error code from the UDR, the NEF shall send an HTTP error response as specified in clause 5.4.7.

4.5.2.3 Nnef_ECSAddress_Unsubscribe service operation

4.5.2.3.1 General

This service operation is used by an NF service consumer to explicitly unsubscribe the notification of ECS Address Configuration Information.

The following procedure using the Nnef_ECSAddress_Unsubscribe service operation is supported:

- unsubscription from the notification of ECS Address Configuration Information.

4.5.2.3.2 Unsubscription of notification of ECS Address Configuration Information

Figure 4.5.2.3.2-1 illustrates the unsubscription of event notifications from NEF.

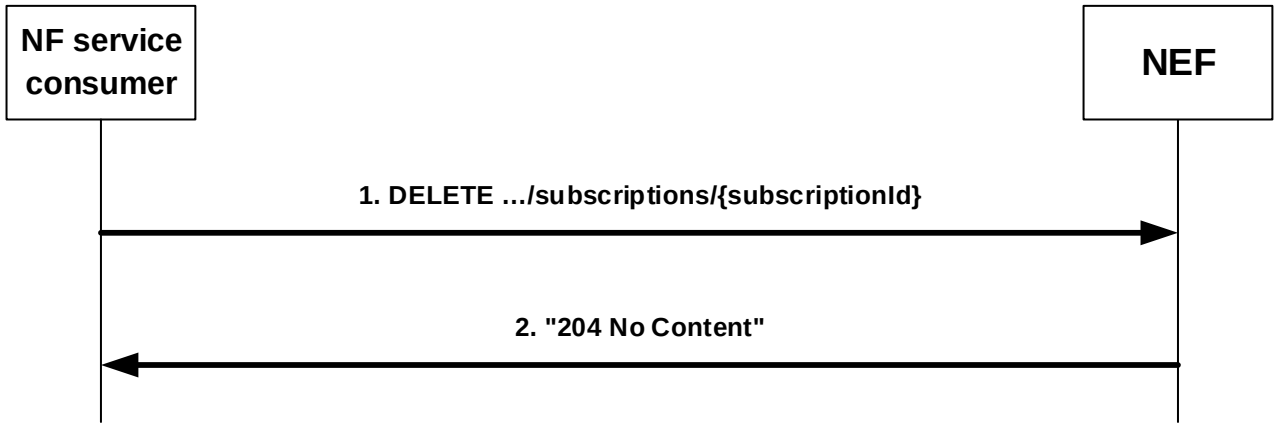

Figure 4.5.2.3.2-1: NF service consumer unsubscribes from notifications

In order to delete an existing subscription to ECS Address Configuration Information, the NF service consumer shall send an HTTP DELETE request message with "{apiRoot}/nnef-ecs-addr-cfg-info/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of figure 4.5.2.3.2-1, where "{subscriptionId}" is the subscription identifier of the existing subscription resource that is to be deleted.

Upon successful reception of an HTTP DELETE, the NEF shall delete the individual resource and shall respond to the NF service consumer with an HTTP "204 No Content" response message, as shown in step 2 of figure 4.5.2.3.2-1.

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

If errors occur when processing the HTTP DELETE request, the NEF shall send an HTTP error response as specified in clause 5.4.7.

4.5.2.4 Nnef_ECSAddress_Notify service operation

4.5.2.4.1 General

The Nnef_ECSAddress_Notify service operation enables the NEF to notify the ECS Address Configuration Information to the NF service consumer.

The following procedure using the Nnef_ECSAddress_Notify service operation is supported:

- notification about subscribed ECS Address Configuration Information.

4.5.2.4.2 Notification of changes of ECS Address Configuration Information

Figure 4.5.2.4.2-1 illustrates the notification about ECS Address Configuration Information.

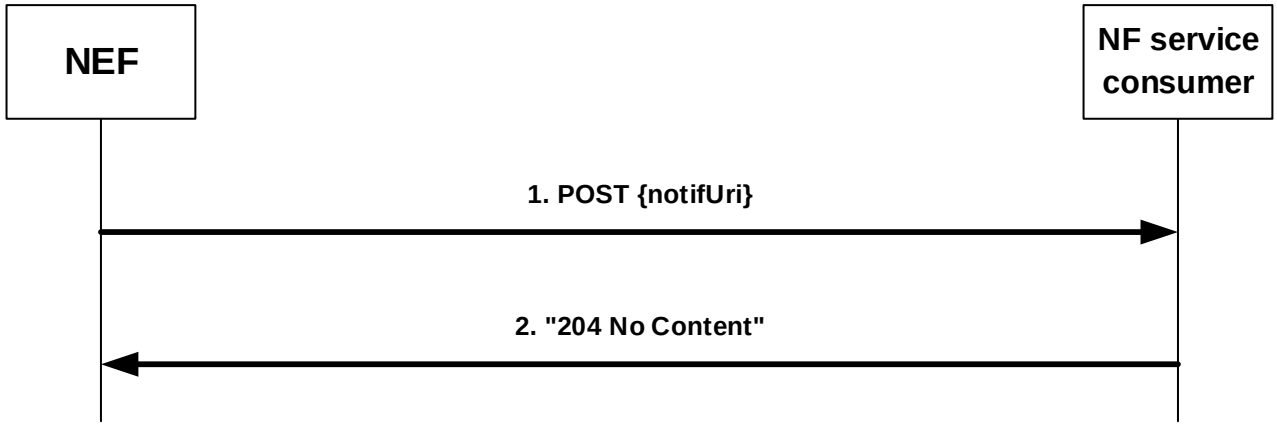

Figure 4.5.2.4.2-1: Notification about ECS Address Configuration Information

If the NEF observes ECS Address Configuration Information that an NF service consumer has subscribed, the NEF shall send an HTTP POST request as shown in step 1 of figure 4.5.2.4.2-1, with the "{notifUri}" as request URI containing the value previously provided by the NF service consumer within the corresponding subscription, and the EcsAddrCfgInfoNotification data structure as request body.

The EcsAddrCfgInfoNotification data structure shall include:

- the notification correlation identifier in the "notifCorrId" attribute;
- the ECS Address Configuration Information within the "ecsAddrCfgInfo" attribute.

NOTE: In this release of the specification, the NF service consumer (e.g., SMF) does not need to understand the internal structure of ECS Address Configuration Information.

Upon successful reception of an HTTP POST request with "{notifUri}" as request URI and EcsAddrCfgInfoNotification data structure as request body, the NF service consumer shall send an HTTP "204 No Content" response, as shown in step 2 of figure 4.5.2.4.2-1.

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

4.6 Nnef_DNAIMapping Service

4.6.1 Service Description

4.6.1.1 Overview

The Nnef_DNAIMapping service, as defined in 3GPP TS 23.502 [3], is provided by the Network Exposure Function (NEF). This service allows the NEF service consumer (e.g. NWDAF) to create or delete subscription(s) of DNAI Mapping information to NEF and also by NEF to notify the NF service consumer about the update of the DNAI Mapping information.

4.6.1.2 Service Architecture

The Nnef_DNAIMapping service is part of the Nnef service-based interface exhibited by the Network Exposure Function (NEF).

Known consumer of the Nnef_DNAIMapping service is:

- Network Data Analytics Function (NWDAF)

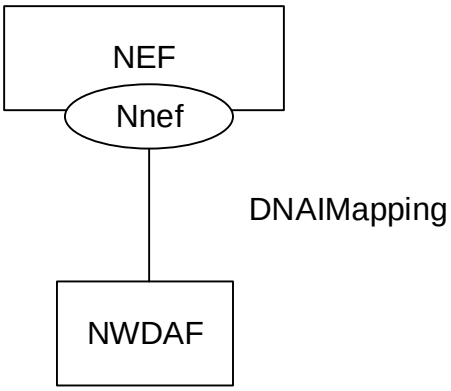

Figure 4.6.1.2-1: Reference Architecture for the Nnef_DNAIMapping Service; SBI representation

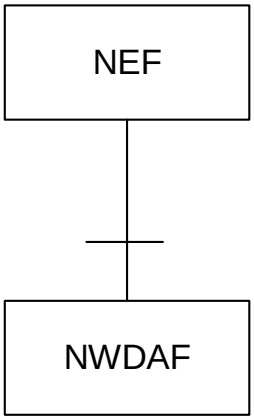

Figure 4.6.1.2-2: Reference Architecture for the Nnef_DNAIMapping Service: reference point representation

4.6.1.3 Network Functions

4.6.1.3.1 Network Exposure Function (NEF)

The Network Exposure Function (NEF) allows the NF service consumer (e.g. NWDAF) to subscribe to and unsubscribe from the NEF for the DNAI Mapping information and also by NEF to notify the NF service consumer about the update of the DNAI Mapping information.

4.6.1.3.2 NF Service Consumers

The known NF service consumers are as follows:

The Network Data Analytics Function (NWDAF):

- supports (un)subscribing to notifications of DNAI Mapping information from the NEF.
- supports receiving the notifications of Update of DNAI Mapping Information from the NEF.

4.6.2 Service Operations

4.6.2.1 Introduction

Service operations defined for the Nnef_DNAIMapping Service are shown in table 4.6.2.1-1.

Table 4.6.2.1-1: Nnef_DNAIMapping Service Operations

Service Operation Name	Description	Initiated by
Nnef_DNAIMapping_Subscribe	This service operation is used by an NF service consumer to explicitly subscribe the notification of DNAI Mapping Information.	NF service consumer
Nnef_DNAIMapping_Unsubscribe	This service operation is used by an NF service consumer to explicitly unsubscribe the notification of DNAI Mapping Information.	NF service consumer
Nnef_DNAIMapping_Notify	This service operation is used by the NEF to provide Update DNAI Mapping Information to the NF service consumer.	NEF

4.6.2.2 Nnef_DNAIMapping_Subscribe service operation

4.6.2.2.1 General

This service operation is provided by the NEF for the NF service consumers to explicitly subscribe the notification of DNAI Mapping Information.

4.6.2.2.2 Creating a new subscription for notification of DNAI Mapping Information

Figure 4.6.2.2.2-1 illustrates the creation of a Individual DNAI Mapping Information Subscription.

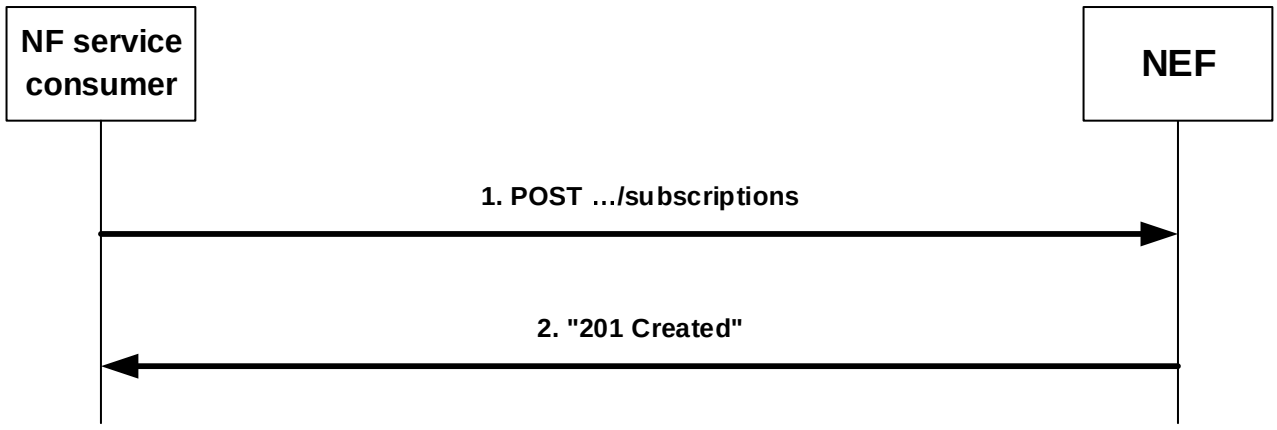

Figure 4.6.2.2.2-1: Creation of a subscription

In order to subscribe to DNAI Mapping Information, the NF service consumer shall send an Nnef_DNAIMapping_Subscribe request using the HTTP POST method to the NEF with "{apiRoot}/nnef-dnai-mapping/<apiVersion>/subscriptions" as request URI as shown in step 1 of figure 4.6.2.2.2-1. The HTTP POST message shall include DnaiMapSub data structure as request body. The contents of the DnaiMapSub data structure are as described in clause 4.4.34.2 of 3GPP TS 29.522 [15].

Upon receipt of the corresponding HTTP POST message, 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 response from the UDR, the NEF shall not create the resource and shall respond to the NF service consumer with a proper error status code. If the NEF received within an error response a "ProblemDetails" data structure with a "cause" attribute indicating an application error, the NEF shall relay this error response to the NF service consumer with a corresponding application error, when applicable.

On successful DNAI Mapping subscription creation, the NEF shall return an HTTP POST response with an HTTP "201 Created" status code to the NF service consumer, including a "Location" header containing the URI of the created "Individual DNAI Mapping Subscription" resource and the response body containing a representation of the created resource within the DnaiMapSub data structure. The contents of the DnaiMapSub data structure in the response are as described for the subscription response in clause 4.4.34.2 of 3GPP TS 29.522 [15].

On failure, the NEF shall take proper error handling actions, as specified in clause 5.5.7, and respond to the NF service consumer with an appropriate error status code.

4.6.2.3 Nnef_DNAIMapping_Unsubscribe service operation

4.6.2.3.1 General

This service operation is used by an NF service consumer (e.g. NWDAF) to explicitly unsubscribe the notification of DNAI Mapping information.

The following procedure using the Nnef_DNAIMapping_Unsubscribe service operation is supported:

- unsubscription from the notification of DNAI Mapping information.

4.6.2.3.2 Unsubscription of notification of DNAI Mapping Information

Figure 4.6.2.3.2-1 illustrates the unsubscription of event notifications from NEF.

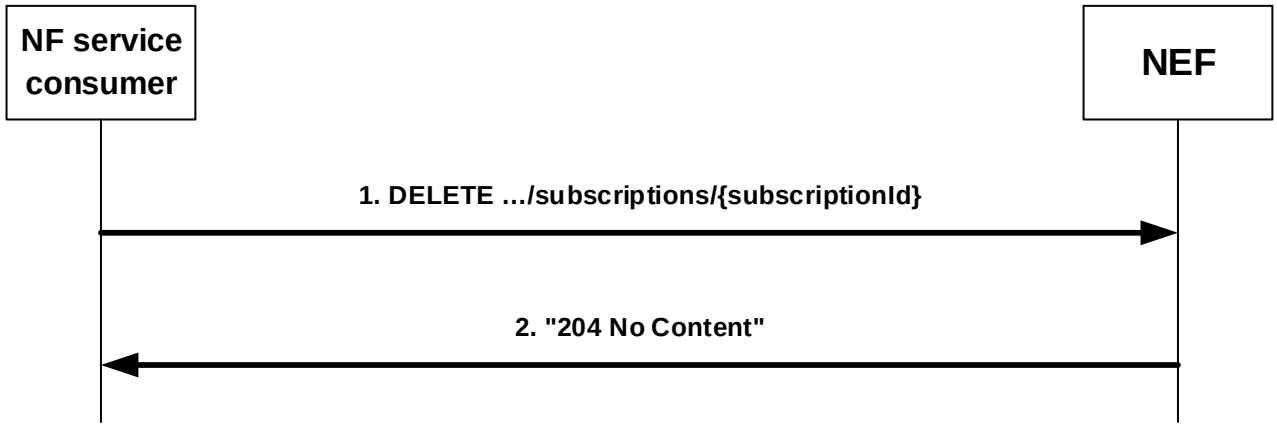

Figure 4.6.2.3.2-1: NF service consumer unsubscribes from notifications

In order to delete an existing subscription to DNAI Mapping Information, the NF service consumer shall send an HTTP DELETE request message with "{apiRoot}/nnef-dnai-mapping/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of figure 4.6.2.3.2-1, where "{subscriptionId}" is the subscription identifier of the existing subscription resource that is to be deleted.

Upon successful reception of an HTTP DELETE, the NEF shall delete the individual resource and shall respond to the NF service consumer with an HTTP "204 No Content" response message, as shown in step 2 of figure 4.6.2.3.2-1.

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

If errors occur when processing the HTTP DELETE request, the NEF shall send an HTTP error response as specified in clause 5.5.7.

4.6.2.4 Nnef_DNAIMapping_Notify service operation

4.6.2.4.1 General

The Nnef_DNAIMapping_Notify service operation enables the NEF to notify the DNAI Mapping Information to the NF service consumer.

The following procedure using the Nnef_DNAIMapping_Notify service operation is supported:

- notification about subscribed DNAI Mapping Information.

4.6.2.4.2 Notification of changes of DNAI Mapping Information

Figure 4.6.2.4.2-1 illustrates the notification about DNAI Mapping Information.

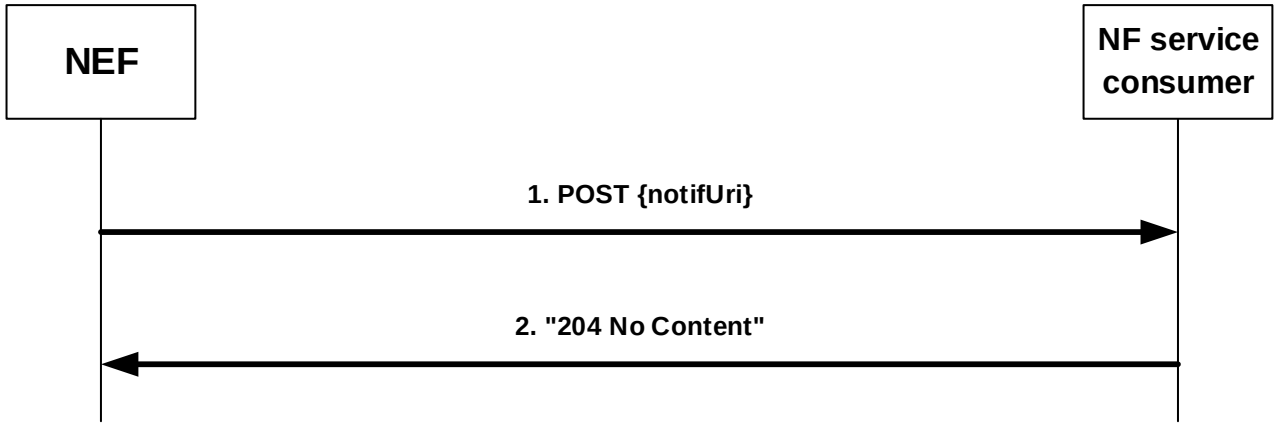

Figure 4.6.2.4.2-1: Notification about changes of DNAI Mapping Information

If the NEF observes DNAI Mapping Information that an NF service consumer has subscribed, the NEF shall send an HTTP POST request as shown in step 1 of figure 4.6.2.4.2-1, with the "{notifUri}" as request URI containing the value previously provided by the NF service consumer within the corresponding subscription, and the DnaiMapUpdateNotif data structure as request body.

Upon successful reception of an HTTP POST request with "{notifUri}" as request URI and DnaiMapUpdateNotif data structure as request body, the NF service consumer shall send an HTTP "204 No Content" response, as shown in step 2 of figure 4.6.2.4.2-1.

On failure, the NF service consumer shall take proper error handling actions, as specified in clause 5.5.7, and respond to the NEF with an appropriate error status code.

4.7 Nnef_UEId Service

4.7.1 Service Description

4.7.1.1 Overview

The Nnef_UEId service is provided by the Network Exposure Function (NEF). This service allows:

- The NF service consumer (e.g., V-NEF) providing the external UE identifier to fetch the internal UE identifier used for e.g., the V-NEF to fetch the SUPI from the H-NEF for the roaming UE under the roaming agreement with the roaming partner(s).
- The NF service consumer (e.g., GMLC) to retrieve the UE ID mapping information.

4.7.1.2 Service Architecture

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

The Nnef_UEId service is part of the Nnef service-based interface exhibited by the Network Exposure Function (NEF).

Known consumer of the Nnef_UEId service is:

- Visited Network Exposure Function (V-NEF)
- Gateway Mobile Location Centre (GMLC)

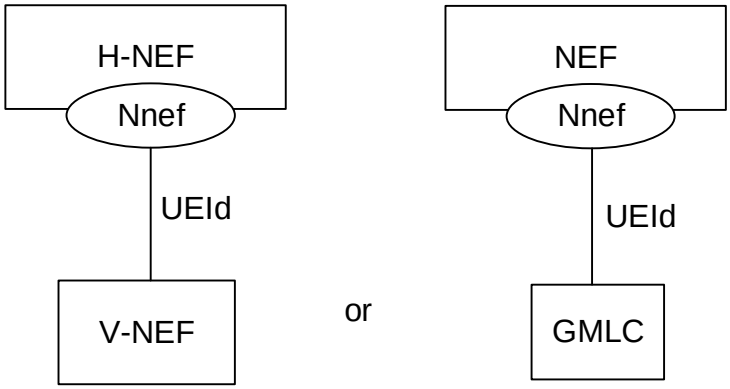

Figure 4.7.1.2-1: Reference Architecture for the Nnef_UEId Service; SBI representation

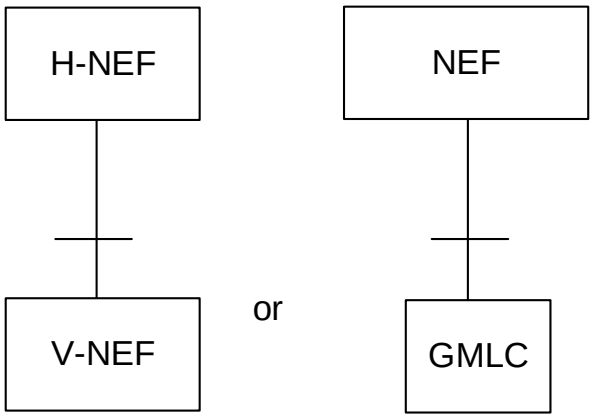

Figure 4.7.1.2-2: Reference Architecture for the Nnef_UEId Service: reference point representation

4.7.1.3 Network Functions

4.7.1.3.1 Network Exposure Function (NEF)

The Network Exposure Function (NEF) allows:

- The NF service consumer (e.g., V-NEF) providing the external UE identifier to fetch the internal UE identifier from the H-NEF for the roaming UE under the roaming agreement with the roaming partner(s).
- The NF service consumer (e.g., GMLC) to retrieve the UE ID mapping information.

4.7.1.3.2 NF Service Consumers

The known NF service consumers are as follows:

The Visited Network Exposure Function (V-NEF):

- providing the external UE identifier to fetch the internal UE identifier from the H-NEF for the roaming UE under the roaming agreement with the roaming partner(s).

The Gateway Mobile Location Centre (GMLC):

- providing the Application Layer ID to fetch the GPSI of a UE, or vice versa.

4.7.2 Service Operations

4.7.2.1 Introduction

The service operations defined for the Nnef_UEId Service are shown in table 4.7.2.1-1.

Table 4.7.2.1-1: Nnef_UEId Service Operations

Service Operation Name	Description	Initiated by
Nnef_UEId_Get	This service operation is either: - used by the NF service consumer (e.g., V-NEF) providing the external UE identifier to fetch the internal UE identifier from the NEF (e.g., H-NEF) for the roaming UE under the roaming agreement with the roaming partner(s). - used by the NF service consumer (e.g., GMLC) to retrieve the UE ID mapping information.	NF service consumer (e.g., V-NEF)

4.7.2.2 Nnef_UEId_Get service operation

4.7.2.2.1 General

The Nnef_UEId_Get service operation enables:

- The NF service consumer (e.g.,V-NEF) provisioning the external UE identifier to fetch the internal UE identifier from the H-NEF for roaming UE under the roaming agreement with the roaming partner(s).
- The NF service consumer (e.g., GMLC) to retrieve the UE ID mapping information.

The following procedure using the Nnef_UEId_Get service operation is supported:

- To fetch the internal UE identifier for the roaming UE.
- To retrieve UE ID mapping information.

4.7.2.2.2 Fetch internal UE information for roaming UE

Figure 4.6.2.2.2-1 illustrates the retrieval of internal UE ID for roaming UE.

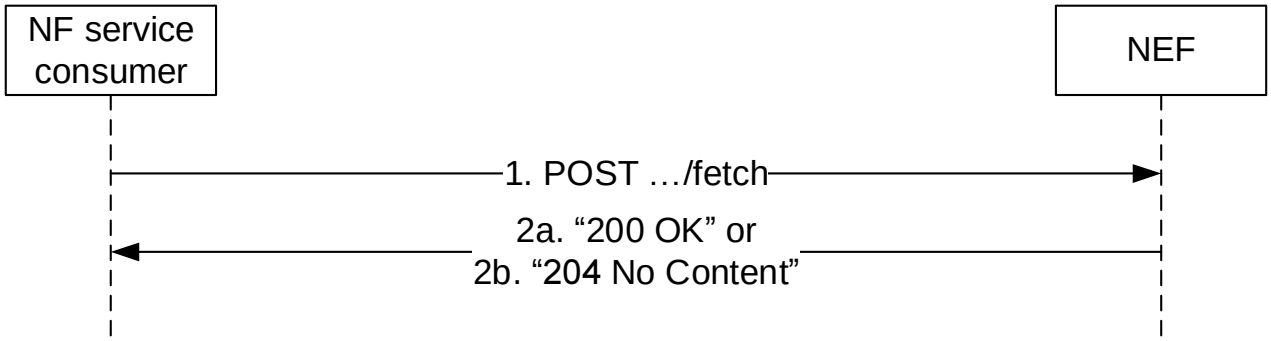

Figure 4.7.2.2.2-1: Fetch internal UE information for roaming UE

In order to fetch the internal UE information (e.g., UE identifier or UE private IP address) for the roaming UE, the NF service consumer (e.g. V-NEF) shall send an HTTP POST request as shown in step 1 of figure 4.7.2.2.2-1 targeting the custom operation URI "{apiRoot}/nnef-ueid/<apiVersion>/fetch" to fetch the internal UE identifier according to the provided UeIdReq data type which shall include:

external UE identifier of an individual UE via a "gpsi" attribute; or

UE public IP address via a "uePubIpAddr" attribute.

When receiving the HTTP POST request message, the NEF shall verify the NF service consumer (e.g. V-NEF) whether belong to the roaming partner(s) under roaming agreement.

On success, the NEF shall respond with "200 OK" status code with the message body containing the UeIdInfo data structure in the response body shall include:

- internal UE identifier of an individual UE via a "supi" attribute; or
- UE private IP address via a "uePvtIpAddr" attribute and optionally with HPLMN DNN and S-NSSAI via a "hPlmnDnnSnssai" attribute.

If the requested internal UE identifier does not exist, the NEF shall respond with "204 No Content" status code.

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

If the NEF cannot successfully fulfil the received HTTP POST request due to an internal error or an error in the HTTP POST request, the NEF shall send an HTTP error response as specified in clause 5.6.7.

4.7.2.2.3 UE ID Mapping Information Retrieval

Figure 4.7.2.2.3-1 depicts a scenario where the service consumer sends a request to the NEF to request UE ID mapping information (see also 3GPP°TS°23.502°[3]).

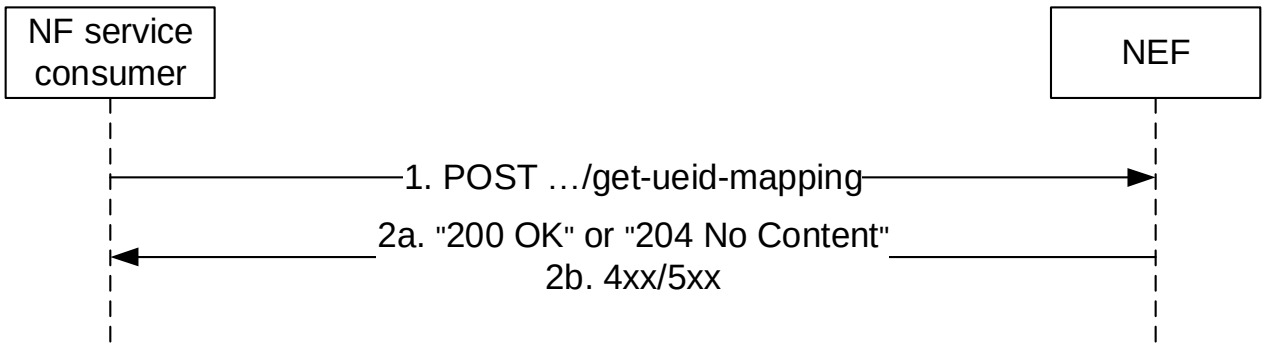

Figure 4.7.2.2.3-1: UE ID Mapping Information Retrieval

1. In order to request the retrieval of UE ID mapping information, the service consumer shall send an HTTP POST request to the NEF targeting the URI of the corresponding custom operation (i.e., "UEIDMappingInfoRetrieval"), with the request body including the MapUeIdInfo data structure.

2a. Upon success, the NEF shall respond with either:

- an HTTP "200 OK" status code with the response body containing the requested UE ID mapping information within the MapUeIdInfo data structure; or
- an HTTP "204 No Content" status code in case no UE ID mapping information exists for the received input parameters.

2b. On failure, the appropriate HTTP status code indicating the error shall be returned and appropriate additional error information should be returned in the HTTP POST response body, as specified in clause 5.6.7.

5 API Definitions

5.1 Nnef_EventExposure Service API

5.1.1 Introduction

The Nnef_EventExposure service shall use the Nnef_EventExposure API.

The API URI of the Nnef_EventExposure API shall be:

{apiRoot}/<apiName>/<apiVersion>

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "nnef-eventexposure".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 5.1.3.

5.1.2 Usage of HTTP

5.1.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

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

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

5.1.2.2 HTTP standard headers

5.1.2.2.1 General

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

5.1.2.2.2 Content type

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

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

5.1.2.3 HTTP custom headers

The Nnef_EventExposure API shall support mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] and may support HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4].

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

5.1.3 Resources

5.1.3.1 Overview

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

Figure 5.1.3.1-1 depicts the resource URIs structure for the Nnef_EventExposure API.

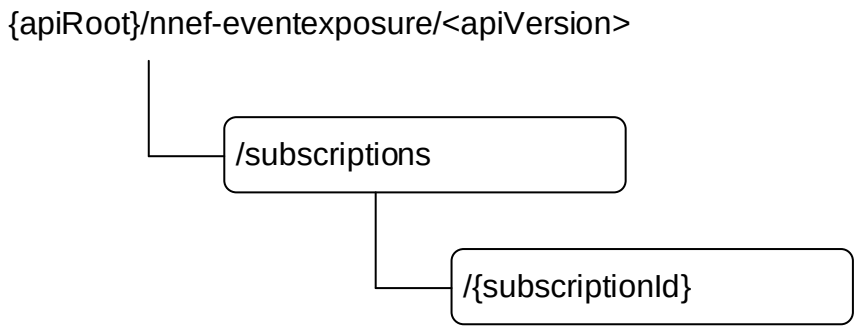

Figure 5.1.3.1-1: Resource URI structure of the Nnef_EventExposure API

Table 5.1.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 5.1.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Network Exposure Event Subscriptions	/subscriptions	POST	Creates a subscription to notifications on application or user related event(s), i.e. creation of an Individual Network Exposure Event Subscription resource.
Individual Network Exposure Event Subscription	/subscriptions/{subscriptionId}	GET	Reads an Individual Network Exposure Event Subscription resource.
		PUT	Modifies an Individual Network Exposure Event Subscription.
		DELETE	Cancels an individual subscription to notifications of subscribed event.

5.1.3.2 Resource: Network Exposure Event Subscriptions

5.1.3.2.1 Description

The resource represents the collection of Network Exposure Event subscriptions of the Nnef_EventExposure service. It allows NF service consumers to create a new subscription to notifications on application or user related event(s).

5.1.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 5.1.3.2.2-1.

Table 5.1.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.1.1

5.1.3.2.3 Resource Standard Methods

5.1.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.1.3.2.3.1-1.

Table 5.1.3.2.3.1-1: URI query parameters supported by the <method 1> method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 5.1.3.2.3.1-2 and the response data structures and response codes specified in table 5.1.3.2.3.1-3.

Table 5.1.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
NefEventExposureSubsc	M	1	Contains the information required for the creation of a new Individual Network Exposure Event Subscription resource.

Table 5.1.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
NefEventExposureSubsc	M	1	201 Created	Contains the representation of the Individual Network Exposure Event Subscription resource.
ProblemDetails	O	0..1	403 Forbidden	(NOTE 2)
NOTE 1: 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. NOTE 2: Failure cases are described in clause 5.1.7.				

Table 5.1.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions/{subscriptionId}.

5.1.3.3 Resource: Individual Network Exposure Event Subscription

5.1.3.3.1 Description

The resource represents an individual Network Exposure Event subscription of the Nnef_EventExposure service. It allows NF service consumers to read/modify/cancel a subscription to notifications on application or user related event(s).

5.1.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.1.3.3.2-1.

Table 5.1.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.1.1
subscriptionId	string	Identifies a subscription to the NEF event exposure service.

5.1.3.3.3 Resource Standard Methods

5.1.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.1.3.3.3.1-1.

Table 5.1.3.3.3.1-1: 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 5.1.3.3.3.1-2 and the response data structures and response codes specified in table 5.1.3.3.3.1-3.

Table 5.1.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.1.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
NefEventExposureSubsc	M	1	200 OK	Contains the representation of the Individual Network Exposure Event Subscription resource.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription retrieval. Applicable if the feature "ES3XX" is supported. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription retrieval. Applicable if the feature "ES3XX" is supported. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.1.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.1.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.1.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 5.1.3.3.3.2-1.

Table 5.1.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.1.3.3.3.2-2 and the response data structures and response codes specified in table 5.1.3.3.3.2-3.

Table 5.1.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
NefEventExposureSubsc	M	1	Modifies the existing Individual Network Exposure Event Subscription resource.

Table 5.1.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
NefEventExposureSubsc	M	1	200 OK	Successful case. The Individual Network Exposure Event Subscription resource was modified and a representation is returned.
n/a			204 No Content	Successful case. The Individual Network Exposure Event Subscription resource was modified.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription modification. Applicable if the feature "ES3XX" is supported. (NOTE 3)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription modification. Applicable if the feature "ES3XX" is supported. (NOTE 3)
ProblemDetails	O	0..1	403 Forbidden	(NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: Failure cases are described in clause 5.1.7. NOTE 3: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.1.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.1.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.1.3.3.3 DELETE

This method shall support the URI query parameters specified in table 5.1.3.3.3.3-1.

Table 5.1.3.3.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.1.3.3.3.3-2 and the response data structures and response codes specified in table 5.1.3.3.3.3-3.

Table 5.1.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.1.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual Network Exposure Event Subscription resource matching the subscriptionId was deleted.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription termination. Applicable if the feature "ES3XX" is supported. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription termination. Applicable if the feature "ES3XX" is supported. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.1.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.1.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.1.4 Custom Operations without associated resources

None.

5.1.5 Notifications

5.1.5.1 General

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

Table 5.1.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Network Exposure Event Notification	{notifUri}	POST	Provides Information about observed events.

5.1.5.2 Network Exposure Event Notification

5.1.5.2.1 Description

The Network Exposure Event Notification is used by the NEF to report one or several observed Events to a NF service consumer that has subscribed to such Notifications.

5.1.5.2.2 Target URI

The Notification URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.1.5.2.2-1.

Table 5.1.5.2.2-1: Callback URI variables for this resource

Name	Data type	Definition
notifUri	Uri	The Notification Uri as assigned by the NF service consumer during the subscription service operation and described within the NefEventExposureSubsc data type (see table 5.1.6.2.2-1).

5.1.5.2.3 Standard Methods

5.1.5.2.3.1 POST

This method shall support the request data structures specified in table 5.1.5.2.3.1-1 and the response data structures and response codes specified in table 5.1.5.2.3.1-1.

Table 5.1.5.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
NefEventExposureNotif	M	1	Provides Information about observed events.

Table 5.1.5.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during event notification. Applicable if the feature "ES3XX" is supported. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during event notification. Applicable if the feature "ES3XX" is supported. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.1.5.2.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

Table 5.1.5.2.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

5.1.6 Data Model

5.1.6.1 General

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

Table 5.1.6.1-1 specifies the data types defined for the Nnef_EventExposure service based interface protocol.

Table 5.1.6.1-1: Nnef_EventExposure specific Data Types

Data type	Section defined	Description	Applicability
GNSSAssistData	5.1.6.3.2	Represents GNSS Assistance Data.	GNSSAssistData
GNSSAssistDataInfo	5.1.6.2.13	Represents GNSS Assistance Data related information.	GNSSAssistData
GNSSServArea	5.1.6.2.14	Represents the serving area of the GNSS Assistance Data.	GNSSAssistData
NefEvent	5.1.6.3.3	Represents Network Exposure Events.	
NefEventExposureNotif	5.1.6.2.3	Represents notifications on network exposure event(s) that occurred for an Individual Network Exposure Event Subscription resource.	
NefEventExposureSubsc	5.1.6.2.2	Represents an Individual Network Exposure Event Subscription resource.	
NefEventFilter	5.1.6.2.7	Represents event filter information for an event.	
NefEventNotification	5.1.6.2.4	Represents information related to an event to be reported.	
NefEventSubs	5.1.6.2.5	Represents an event to be subscribed and the related event filter information	
PerformanceDataInfo	5.1.6.2.12	Contains Performance Data Analytics related information collection	PerformanceData
ServiceExperienceInfo	5.1.6.2.9	Contains service experience information associated with an application.	ServiceExperience
TargetUeIdentification	5.1.6.2.8	Identifies the UE to which the request applies.	
UeCommunicationInfo	5.1.6.2.6	Contains UE communication information associated with an application.	UeCommunication
UeMobilityInfo	5.1.6.2.10	Contains UE mobility information associated with an application.	UeMobility
UeTrajectoryInfo	5.1.6.2.11	Contains UE trajectory information.	UeMobility

Table 5.1.6.1-2 specifies data types re-used by the Nnef_EventExposure service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnef_EventExposure service based interface.

Table 5.1.6.1-2: Nnef_EventExposure re-used Data Types

Data type	Reference	Comments	Applicability
AddrFqdn	3GPP TS 29.517 [18]	IP address and/or FQDN.	
ApplicationId	3GPP TS 29.571 [16]	Application identifier	
CollectiveBehaviourFilter	3GPP TS 29.517 [18]	Contains the parameter type and value pair to express the collective behaviour event filters.	CollectiveBehaviour
CollectiveBehaviourInfo	3GPP TS 29.517 [18]	Contains the collective behaviour analytics information.	CollectiveBehaviour
CommunicationCollection	3GPP TS 29.517 [18]	Contains communication information.	UeCommunication
ConsumptionReportingUnitsCollection	3GPP TS 26.512 [30]	Represents the Media Streaming Consumption.	MSEventExposure
DateTime	3GPP TS 29.571 [16]	Contains a date and a time.	
DatVolTransTimeCollection	3GPP TS 29.517 [18]	Contains data volume transfer time information.	DataVolTransferTime
Dnai	3GPP TS 29.571 [16]		
DispersionCollection	3GPP TS 29.517 [18]	Contains dispersion collection information.	Dispersion
DurationSec	3GPP TS 29.571 [16]	Indicates a period of time in units of seconds.	DataVolTransferTime
DynamicPolicyInvocationsCollection	3GPP TS 26.512 [30]	Represents the Media Streaming Dynamic Policy invocation.	MSEventExposure
ExceptionInfo	3GPP TS 29.517 [18]	Represents exception information for a service flow.	Exceptions
GeographicArea	3GPP TS 29.572 [28]	Represents a geographic area.	
GeographicalCoordinates	3GPP TS 29.572 [28]	Represents geographical coordinates.	
GroupId	3GPP TS 29.571 [16]	Contains a Group identifier.	
IpAddr	3GPP TS 29.571 [16]	Identifies the IP address of a UE.	PerformanceData
MediaStreamingAccessesCollection	3GPP TS 26.512 [30]	Represents the Media Streaming access.	MSEventExposure
MSAccessActivityCollection	3GPP TS 29.517 [18]	Represents the Media Streaming access activity of UE Application collected via Data Collection AF.	MSAccessActivity
MsConsumptionCollection	3GPP TS 29.517 [18]	Represents the Media Streaming Consumption reports of UE Application collected via Data Collection AF.	MSConsumption

MsDynPolicyInvocationCollection	3GPP TS 29.517 [18]	Represents the Media Streaming Dynamic Policy Invocation of UE Application collected via Data Collection AF.	MSDynPolicyInvocation
MsQoeMetricsCollection	3GPP TS 29.517 [18]	Represents the Media Streaming QoE Metrics of UE Application collected via Data Collection AF.	MSQoeMetrics
MsNetAssInvocationCollection	3GPP TS 29.517 [18]	Represents the Media Streaming Network Assistance invocation of UE Application collected via Data Collection AF.	MSNetAssInvocation
NetworkAreaInfo	3GPP TS 29.554 [21]	Represents a network area information.	
NetworkAssistanceInvocationsCollection	3GPP TS 26.512 [30]	Represents the Media Streaming Network Assistance invocation.	MSEventExposure
PacketDelBudget	3GPP TS 29.571 [16]	Indicates average Packet Delay.	PerformanceData
PacketLossRate	3GPP TS 29.571 [16]	Indicates average Loss Rate.	PerformanceData
PerformanceData	3GPP TS 29.517 [18]	Contains Performance Data	PerformanceData
QoEMetricsCollection	3GPP TS 26.512 [30]	Represents the Media Streaming QoE metrics.	MSEventExposure
RedirectResponse	3GPP TS 29.571 [16]	Contains redirection related information.	ES3XX
ReportingInformation	3GPP TS 29.523 [22]	Represents the type of reporting the subscription requires.	
Supi	3GPP TS 29.571 [16]	Contains a SUPI.	
SupportedFeatures	3GPP TS 29.571 [16]	Indicates the features supported.	
ServiceExperienceInfoPerFlow	3GPP TS 29.517 [18]	Contains service experience information associated with a service flow.	ServiceExperience
Tai	3GPP TS 29.571 [16]	Represents the identifier of a tracking area.	
Uinteger	3GPP TS 29.571 [16]	Unsigned integer.	ServiceExperienceExt_eNA
UserDataCongestionCollection	3GPP TS 29.517 [18]	Contains User Data Congestion Analytics related information collection.	UserDataCongestion
UserLocation	3GPP TS 29.571 [16]	Contains user location information.	UeMobility
Uri	3GPP TS 29.571 [16]	Contains a URI.	

Volume	3GPP TS 29.122 [29]	Unsigned integer identifying a volume in units of bytes.	DataVolTransferTime

5.1.6.2 Structured data types

5.1.6.2.1 Introduction

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

5.1.6.2.2 Type: NefEventExposureSubsc

Table 5.1.6.2.2-1: Definition of type NefEventExposureSubsc

Attribute name	Data type	P	Cardinality	Description	Applicability
dataAccProfId	string	O	0..1	Represents a unique identifier for the Data Access Profile.	DataAccProfileId
eventsSubs	array(NefEvent Subs)	M	1..N	Subscribed events and the related event filters.	
eventsRepInfo	ReportingInform ation	O	0..1	Represents the reporting requirements of the subscription. If omitted, the default values within the ReportingInformation data type apply. (NOTE 2)	
notifUri	Uri	M	1	Notification URI for event reporting.	
eventNotifs	array(NefEvent Notification)	C	1..N	Represents the Events to be reported. Shall only be present if the immediate reporting indication in the "immRep" attribute within the "eventsRepInfo" attribute sets to true in the event subscription, and the reports are available.	
notifId	string	M	1	Notification Correlation ID assigned by the NF service consumer.	
suppFeat	SupportedFeatu res	C	0..1	This IE represents a list of Supported features used as described in clause 5.8. Shall be present in the HTTP POST request/response; or in the HTTP GET response if the "supp-feat" attribute query parameter is included in the HTTP GET request. (NOTE 1)	

NOTE 1: In the HTTP POST request it represents the set of NF service consumer supported features. In the HTTP POST and GET responses it represents the set of features supported by both the NF service consumer and the NEF.

NOTE 2: The "eventsRepInfo" attribute may include muting instructions within the "notifFlagInstruct" attribute and/or muting notifications settings within the "mutingSetting" attribute only if the EnhDataMgmt feature is supported.

5.1.6.2.3 Type: NefEventExposureNotif

Table 5.1.6.2.3-1: Definition of type NefEventExposureNotif

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

5.1.6.2.4 Type: NefEventNotification

Table 5.1.6.2.4-1: Definition of type NefEventNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
event	NefEvent	M	1	Represents the reported application related event.	
timeStamp	DateTime	M	1	Time at which the event is observed.	
svcExprcInfos	array(ServiceExperienceInfo)	C	1..N	Contains the service experience information. Shall be present if the "event" attribute sets to "SVC_EXPERIENCE"	ServiceExperience
ueMobilityInfos	array(UeMobilityInfo)	C	1..N	Contains the UE mobility information. Shall be present if the "event" attribute sets to "UE_MOBILITY"	UeMobility
ueCommInfos	array(UeCommunicationInfo)	C	1..N	Contains the application communication information. Shall be present if the "event" attribute sets to "UE_COMM"	UeCommunication
excepInfos	array(ExceptionInfo)	C	1..N	Each element represents the exception information for a service flow. Shall be present if the "event" attribute sets to "EXCEPTIONS".	Exceptions
congestionInfos	array(UserDataCongestionCollection)	C	1..N	Each element represents the user data congestion information for an AF application. Shall be present if the "event" attribute sets to "USER_DATA_CONGESTION".	UserDataCongestion
perfDataInfos	array(PerformanceDataInfo)	C	1..N	Each element represents the performance data information collected for an AF application.	PerformanceData
dispersionInfos	array(DispersionCollection)	C	1..N	Each element represents the UE dispersion information collected for an AF. Shall be present if the "event" attribute sets to "DISPERSION".	Dispersion
collBhvrInfs	array(CollectiveBehaviourInfo)	C	1..N	Each element represents the collective behaviour information related to a set of UEs, applications. Shall be present if the "event" attribute sets to "COLLECTIVE_BEHAVIOUR". (NOTE)	CollectiveBehaviour
msQoeMetrInfos	array(MsQoeMetricsCollection)	C	1..N	Each element represents the Media Streaming QoE metrics information collected for an UE application via the Data Collection AF. Shall be present if the "event" attribute sets to "MS_QOE_METRICS". This attribute is deprecated; the attribute "msQoeMetrics" should be used instead.	MSQoeMetrics
msQoeMetrics	array(QoEMetricsCollection)	C	1..N	Each element represents the Media Streaming QoE metrics event notification. Shall be present if the "event" attribute sets to "MS_QOE_METRICS". This attribute deprecates "msQoeMetrInfos" attribute.	MSEventExposure

msConsumpInfos	array(MsConsumptionCollection)	C	1..N	Each element represents the Media Streaming Consumption reports information collected for an UE application via the Data Collection AF. Shall be present if the "event" attribute sets to "MS_CONSUMPTION". This attribute is deprecated; the attribute "msConsumpReports" should be used instead.	MSConsumption
msConsumpReports	array(ConsumptionReportingUnitsCollection)	C	1..N	Each element represents the Media Streaming Consumption event notification. Shall be present if the "event" attribute sets to "MS_CONSUMPTION". This attribute deprecates "msConsumpInfos" attribute.	MSEventExposure
msNetAssInvInfos	array(MsNetAssInvocationCollection)	C	1..N	Each element represents the Media Streaming Network Assistance invocation information collected for an UE application via the Data Collection AF. Shall be present if the "event" attribute sets to "MS_NET_ASSIST_INVOCATION". This attribute is deprecated; the attribute "msNetAssistInvocation" should be used instead.	MSNetAssInvocation
msNetAssistInvocation	array(NetworkAssistanceInvocationsCollection)	C	1..N	Each element represents the Media Streaming Network Assistance invocation event notification. Shall be present if the "event" attribute sets to "MS_NET_ASSIST_INVOCATION". This attribute deprecates "msNetAssInvInfos" attribute.	MSEventExposure
msDynPlyInvInfos	array(MsDynPolicyInvocationCollection)	C	1..N	Each element represents the Media Streaming Dynamic Policy Invocation information collected for an UE application via the Data Collection AF. Shall be present if the "event" attribute sets to "MS_DYN_POLICY_INVOCATION". This attribute is deprecated; the attribute "msDynPlyInvocation" should be used instead.	MSDynPolicyInvocation
msDynPlyInvocation	array(DynamicPolicyInvocationsCollection)	C	1..N	Each element represents the Media Streaming Dynamic Policy invocation event notification. Shall be present if the "event" attribute sets to "MS_DYN_POLICY_INVOCATION". This attribute deprecates "msDynPlyInvInfos" attribute.	MSEventExposure

msAccActInfos	array(MSAccessActivityCollection)	C	1..N	Each element represents the Media Streaming access activity collected for an UE application via the Data Collection AF. Shall be present if the "event" attribute sets to "MS_ACCESS_ACTIVITY". This attribute is deprecated; the attribute "msAccess" should be used instead.	MSAccessActivity
msAccess	array(MediaStreamingAccessesCollection)	C	1..N	Each element represents the Media Streaming access event notification. Shall be present if the "event" attribute sets to "MS_ACCESS_ACTIVITY". This attribute deprecates "msAccActInfos" attribute.	MSEventExposure
gnssAssistDataInfo	GNSSAssistDataInfo	C	0..1	Represents the GNSS Assistance data information. This attribute shall be present only if the "event" attribute is set to "GNSS_ASSISTANCE_DATA".	GNSSAssistData
datVolTransTimeInfos	array(DatVolTransTimeCollection)	C	1..N	Each element represents the data volume transfer time information related to an UE. The "gpsi" attribute within the DatVolTransTimeCollection data type is not applicable. This attribute shall be present if the "event" attribute sets to "DATA_VOLUME_TRANSFER_TIME".	DataVolTransferTime
NOTE: The "collBhvrInfs" attribute may include the "collisionDist", "absDirs", "relDirs", "ueTrajectory" and "confidence" attributes only if the "RelativeProximity" feature is supported.					

5.1.6.2.5 Type NefEventSubs

Table 5.1.6.2.5-1: Definition of type NefEventSubs

Attribute name	Data type	P	Cardinality	Description	Applicability
event	NefEvent	M	1	Subscribed event.	
eventFilter	NefEventFilter	C	0..1	Represents the event filter information associated with each event. Shall be present if "event" sets to "SVC_EXPERIENCE", "UE_MOBILITY", "UE_COMM", "EXCEPTIONS", "USER_DATA_CONGESTION", "PERF_DATA" "COLLECTIVE_BEHAVIOUR", "DISPERSION", "MS_QOE_METRICS", "MS_CONSUMPTION", "MS_NET_ASSIST_INVOCATION", "MS_DYN_POLICY_INVOCATION", "MS_ACCESS_ACTIVITY", "DATA_VOLUME_TRANSFER_TIME" or "GNSS_ASSISTANCE_DATA".	ServiceExperience UeCommunication UeMobility Exceptions UserDataCongestion PerformanceData Dispersion CollectiveBehaviour MSQoeMetrics MSConsumption MSNetAssInvocation MSDynPolicyInvocation MSAccessActivity DataVolTransferTime GNSSAssistData
eventRepInfo	ReportingInformation	O	0..1	Represents the reporting requirements to be applied for the event provided within the "event" attribute. (NOTE 1, NOTE 2)	PerEventRepReq

NOTE 1: When the "PerEventRepReq" feature is supported and this attribute is present, the "eventRepInfo" attribute may include muting instructions within the "notifFlagInstruct" attribute and/or muting notifications settings within the "mutingSetting" attribute only when the "EnhDataMgmt" feature is supported.

NOTE 2: When the "PerEventRepReq" feature is supported and this attribute is present, the event reporting requirements provided within this attribute shall take precedence over the common events reporting requirements provided within the "eventsRepInfo" attribute of the parent NefEventExposureSubsc data structure.

5.1.6.2.6 Type UeCommunicationInfo

Table 5.1.6.2.6-1: Definition of type UeCommunicationInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
supi	Supi	C	0..1	Identifies an UE. Shall be present if the event exposure request applies to more than one UE.	
interGroupId	GroupId	O	0..1	Identifies an UE group.	
appId	ApplicationId	O	0..1	Identifies an application identifier.	
comms	array(CommunicationCollection)	M	1..N	This attribute contains a list of communication information.	

5.1.6.2.7 Type NefEventFilter

Table 5.1.6.2.7-1: Definition of type NefEventFilter

Attribute name	Data type	P	Cardinality	Description	Applicability
tgtUe	TargetUeIdentification	M	1	Represents the UE information to which the request applies.	
appIds	array(ApplicationId)	C	1..N	Each element indicates an application identifier. If absent, the NefEventFilter data applies to any application (i.e. all applications). (NOTE 2)	ServiceExperience Exceptions UeCommunication UeMobility UserDataCongestion PerformanceData Dispersion CollectiveBehaviour MSQoeMetrics MSConsumption MSNetAssInvocation MSDynPolicyInvocation MSAccessActivity DataVolTransferTime
locArea	NetworkAreaInfo	O	0..1	Represents an area of interest. (NOTE 3)	ServiceExperience Exceptions UeCommunication UeMobility UserDataCongestion Dispersion CollectiveBehaviour MSQoeMetrics MSConsumption MSNetAssInvocation MSDynPolicyInvocation MSAccessActivity DataVolTransferTime GNSSAssistData
collAttrs	array(CollectiveBehaviourFilter)	O	1..N	Each element indicates a collective attribute parameter type and value. (NOTE 4)	CollectiveBehaviour

NOTE 1: Applicability is further described in the corresponding data type.
NOTE 2: For the events "EXCEPTIONS", "UE_MOBILITY", "UE_COMM", and "PERF_DATA", if present, the "appIds" attribute shall include only one element.
NOTE 3: For the "SVC_EXPERIENCE" or "GNSS_ASSISTANCE_DATA" event, only the "tais" attribute within the NetworkAreaInfo data type encoding the "nwAreaInfo" attribute is applicable.
NOTE 4: The attributes "collBehAttr" and "dataProcType" within this attribute may be used to indicate values of collective behaviour attributes to be matched only if the feature "ExtEventFilters" is supported.

5.1.6.2.8 Type TargetUeIdentification

Table 5.1.6.2.8-1: Definition of type TargetUeIdentification

Attribute name	Data type	P	Cardinality	Description	Applicability
supis	array(Supi)	O	1..N	Each element identifies a SUPI for an UE.	ServiceExperience Exceptions UeMobility UeCommunication UserDataCongestion Dispersion MSQoeMetrics MSConsumption MSNetAssInvocation MSDynPolicyInvocation MSAccessActivity DataVolTransferTime
interGroupIds	array(GroupId)	O	1..N	Each element represents an internal group identifier which identifies a group of UEs.	ServiceExperience Exceptions UeMobility UeCommunication MSQoeMetrics MSConsumption MSNetAssInvocation MSDynPolicyInvocation MSAccessActivity
anyUeId	boolean	O	0..1	Identifies whether the request applies to any UE. This attribute shall set to "true" if applicable for any UE, otherwise, set to "false".	ServiceExperience Exceptions UserDataCongestion GNSSAssistData
ueIpAddr	IpAddr	O	0..1	Identifies the UE IP address.	EnPerformanceData
NOTE: For an applicable feature, only one attribute identifying the target UE shall be provided.					

5.1.6.2.9 Type: ServiceExperienceInfo

Table 5.1.6.2.9-1: Definition of type ServiceExperienceInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
appId	ApplicationId	C	0..1	Identifies an application identifier. Shall be present if the event exposure service request applies to more than one application.	ServiceExperience
supis	array(Supi)	C	1..N	Each element represents the internal UE identifier.	ServiceExperience
svcExpPerFlows	array(ServiceExperienceInfoPerFlow)	M	1..N	Each element indicates service experience for each service flow.	ServiceExperience
contrWeights	array(Uinteger)	O	1..N	Indicates the Service Experience Contribution Weights of a list of UEs in the same sequence as in the presented "supis" list of UEs. The weights indicate the relative importance among the elements of this array. The higher the number, the higher the importance.	ServiceExperienceExt_eNA

5.1.6.2.10 Type: UeMobilityInfo

Table 5.1.6.2.10-1: Definition of type UeMobilityInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
supi	Supi	M	1	Identifies an UE. Shall be present if the event exposure request applies to more than one UE.	
appId	ApplicationId	O	0..1	Identifies an application identifier. (NOTE)	
ueTrajs	array(UeTrajectoryInfo)	M	1..N	Identifies an UE moving trajectory.	
areas	array(NetworkAreaInfo)	O	1..N	Indicates a list of areas used by the AF for the application service.	UeMobility_Ext
NOTE: If the "appId" attribute is not present, then indicates the collected UE mobility information is applicable to all the applications for the UE.					

5.1.6.2.11 Type: UeTrajectoryInfo

Table 5.1.6.2.11-1: Definition of type UeTrajectoryInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
ts	DateTime	M	1	Identifies the timestamp when the UE enters this area.	
location	UserLocation	M	1	Includes the location of the UE. (NOTE)	
NOTE: Only EutraLocation data and/or NrLocation data in UserLocation data are applicable to the property.					

5.1.6.2.12 Type PerformanceDataInfo

Table 5.1.6.2.12-1: Definition of type PerformanceDataInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
appId	ApplicationId	O	0..1	Indicates an application identifier.	
ueIpAddr	IpAddr	O	0..1	Identifies the IP address of a UE.	
ipTrafficFilter	FlowInfo	O	0..1	Identifies IP packet filter.	
userLoc	UserLocation	O	0..1	Represents the user location.	
appLocs	array(Dnai)	O	1..N	Represents the application locations.	
asAddr	AddrFqdn	O	0..1	Represents the IP address or FQDN of the Application Server. (NOTE 1)	
perfData	PerformanceData	M	1	Indicates the performance data. (NOTE 2)	
timeStamp	DateTime	M	1	It defines the timestamp of analytics generation.	
NOTE 1: If the "asAddr" attribute is included, either the "ipAddr" attribute or the "fqdn" attribute in the AddrFqdn data type shall be provided. NOTE 2: If the feature "PerformanceDataExt_AIML" is supported, the attribute "perfData" indicates the UL/DL performance data. The "pdbDl", "maxPdbUl", "maxPdbDl", "plrDl", "maxPlrUl", "maxPlrDl", "maxThrputUl", "minThrputUl", "maxThrputDl" and "minThrputDl" attribute(s) within the PerformanceData data type is applicable only if the "PerformanceDataExt_AIML" feature is supported.					

5.1.6.2.13 Type GNSSAssistDataInfo

Table 5.1.6.2.13-1: Definition of type GNSSAssistDataInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
gnssAssistData	GNSSAssistData	M	1	Contains the GNSS Assistance Data.	
servArea	GNSSServArea	M	1	Contains the serving area of the provided GNSS Assistance Data.	
sourceInfo	GeographicalCoordinates	O	0..1	Contains the global geographical coordinates of the source of the GNSS assistance data provided within the "gnssAssistData" attribute.	

5.1.6.2.14 Void

5.1.6.2.15 Type GNSSServArea

Table 5.1.6.2.15-1: Definition of type GNSSServArea

Attribute name	Data type	P	Cardinality	Description	Applicability
geographicalArea	GeographicArea	C	0..1	Contains the GNSS Service Area in the form of a geographical area. (NOTE)	
taiList	array(Tai)	C	1..N	Contains the GNSS Service Area in the form of a list of tracking area(s). (NOTE)	
NOTE: These attributes are mutually exclusive. Either one of them shall be provided.					

5.1.6.3 Simple data types and enumerations

5.1.6.3.1 Introduction

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

5.1.6.3.2 Simple data types

The simple data types defined in table 5.1.6.3.2-1 shall be supported.

Table 5.1.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability
GNSSAssistData	string	Represents GNSS Assistance Data encoded as specified in clause 6.5.2.1 of 3GPP TS 37.355 [31].	GNSSAssistData

5.1.6.3.3 Enumeration: NefEvent

The enumeration NefEvent represents the subscribed/notified event to be monitored. It shall comply with the provisions defined in table 5.1.6.3.3-1.

Table 5.1.6.3.3-1: Enumeration NefEvent

Enumeration value	Description	Applicability
SVC_EXPERIENCE	Indicates that the subscribed/notified event is service experience information.	ServiceExperience
UE_COMM	Indicates that the subscribed/notified event is UE communication information.	UeCommunication
UE_MOBILITY	Indicates that the subscribed/notified event is UE mobility information.	UeMobility
EXCEPTIONS	Indicates that the subscribed/notified event is exceptions information.	Exceptions
USER_DATA_CONGESTION	Indicates that the subscribed/notified event is user data congestion analytics related information.	UserDataCongestion
PERF_DATA	Indicates that the subscribed/notified event is performance data information.	PerformanceData
DISPERSION	Indicates that the event subscribed is dispersion information.	Dispersion
COLLECTIVE_BEHAVIOUR	Indicates that the subscribed/notified event is collective behaviour information. If the "RelativeProximity" feature is supported, this event is also applicable for relative proximity data collection.	CollectiveBehaviour RelativeProximity
MS_QOE_METRICS	Indicates that the subscribed/notified event is Media Streaming QoE metrics.	MSQoeMetrics
MS_CONSUMPTION	Indicates that the subscribed/notified event is Media Streaming Consumption reports.	MSConsumption
MS_NET_ASSIST_INVOCATION	Indicates that the subscribed/notified event is Media Streaming Network Assistance invocation.	MSNetAssInvocation
MS_DYN_POLICY_INVOCATION	Indicates that the subscribed/notified event is Media Streaming Dynamic Policy invocation.	MSDynPolicyInvocation
MS_ACCESS_ACTIVITY	Indicates that the subscribed/notified event is Media Streaming access activity.	MSAccessActivity
GNSS_ASSISTANCE_DATA	Indicates that the subscribed/notified event is GNSS Assistance Data Collection.	GNSSAssistData
DATA_VOLUME_TRANSFER_TIME	Indicates that the event subscribed is data volume transfer time information.	DataVolTransferTime

5.1.7 Error Handling

5.1.7.1 General

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

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

5.1.7.2 Protocol Errors

No specific procedures for the Nnef_EventExposure service are specified.

5.1.7.3 Application Errors

The application errors defined for the Nnef_EventExposure service are listed in Table 5.1.7.3-1.

Table 5.1.7.3-1: Application errors

Application Error	HTTP status code	Description
MUTING_INSTR_NOT_ACCEPTED	403 Forbidden	Indicates that the muting instructions received by the NF service consumer cannot be accepted.

5.1.8 Feature negotiation

The optional features in table 5.1.8-1 are defined for the Nnef_EventExposure API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.1.8-1: Supported Features

Feature number	Feature Name	Description
1	ServiceExperience	This feature indicates support for the "SVC_EXPERIENCE" event.
2	UeMobility	This feature indicates support for the "UE_MOBILITY" event.
3	UeCommunication	This feature indicates support for the "UE_COMM" event.
4	Exceptions	This feature indicates support for the "EXCEPTIONS" event.
5	ES3XX	Extended Support for 3xx redirections. This feature indicates the support of redirection for any service operation, according to Stateless NF procedures as specified in clauses 6.5.3.2 and 6.5.3.3 of 3GPP TS 29.500 [4] and according to HTTP redirection principles for indirect communication, as specified in clause 6.10.9 of 3GPP TS 29.500 [4].
6	EneNA	This feature indicates support for the enhancements of network data analytics requirements.
7	UserDataCongestion	This feature indicates support for the event related to User Data Congestion Analytics related information.
8	PerformanceData	This feature indicates support for the event related to performance data information.
9	Dispersion	This feature indicates support for the event related to Dispersion Analytics related information.
10	CollectiveBehaviour	This feature indicates support of collective behaviour information associated with the UEs and its applications.
11	MSQoeMetrics	This feature indicates support for the event related to Media Streaming QoE metrics for UE Application collected via the Data Collection AF.
12	MSConsumption	This feature indicates support for the event related to Media Streaming Consumption reports for UE Application collected via the Data Collection AF.
13	MSNetAssInvocation	This feature indicates support for the event related to Media Streaming Network Assistance invocation for UE Application collected via the Data Collection AF.
14	MSDynPolicyInvocation	This feature indicates support for the event related to Media Streaming Dynamic Policy invocation for UE Application collected via the Data Collection AF.
15	MSAccessActivity	This feature indicates support for the event related to Media Streaming access activity for UE Application collected via the Data Collection AF.
16	DataAccProfileId	This feature indicates support for Data Access Profile Identifier.
17	GNSSAssistData	This feature indicates the support of the GNSS Assistance Data Collection functionality as part of the enhancements to the 5G LCS functionality. The following functionalities are supported: - GNSS Assistance Data Collection.

18	UeMobility_Ext	This feature indicates support for further extensions to the event related to UE mobility supporting AIML including support of list of application service area collection. Supporting this feature also requires the support of feature UeMobility.
19	PerformanceDataExt_AIML	This feature indicates the support for the extensions of the analytics related to DN performance supporting AIML, including support of Max/Min UL/DL data collection on packet delay, pack loss and throughput. Supporting this feature also requires the support of feature PerformanceData.
20	ServiceExperienceExt_eNA	This feature indicates support for the extensions to service experience supporting eNA, including Service Experience Contribution Weights. Supporting this feature also requires the support of feature ServiceExperience.
21	EnPerformanceData	This feature indicates support for the enhancements of performance data. It requires the support of the PerformanceData feature.
22	EnhDataMgmt	Indicates the support of enhanced data management mechanisms. Supporting this feature also requires the support of feature EneNA.
23	ExtEventFilters	Indicates supported of extended AF event filters.
24	DataVolTransferTime	This feature indicates support for the event related to data volume transfer time.
25	MSEventExposure	This feature indicates the support for Media Streaming event exposure. This feature is recommended to be implemented to avoid the usage of the deprecated attributes.
26	PerEventRepReq	This feature indicates the support of the per-event reporting requirements management functionality. The following functionalities are supported: - Provisioning/updating the reporting requirements on a per subscribed event granularity.
27	RelativeProximity	This feature indicates the support of providing confidence information of the relative proximity data. Supporting this feature requires the support of the CollectiveBehaviour feature.

5.1.9 Security

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

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

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

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

5.2 Nnef_EASDeployment Service API

5.2.1 Introduction

The Nnef_EASDeployment service shall use the Nnef_EASDeployment API.

The API URI of the Nnef_EASDeployment API shall be:

{apiRoot}/<apiName>/<apiVersion>

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "nnef-eas-deployment".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 5.2.3.

5.2.2 Usage of HTTP

5.2.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

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

The OpenAPI [6] specification of HTTP messages and content bodies for the Nnef_EASDeployment API is contained in Annex 3.

5.2.2.2 HTTP standard headers

5.2.2.2.1 General

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

5.2.2.2.2 Content type

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

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

5.2.2.3 HTTP custom headers

The Nnef_EASDeployment API shall support mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] and may support HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4].

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

5.2.3 Resources

5.2.3.1 Overview

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

Figure 5.2.3.1-1 depicts the resource URIs structure for the Nnef_EASDeployment API.

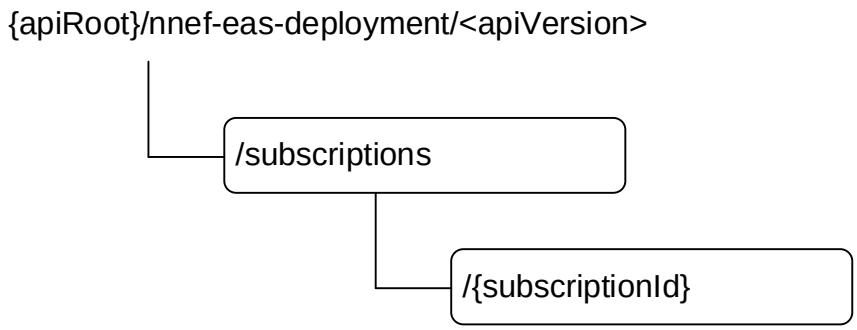

Figure 5.2.3.1-1: Resource URI structure of the Nnef_EASDeployment API

Table 5.2.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 5.2.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
EAS Deployment Event Subscriptions	/subscriptions	POST	Creates a subscription to notifications of changes of EAS Deployment Information, i.e. creation of an Individual EAS Deployment Event Subscription resource.
Individual EAS Deployment Event Subscription	/subscriptions/{subscriptionId}	GET	Reads an Individual EAS Deployment Event Subscription resource.
		DELETE	Cancels an individual subscription to notifications of subscribed EAS Deployment changes event.

5.2.3.2 Resource: EAS Deployment Event Subscriptions

5.2.3.2.1 Description

The resource represents the collection of EAS Deployment changes Event subscriptions of the Nnef_EASDeployment service. It allows NF service consumers to create a new subscription to notifications on EAS Deployment changes event(s).

5.2.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nnef-eas-deployment/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 5.2.3.2.2-1.

Table 5.2.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.2.1

5.2.3.2.3 Resource Standard Methods

5.2.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.2.3.2.3.1-1.

Table 5.2.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 5.2.3.2.3.1-2 and the response data structures and response codes specified in table 5.2.3.2.3.1-3.

Table 5.2.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
EasDeploySubData	M	1	Contains the information required for the creation of a new Individual EAS Deployment Event Subscription resource.

Table 5.2.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response Codes	Description
EasDeploySubData	M	1	201 Created	Contains the representation of the Individual EAS Deployment Event Subscription resource.
NOTE: The mandatory HTTP error status code for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.2.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnef-eas-deployment/<apiVersion>/subscriptions/{subscriptionId}.

5.2.3.3 Resource: Individual EAS Deployment Event Subscription

5.2.3.3.1 Description

The resource represents an individual EAS Deployment Event subscription of the Nnef_EASDeployment service. It allows NF service consumers to subscribe/unsubscribe an EAS Deployment information change event, and allows the NEF to notify EAS Deployment change event to the subscribed NF service consumer.

5.2.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nnef-eas-deployment/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.2.3.3.2-1.

Table 5.2.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.2.1
subscriptionId	string	Identifies a subscription to the NEF event exposure service.

5.2.3.3.3 Resource Standard Methods

5.2.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.2.3.3.3.1-1.

Table 5.2.3.3.3.1-1: URI query parameters supported by the GET method on this resource

Name	Data type	P	Cardinality	Description

This method shall support the request data structures specified in table 5.2.3.3.3.1-2 and the response data structures and response codes specified in table 5.2.3.3.3.1-3.

Table 5.2.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.2.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
EasDeploySubData	M	1	200 OK	Contains the representation of the Individual EAS Deployment information changes Event Subscription resource.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription retrieval. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription retrieval. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.2.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.2.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.2.3.3.3.2 PUT

This HTTP method is not supported for the resource.

5.2.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 5.2.3.3.3.3-1.

Table 5.2.3.3.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.2.3.3.3.3-2 and the response data structures and response codes specified in table 5.2.3.3.3.3-3.

Table 5.2.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.2.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual EAS Deployment information changes Event Subscription resource matching the subscriptionId was deleted.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription termination. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription termination. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.2.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.2.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.2.4 Custom Operations without associated resources

None.

5.2.5 Notifications

5.2.5.1 General

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

Table 5.2.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Event Notification	{notifUri}	POST	Provides Information about EAS Deployment Information changes event(s).

5.2.5.2 EAS Deployment Event Notification

5.2.5.2.1 Description

The EAS Deployment Event Notification is used by the NEF to report the observed EAS Deployment information changes event to a NF service consumer that has subscribed to such Notifications.

5.2.5.2.2 Target URI

The Notification URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.2.5.2.2-1.

Table 5.2.5.2.2-1: Callback URI variables for this resource

Name	Data type	Definition
notifUri	Uri	The Notification Uri as assigned by the NF service consumer during the subscription service operation and described within the EasDeploySubData data type (see table 5.2.6.2.2-1).

5.2.5.2.3 Standard Methods

5.2.5.2.3.1 POST

This method shall support the request data structures specified in table 5.2.5.2.3.1-1 and the response data structures and response codes specified in table 5.2.5.2.3.1-2.

Table 5.2.5.2.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
EasDeployInfoNotif	M	1	Provides Information about the EAS Deployment Information changes event.

Table 5.2.5.2.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during event notification. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during event notification. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.2.5.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

Table 5.2.5.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

5.2.6 Data Model

5.2.6.1 General

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

Table 5.2.6.1-1 specifies the data types defined for the Nnef_EASDeployment service based interface protocol.

Table 5.2.6.1-1: Nnef_EASDeployment specific Data Types

Data type	Section defined	Description	Applicability
EasDeployInfoNotif	5.2.6.2.3	Represents notifications on EAS Deployment Information changes event(s) that occurred for an Individual EAS Deployment Event Subscription resource.	
EasDeploySubData	5.2.6.2.2	Represents EAS Deployment Information changes event(s) subscription data.	
EasDeployInfoData	5.2.6.2.5	Represents the EAS Deployment Information to be reported.	
EasDepNotification	5.2.6.2.4	Represents the EAS Deployment Notifcation.	
EasEvent	5.2.6.3.3	represents the EAS event.	

Table 5.2.6.1-2 specifies data types re-used by the Nnef_EASDeployment service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnef_EASDeployment service based interface.

Table 5.2.6.1-2: Nnef_EASDeployment re-used Data Types

Data type	Reference	Comments	Applicability
DnaiInformation	3GPP TS 29.522 [15]	Represents the DNAI inormation including the DNS server identifier (consisting of IP address and port) and/or IP address(s) of the EAS in the local DN for the DNAI.	
DnnSnssaiInformation	3GPP TS 29.522 [15]	Identifies a combination of (DNN, S-NSSAI).	
FqdnPatternMatchingRule	3GPP TS 29.571 [16]	Represents the FQDN pattern matching rule.	
GroupId	3GPP TS 29.571 [16]	Contains a Group identifier.	
RedirectResponse	3GPP TS 29.571 [16]	Contains redirection related information.	
SupportedFeatures	3GPP TS 29.571 [16]	Indicates the supported features.	
Uri	3GPP TS 29.571 [16]	Contains a URI.	

5.2.6.2 Structured data types

5.2.6.2.1 Introduction

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

5.2.6.2.2 Type: EasDeploySubData

Table 5.2.6.2.2-1: Definition of type EasDeploySubData

Attribute name	Data type	P	Cardinality	Description	Applicability
appId	string	O	0..1	Identifies the application for which the EAS Deployment Information corresponds to.	
dnnSnssaiInfos	array(DnnSnssaiInformation)	O	1..N	Each of the element identifies a combination of (DNN, S-NSSAI).	
eventId	EasEvent	M	1	Event ID assigned by the NF service consumer.	
eventsNotifs	array(EasDeployInfoData)	C	1..N	Represents the EAS Deployment Information changes event(s) to be reported. Shall only be present if the "immRep" attribute is included in the request and sets to true, and the current status of EAS Deployment Information is available.	
immRep	boolean	O	0..1	Indication of immediate reporting: - true: requires the immediate reporting of the current status of EAS Deployment Information, if available. - false (default): EAS Deployment Information event report occurs when the event is met.	
interGroupId	GroupId	O	0..1	Identifies an internal UE group.	
notifId	string	M	1	Notification Correlation ID assigned by the NF service consumer.	
notifUri	Uri	M	1	Notification URI for the EAS Deployment Information event reporting.	
suppFeat	SupportedFeatures	C	0..1	Contains the supported features among those defined in clause 5.2.8. This attribute shall be provided when feature negotiation needs to take place.	

5.2.6.2.3 Type: EasDeployInfoNotif

Table 5.2.6.2.3-1: Definition of type EasDeployInfoNotif

Attribute name	Data type	P	Cardinality	Description	Applicability
easDepNotifs	array(EasDepNotification)	M	1..N	Represents the EAS Deployment Notifcation(s).	
notifId	string	M	1	Notification Correlation ID assigned by the NF service consumer.	

5.2.6.2.4 Type: EasDepNotification

Table 5.2.6.2.4-1: Definition of type EasDepNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
easDepInfo	EasDeployInfoData	M	1	Represents the EAS Deployment Information to be reported.	
eventId	EasEvent	M	1	Event ID assigned by the NF service consumer.	

5.2.6.2.5 Type: EasDeployInfoData

Table 5.2.6.2.5-1: Definition of type EasDeployInfoData

Attribute name	Data type	P	Cardinality	Description	Applicability
appId	string	O	0..1	Identifies the application for which the EAS Deployment Information corresponds to.	
dnaiInfos	map(DnaiInformation)	O	1..N	list of DNS server identifier (consisting of IP address and port) and/or IP address(s) of the EAS in the local DN for each DNAI. The key of map is the DNAI.	
dnn	Dnn	O	0..1	DNN for the EAS Deployment Information.	
fqdnPatternList	array(FqdnPatternMatchingRule)	M	1..N	Supported FQDN pattern(s) for application(s) deployed in the Local part of the DN where each FQDN pattern is described by a FQDN Pattern Matching Rule.	
internalGroupId	GroupId	O	0..1	Internal Group ID for the EAS Deployment Information.	
snssai	Snssai	O	0..1	S-NSSAI for the EAS Deployment Information.	
targetAfId	string	O	0..1	Identifier of the AF that is responsible for the EAS associated with this EAS deployment information.	EasRelocationEnh

5.2.6.3 Simple data types and enumerations

5.2.6.3.1 Introduction

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

5.2.6.3.2 Simple data types

The simple data types defined in table 5.2.6.3.2-1 shall be supported.

Table 5.2.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.2.6.3.3 Enumeration: EasEvent

The enumeration EasEvent represents the EAS event requested by the NF service consumer. It shall comply with the provisions defined in table 5.2.6.3.3-1.

Table 5.2.6.3.3-1: Enumeration EasEvent

Enumeration value	Description	Applicability
EAS_INFO_CHG	Indicates that the EAS Deployment Information is changed.	

5.2.7 Error Handling

5.2.7.1 General

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

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

5.2.7.2 Protocol Errors

No specific procedures for the Nnef_EASDeployment service are specified.

5.2.7.3 Application Errors

The application errors defined for the Nnef_EASDeployment service are listed in Table 5.2.7.3-1.

Table 5.2.7.3-1: Application errors

Application Error	HTTP status code	Description

5.2.8 Feature negotiation

The optional features in table 5.2.8-1 are defined for the Nnef_EASDeployment API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.2.8-1: Supported Features

Feature number	Feature Name	Description
1	EasRelocationEnh	This feature indicates enhanced support of EAS relocation procedures via additional information about the AFs that are responsible for certain EAS.

5.2.9 Security

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

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

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

The Nnef_EASDeployment API defines a single scope "nnef-eas-deployment" for the entire service, and it does not define any additional scopes at resource or operation level.

5.3 Nnef_TrafficInfluenceData Service API

5.3.1 Introduction

The Nnef_TrafficInfluenceData service shall use the Nnef_TrafficInfluenceData API.

The API URI of the Nnef_TrafficInfluenceData API shall be:

{apiRoot}/<apiName>/<apiVersion>

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "nnef-traffic-influence-data".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 5.3.3.

5.3.2 Usage of HTTP

5.3.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

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

The OpenAPI [6] specification of HTTP messages and content bodies for the Nnef_TrafficInfluenceData API is contained in Annex A.4.

5.3.2.2 HTTP standard headers

5.3.2.2.1 General

See clause 5.3.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

5.3.2.2.2 Content type

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

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

5.3.2.3 HTTP custom headers

The Nnef_TrafficInfluenceData API shall support mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] and may support HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4].

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

5.3.3 Resources

5.3.3.1 Overview

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

Figure 5.3.3.1-1 depicts the resource URIs structure for the Nnef_TrafficInfluenceData API.

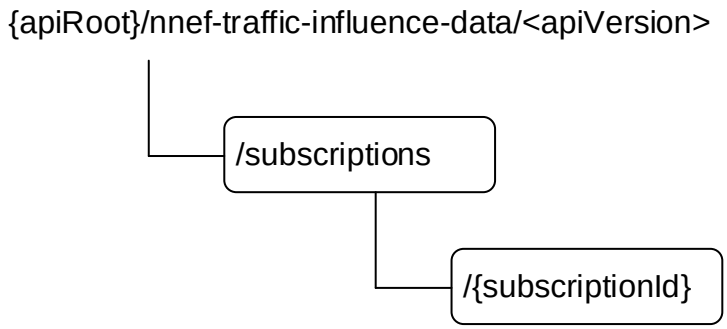

Figure 5.3.3.1-1: Resource URI structure of the Nnef_TrafficInfluenceData API

Table 5.3.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 5.3.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
Traffic Influence Data Subscriptions	/subscriptions	POST	Creates a subscription to notifications of Traffic Influence Data Information, i.e. creation of an Individual Traffic Influence Data Subscription resource.
Individual Traffic Influence Data Subscription	/subscriptions/{subscriptionId}	PUT	Modify all of the properties of an existing subscription to Traffic Influence Data.
		GET	Reads a subscription to Individual Traffic Influence Data.
		DELETE	Cancels an individual subscription to notifications of Traffic Influence Data.

5.3.3.2 Resource: Traffic Influence Data Subscriptions

5.3.3.2.1 Description

The resource represents the collection of Traffic Influence Data subscriptions of the Nnef_TrafficInfluenceData service. It allows NF service consumers to create a new subscription to notifications on Traffic Influence Data.

5.3.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nnef-traffic-influence-data/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 5.3.3.2.2-1.

Table 5.3.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.3.1

5.3.3.2.3 Resource Standard Methods

5.3.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.3.3.2.3.1-1.

Table 5.3.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 5.3.3.2.3.1-2 and the response data structures and response codes specified in table 5.3.3.2.3.1-3.

Table 5.3.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
TrafficInfluDataSub	M	1	Contains the information required for the creation of a new Individual Traffic Influence Data Subscription resource.

Table 5.3.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response Codes	Description
TrafficInfluDataSub	M	1	201 Created	Contains the representation of the Individual Traffic Influence Data Subscription resource.
NOTE: The mandatory HTTP error status code for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.3.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnef-traffic-influence-data/<apiVersion>/subscriptions/{subscriptionId}.

5.3.3.3 Resource: Individual Traffic Influence Data Subscription

5.3.3.3.1 Description

The resource represents an individual Traffic Influence Data subscription of the Nnef_TrafficInfluenceData service. It allows NF service consumers to subscribe/unsubscribe an Traffic Influence Data information, and allows the NEF to notify Traffic Influence Data to the NF service consumer.

5.3.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nnef-traffic-influence-data/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.3.3.3.2-1.

Table 5.3.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.3.1
subscriptionId	string	Identifier of the subscription.

5.3.3.3.3 Resource Standard Methods

5.3.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.3.3.3.3.1-1.

Table 5.3.3.3.3.1-1: 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 5.3.3.3.3.1-2 and the response data structures and response codes specified in table 5.3.3.3.3.1-3.

Table 5.3.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
TrafficInfluDataSub	M	1	200 OK	The subscription information is returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription retrieval. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription retrieval. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.3.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.3.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.3.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 5.3.3.3.3.2-1.

Table 5.3.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.3.3.3.3.2-2 and the response data structures and response codes specified in table 5.3.3.3.3.2-3.

Table 5.3.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
TrafficInfluDataSub	M	1	Modify an existing subscription to Traffic Influence Data.

Table 5.3.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
TrafficInfluDataSub	M	1	200 OK	The subscription was updated successfully.
n/a			204 No Content	The subscription has been successfully updated and no content is returned in the response body.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription retrieval. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription retrieval. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.3.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.3.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.3.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 5.3.3.3.3.3-1.

Table 5.3.3.3.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.3.3.3.3.3-2 and the response data structures and response codes specified in table 5.3.3.3.3.3-3.

Table 5.3.3.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.3.3.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual Traffic Influence Data Subscription resource matching the subscriptionId was deleted.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription termination. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription termination. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.3.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.3.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.3.4 Custom Operations without associated resources

None.

5.3.5 Notifications

5.3.5.1 General

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

Table 5.3.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Event Notification	{notifUri}	POST	Provides Traffic Influence Data.

5.3.5.2 Traffic Influence Data Notification

5.3.5.3.1 Description

The Traffic Influence Data Notification is used by the NEF to report the observed Traffic Influence Data to an NF service consumer that has subscribed to such Notifications.

5.3.5.3.2 Target URI

The Notification URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.3.5.3.2-1.

Table 5.3.5.3.2-1: Callback URI variables for this resource

Name	Data type	Definition
notifUri	Uri	The Notification URI as assigned by the NF service consumer during the subscription service operation and described within the TrafficInfluDataSub data type.

5.3.5.3.3 Standard Methods

5.3.5.3.3.1 POST

This method shall support the request data structures specified in table 5.3.5.3.3.1-1 and the response data structures and response codes specified in table 5.3.5.3.3.1-2.

Table 5.3.5.3.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
TrafficInfluDataNotify	M	1	Provides the Traffic Influence Data.

Table 5.3.5.3.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during notification. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during notification. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.3.5.3.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

Table 5.3.5.3.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI representing the end point of an alternative NF consumer (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

5.3.6 Data Model

5.3.6.1 General

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

Table 5.3.6.1-1 specifies the data types defined for the Nnef_TrafficInfluenceData service based interface protocol.

Table 5.3.6.1-1: Nnef_TrafficInfluenceData specific Data Types

Data type	Section defined	Description	Applicability
TrafficInfluDataNotify	5.3.6.2.3	Contains traffic influence data for notification.	
TrafficInfluDataSub	5.3.6.2.2	Contains traffic influence subscription data.	

Table 5.3.6.1-2 specifies data types re-used by the Nnef_TrafficInfluenceData service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnef_TrafficInfluenceData service based interface.

Table 5.3.6.1-2: Nnef_TrafficInfluenceData re-used Data Types

Data type	Reference	Comments	Applicability
Dnn	3GPP TS 29.571 [16]	Identifies the DNN.	
Ipv4Addr	3GPP TS 29.571 [16]	Identifies an IPv4 address.	
Ipv6Addr	3GPP TS 29.571 [16]	Identifies an IPv6 address.	
PlmnId	3GPP TS 29.571 [16]	Identifies a PLMN.	
RedirectResponse	3GPP TS 29.571 [16]	Contains redirection related information.	
ReportingInformation	3GPP TS 29.523 [22]	Represents the type of reporting the subscription requires.	
Snssai	3GPP TS 29.571 [16]	Identifies a Single Network Slice Selection Assistance Information.	
Supi	3GPP TS 29.571 [16]	The SUPI for an UE.	
SupportedFeatures	3GPP TS 29.571 [16]	Indicates the features supported.	
TrafficInfluDataNotif	3GPP TS 29.519 [30]	Contains traffic influence data.	
Uri	3GPP TS 29.571 [16]	Contains a URI.	

5.3.6.2 Structured data types

5.3.6.2.1 Introduction

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

5.3.6.2.2 Type: TrafficInfluDataSub

Table 5.3.6.2.2-1: Definition of type TrafficInfluDataSub

Attribute name	Data type	P	Cardinality	Description	Applicability
notifUri	Uri	M	1	URI provided by the NF service consumer indicating where to receive the subscribed notifications from the NEF.	
notifCorrId	string	M	1	Notification correlation identifier.	
dnns	array(Dnn)	C	1..N	Each element identifies a DNN. (NOTE)	
snssais	array(Snssai)	C	1..N	Each element identifies an internal slice. (NOTE)	
supis	array(Supi)	O	1..N	Each element identifies auser.	
anyUe	boolean	O	0..1	Identifies any UE when setting to "true". Default value is "false" if omitted.	
hplmnId	PlmnId	O	0..1	Identifies a PLMN.	
ipv4Addrs	array(Ipv4Addr)	O	1..N	Each element identifies a UE IPv4 address.	
ipv6Addrs	array(Ipv6Addr)	O	1..N	Each element identifies a UE IPv6 address.	
rptInfo	ReportingInformation	O	0..1	Represents the reporting requirements of the subscription.	
immReports	array(TrafficInfluData)	O	1..N	Contains the Traffic Influence Data that match this subscription. It may be included only in the POST (or PUT) response body of a subscription creation (or modification), and only if the "immRep" attribute contained in "rptInfo" is set to "true" in the corresponding HTTP request.	
supportedFeatures	SupportedFeatures	C	0..1	Used to negotiate the applicability of the optional features. This attribute shall be provided in the POST request and in the response of successful resource creation.	
NOTE: At least one of "dnns", "snssais", shall be provided.					

5.3.6.2.3 Type: TrafficInfluDataNotify

Table 5.3.6.2.3-1: Definition of type TrafficInfluDataNotify

Attribute name	Data type	P	Cardinality	Description	Applicability
notifCorrId	string	M	1	Notification correlation identifier.	
eventNotifications	array(TrafficInfluDataNotif)	M	1..N	Notifications about Individual Events.	

5.3.6.3 Simple data types and enumerations

5.3.6.3.1 Introduction

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

5.3.6.3.2 Simple data types

The simple data types defined in table 5.3.6.3.2-1 shall be supported.

Table 5.3.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.3.7 Error Handling

5.3.7.1 General

For the Nnef_TrafficInfluenceData API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.3.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.2.7.1-1 of 3GPP TS 29.500 [4].

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

5.3.7.2 Protocol Errors

No specific procedures for the Nnef_TrafficInfluenceData service are specified.

5.3.7.3 Application Errors

The application errors defined for the Nnef_TrafficInfluenceData service are listed in Table 5.3.7.3-1.

Table 5.3.7.3-1: Application errors

Application Error	HTTP status code	Description

5.3.8 Feature negotiation

The optional features in table 5.3.8-1 are defined for the Nnef_TrafficInfluenceData API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.3.8-1: Supported Features

Feature number	Feature Name	Description

5.3.9 Security

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

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

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

The Nnef_TrafficInfluenceData API defines a single scope "nnef-traffic-influence-data" for the entire service, and it does not define any additional scopes at resource or operation level.

5.4 Nnef_ECSAddress Service API

5.4.1 Introduction

The Nnef_ECSAddress service shall use the Nnef_ECSAddress API.

The API URI of the Nnef_ECSAddress API shall be:

{apiRoot}/<apiName>/<apiVersion>

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "nnef-ecs-addr-cfg-info".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 5.4.3.

5.4.2 Usage of HTTP

5.4.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.4 of 3GPP TS 29.500 [4].

The OpenAPI [6] specification of HTTP messages and content bodies for the Nnef_ECSAddress API is contained in Annex A.5.

5.4.2.2 HTTP standard headers

5.4.2.2.1 General

See clause 5.4.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

5.4.2.2.2 Content type

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

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

5.4.2.3 HTTP custom headers

The Nnef_ECSAddress API shall support mandatory HTTP custom header fields specified in clause 5.4.3.2 of 3GPP TS 29.500 [4] and may support HTTP custom header fields specified in clause 5.4.3.3 of 3GPP TS 29.500 [4].

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

5.4.3 Resources

5.4.3.1 Overview

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

Figure 5.4.3.1-1 depicts the resource URIs structure for the Nnef_ECSAddress API.

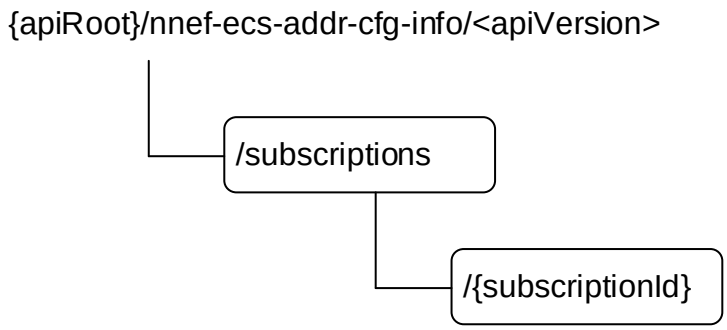

Figure 5.4.3.1-1: Resource URI structure of the Nnef_ECSAddress API

Table 5.4.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 5.4.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
ECS Address Configuration Information Subscriptions	/subscriptions	POST	Creates a subscription to notifications of ECS Address Configuration Information, i.e. creation of an Individual ECS Address Configuration Information Subscription resource.
Individual ECS Address Configuration Information Subscription	/subscriptions/{subscriptionId}	PUT	Modify all of the properties of an existing subscription to ECS Address Configuration Information.
		PATCH	Partially modify the properties of an existing subscription to ECS Address Configuration Information.
		GET	Reads a subscription to Individual ECS Address Configuration Information.
		DELETE	Cancels an individual subscription to notifications of ECS Address Configuration Information.

5.4.3.2 Resource: ECS Address Configuration Information Subscriptions

5.4.3.2.1 Description

The resource represents the collection of ECS Address Configuration Information subscriptions of the Nnef_ECSAddress service. It allows NF service consumers to create a new subscription to notifications on ECS Address Configuration Information.

5.4.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nnef-ecs-addr-cfg-info/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 5.4.3.2.2-1.

Table 5.4.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.4.1

5.4.3.2.3 Resource Standard Methods

5.4.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.4.3.2.3.1-1.

Table 5.4.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 5.4.3.2.3.1-2 and the response data structures and response codes specified in table 5.4.3.2.3.1-3.

Table 5.4.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
EcsAddrCfgInfoSub	M	1	Contains the information required for the creation of a new Individual ECS Address Configuration Information Subscription resource.

Table 5.4.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response Codes	Description
EcsAddrCfgInfoSub	M	1	201 Created	Contains the representation of the Individual ECS Address Configuration Information Subscription resource.
NOTE: The mandatory HTTP error status code for the POST method listed in table 5.4.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.4.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnef-ecs-addr-cfg-info/<apiVersion>/subscriptions/{subscriptionId}.

5.4.3.3 Resource: Individual ECS Address Configuration Information Subscription

5.4.3.3.1 Description

The resource represents an individual ECS Address Configuration Information subscription of the Nnef_ECSAddress service. It allows NF service consumers to subscribe/unsubscribe an ECS Address Configuration Information, and allows the NEF to notify ECS Address Configuration Information to the NF service consumer.

5.4.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nnef-ecs-addr-cfg-info/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.4.3.3.2-1.

Table 5.4.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.4.1.
subscriptionId	string	Identifier of the subscription.

5.4.3.3.3 Resource Standard Methods

5.4.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.4.3.3.3.1-1.

Table 5.4.3.3.3.1-1: 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 5.4.3.3.3.1-2 and the response data structures and response codes specified in table 5.4.3.3.3.1-3.

Table 5.4.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.4.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
EcsAddrCfgInfoSub	M	1	200 OK	The subscription information is returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription retrieval. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription retrieval. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the GET method listed in table 5.4.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.4.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].

Table 5.4.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.4.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 5.4.3.3.3.2-1.

Table 5.4.3.3.3.2-1: URI query parameters supported by the PUT method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.4.3.3.3.2-2 and the response data structures and response codes specified in table 5.4.3.3.3.2-3.

Table 5.4.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

Data type	P	Cardinality	Description
EcsAddrCfgInfoSub	M	1	Modify an existing subscription to ECS Address Configuration Information.

Table 5.4.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

Data type	P	Cardinality	Response codes	Description
EcsAddrCfgInfoSub	M	1	200 OK	The subscription was updated successfully.
n/a			204 No Content	The subscription has been successfully updated and no content is returned in the response body.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription retrieval. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription retrieval. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.4.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].

Table 5.4.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.4.3.3.3 DELETE

This method shall support the URI query parameters specified in table 5.4.3.3.3-1.

Table 5.4.3.3.3-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.4.3.3.3-2 and the response data structures and response codes specified in table 5.4.3.3.3-3.

Table 5.4.3.3.3-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.4.3.3.3-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual ECS Address Configuration Information Subscription resource matching the subscriptionId was deleted.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription termination. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription termination. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the DELETE method listed in table 5.4.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.4.3.3.3.3-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.4.3.3.3.3-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.4.3.3.4 PATCH

This method shall support the URI query parameters specified in table 5.4.3.3.4-1.

Table 5.4.3.3.4-1: URI query parameters supported by the PATCH method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.4.3.3.4-2 and the response data structures and response codes specified in table 5.4.3.3.4-3.

Table 5.4.3.3.4-2: Data structures supported by the PATCH Request Body on this resource

Data type	P	Cardinality	Description
EcsAddrCfgInfoSubPatch	M	1	Partially modify an existing subscription to ECS Address Configuration Information.

Table 5.4.3.3.3.4-3: Data structures supported by the PATCH Response Body on this resource

Data type	P	Cardinality	Response codes	Description
EcsAddrCfgInfoSub	M	1	200 OK	The subscription was updated successfully.
n/a			204 No Content	The subscription has been successfully updated and no content is returned in the response body.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription retrieval. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription retrieval. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the PATCH method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.4.3.3.3.4-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].

Table 5.4.3.3.3.4-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.4.4 Custom Operations without associated resources

None.

5.4.5 Notifications

5.4.5.1 General

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

Table 5.4.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Event Notification	{notifUri}	POST	Provides ECS Address Configuration Information.

5.4.5.2 ECS Address Configuration Information Notification

5.4.5.4.1 Description

The ECS Address Configuration Information Notification is used by the NEF to report the observed ECS Address Configuration Information to an NF service consumer that has subscribed to such Notifications.

5.4.5.4.2 Target URI

The Notification URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.4.5.4.2-1.

Table 5.4.5.4.2-1: Callback URI variables for this resource

Name	Data type	Definition
notifUri	Uri	The Notification URI as assigned by the NF service consumer during the subscription service operation and described within the EcsAddrCfgInfoSub data type.

5.4.5.4.3 Standard Methods

5.4.5.4.3.1 POST

This method shall support the request data structures specified in table 5.4.5.4.3.1-1 and the response data structures and response codes specified in table 5.4.5.4.3.1-2.

Table 5.4.5.4.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
EcsAddrCfgInfoNotification	M	1	Provides the ECS Address Configuration Information.

Table 5.4.5.4.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during notification. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during notification. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.4.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.4.5.4.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

Table 5.4.5.4.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

5.4.6 Data Model

5.4.6.1 General

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

Table 5.4.6.1-1 specifies the data types defined for the Nnef_ECSAddress service based interface protocol.

Table 5.4.6.1-1: Nnef_ECSAddress specific Data Types

Data type	Section defined	Description	Applicability
EcsAddrCfgInfoNotification	5.4.6.2.3	Contains ECS Address Configuration Information for notification.	
EcsAddrCfgInfoSub	5.4.6.2.2	Contains ECS Address Configuration Information subscription data.	
EcsAddrCfgInfoSubPatch	5.4.6.2.4	Contains the updated ECS Address Configuration Information subscription data.	

Table 5.4.6.1-2 specifies data types re-used by the Nnef_ECSAddress service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnef_ECSAddress service based interface.

Table 5.4.6.1-2: Nnef_ECSAddress re-used Data Types

Data type	Reference	Comments	Applicability
Dnn	3GPP TS 29.571 [16]	Identifies the DNN.	
EcsAddrInfo	3GPP TS 29.522 [15]	Contains ECS Address Configuration Information.	
RedirectResponse	3GPP TS 29.571 [16]	Contains redirection related information.	
Snssai	3GPP TS 29.571 [16]	Identifies a Single Network Slice Selection Assistance Information.	
SupportedFeatures	3GPP TS 29.571 [16]	Indicates the features supported.	
Uri	3GPP TS 29.571 [16]	Contains a URI.	

5.4.6.2 Structured data types

5.4.6.2.1 Introduction

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

5.4.6.2.2 Type: EcsAddrCfgInfoSub

Table 5.4.6.2.2-1: Definition of type EcsAddrCfgInfoSub

Attribute name	Data type	P	Cardinality	Description	Applicability
notifUri	Uri	M	1	URI provided by the NF service consumer indicating where to receive the subscribed notifications from the NEF.	
notifCorrId	string	M	1	Notification correlation identifier.	
dnns	array(Dnn)	O	1..N	Each element identifies a DNN.	
snssais	array(Snssai)	O	1..N	Each element identifies an internal slice.	
immRepInd	boolean	O	0..1	Indication of immediate reporting. If included, when it is set to true it indicates immediate reporting of the subscribed events, if available. Otherwise, reporting will occur when the event is met.	
immReports	array(EcsAddrCfgInfoNotification)	O	1..N	Contains the ECS Address Configuration Information that match this subscription. It may be included only in the POST (or PUT/PATCH) response body of a subscription creation (or modification), and only if the "immRepInd" attribute is set to "true" in the corresponding HTTP request.	
supportedFeatures	SupportedFeatures	C	0..1	Used to negotiate the applicability of the optional features. This attribute shall be provided in the POST request and in the response of successful resource creation.	

5.4.6.2.3 Type: EcsAddrCfgInfoNotification

Table 5.4.6.2.3-1: Definition of type EcsAddrCfgInfoNotification

Attribute name	Data type	P	Cardinality	Description	Applicability
notifCorrId	string	M	1	Notification correlation identifier.	
ecsAddrCfgInfo	array(EcsAddrInfo)	M	1..N	Contains the ECS Address Configuration Information.	

5.4.6.2.4 Type: EcsAddrCfgInfoSubPatch

Table 5.4.6.2.4-1: Definition of type EcsAddrCfgInfoSubPatch

Attribute name	Data type	P	Cardinality	Description	Applicability
notifUri	Uri	O	0..1	URI provided by the NF service consumer indicating where to receive the subscribed notifications from the NEF.	
notifCorrId	string	O	0..1	Notification correlation identifier.	
dnns	array(Dnn)	O	1..N	Each updated element identifies a DNN.	
snssais	array(Snssai)	O	1..N	Each updated element identifies an internal slice.	
immRepInd	boolean	O	0..1	Indication of immediate reporting. If included, when it is set to true it indicates immediate reporting of the subscribed events, if available. Otherwise, reporting will occur when the event is met.	

5.4.6.3 Simple data types and enumerations

5.4.6.3.1 Introduction

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

5.4.6.3.2 Simple data types

The simple data types defined in table 5.4.6.3.2-1 shall be supported.

Table 5.4.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.4.7 Error Handling

5.4.7.1 General

For the Nnef_ECSAddress API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.4.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.4.7.1-1 of 3GPP TS 29.500 [4].

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

5.4.7.2 Protocol Errors

No specific procedures for the Nnef_ECSAddress service are specified.

5.4.7.3 Application Errors

The application errors defined for the Nnef_ECSAddress service are listed in Table 5.4.7.3-1.

Table 5.4.7.3-1: Application errors

Application Error	HTTP status code	Description

5.4.8 Feature negotiation

The optional features in table 5.4.8-1 are defined for the Nnef_ECSAddress API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.4.8-1: Supported Features

Feature number	Feature Name	Description

5.4.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Nnef_ECSAddress API may be authorized by means of the Oauth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the “Client Credentials” authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If Oauth2 is used, an NF Service Consumer, prior to consuming services offered by the Nnef_ECSAddress API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.4.2.2.

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

The Nnef_ECSAddress API defines a single scope "nnef-ecs-addr-cfg-info" for the entire service, and it does not define any additional scopes at resource or operation level.

5.5 Nnef_DNAIMapping Service API

5.5.1 Introduction

The Nnef_DNAIMapping service shall use the Nnef_DNAIMapping API.

The API URI of the Nnef_DNAIMapping API shall be:

{apiRoot}/<apiName>/<apiVersion>

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "nnef-dnai-mapping".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 5.5.3.

5.5.2 Usage of HTTP

5.5.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

HTTP/2 shall be transported as specified in clause 5.6 of 3GPP TS 29.500 [4].

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

5.5.2.2 HTTP standard headers

5.5.2.2.1 General

See clause 5.6.2 of 3GPP TS 29.500 [4] for the usage of HTTP standard headers.

5.5.2.2.2 Content type

JSON, IETF RFC 8259 [12], shall be used as content type of the HTTP bodies specified in the present specification as specified in clause 5.6 of 3GPP TS 29.500 [4]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

5.5.2.3 HTTP custom headers

The Nnef_DNAIMapping API shall support mandatory HTTP custom header fields specified in clause 5.6.3.2 of 3GPP TS 29.500 [4] and may support HTTP custom header fields specified in clause 5.6.3.3 of 3GPP TS 29.500 [4].

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

5.5.3 Resources

5.5.3.1 Overview

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

Figure 5.5.3.1-1 depicts the resource URIs structure for the Nnef_DNAIMapping API.

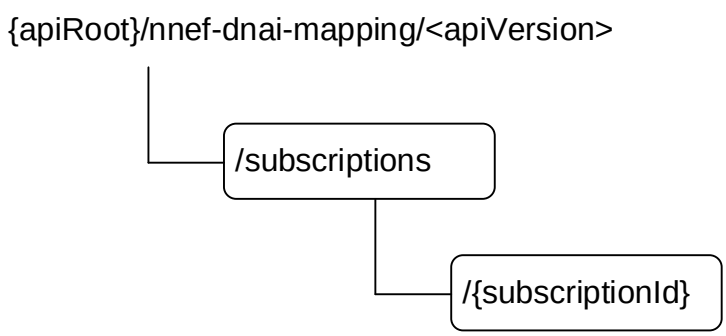

Figure 5.5.3.1-1: Resource URI structure of the Nnef_DNAIMapping API

Table 5.5.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 5.5.3.1-1: Resources and methods overview

Resource name	Resource URI	HTTP method or custom operation	Description
DNAI Mapping Subscriptions	/subscriptions	POST	Creates a subscription to notifications of DNAI Mapping, i.e. creation of an Individual DNAI Mapping Subscription resource.
Individual DNAI Mapping Subscription	/subscriptions/{subscriptionId}	GET	Reads a subscription to Individual DNAI Mapping.
		DELETE	Delete an individual subscription to notifications of DNAI Mapping.

5.5.3.2 Resource: DNAI Mapping Subscriptions

5.5.3.2.1 Description

The resource represents the collection of DNAI Mapping subscriptions of the Nnef_DNAIMapping service. It allows NF service consumers to create a new subscription to notifications on DNAI Mapping.

5.5.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nnef-dnai-mapping/<apiVersion>/subscriptions**

This resource shall support the resource URI variables defined in table 5.5.3.2.2-1.

Table 5.5.3.2.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.5.1

5.5.3.2.3 Resource Standard Methods

5.5.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.5.3.2.3.1-1.

Table 5.5.3.2.3.1-1: URI query parameters supported by the POST method on this resource

Name	Data type	P	Cardinality	Description	Applicability
n/a					

This method shall support the request data structures specified in table 5.5.3.2.3.1-2 and the response data structures and response codes specified in table 5.5.3.2.3.1-3.

Table 5.5.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
DnaiMapSub	M	1	Contains the information required for the creation of a new Individual DNAI Mapping Subscription resource.

Table 5.5.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response Codes	Description
DnaiMapSub	M	1	201 Created	Contains the representation of the Individual DNAI Mapping Subscription resource.
NOTE: The mandatory HTTP error status code for the POST method listed in table 5.6.7.1-1 of 3GPP TS 29.500 [4] also apply.				

Table 5.5.3.2.3.1-4: Headers supported by the 201 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnef-dnai-mapping/<apiVersion>/subscriptions/{subscriptionId}.

5.5.3.3 Resource: Individual DNAI Mapping Subscription

5.5.3.3.1 Description

The resource represents an individual DNAI Mapping subscription of the Nnef_DNAIMapping service. It allows NF service consumers to subscribe/unsubscribe DNAI Mapping information, and allows the NEF to notify DNAI Mapping Information to the NF service consumer.

5.5.3.3.2 Resource Definition

Resource URI: **{apiRoot}/nnef-dnai-mapping/<apiVersion>/subscriptions/{subscriptionId}**

This resource shall support the resource URI variables defined in table 5.5.3.3.2-1.

Table 5.5.3.3.2-1: Resource URI variables for this resource

Name	Data type	Definition
apiRoot	string	See clause 5.5.1.
subscriptionId	string	Identifier of the subscription.

5.5.3.3.3 Resource Standard Methods

5.5.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.5.3.3.3.1-1.

Table 5.5.3.3.3.1-1: 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 5.5.3.3.3.1-2 and the response data structures and response codes specified in table 5.5.3.3.3.1-3.

Table 5.5.3.3.3.1-2: Data structures supported by the GET Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.5.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

Data type	P	Cardinality	Response codes	Description
DnaiMapSub	M	1	200 OK	The subscription information is returned.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription retrieval. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription retrieval. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the GET method listed in table 5.6.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.5.3.3.3.1-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected.
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].

Table 5.5.3.3.3.1-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.5.3.3.3.2 DELETE

This method shall support the URI query parameters specified in table 5.5.3.3.3.2-1.

Table 5.5.3.3.3.2-1: URI query parameters supported by the DELETE method on this resource

Name	Data type	P	Cardinality	Description
n/a				

This method shall support the request data structures specified in table 5.5.3.3.3.2-2 and the response data structures and response codes specified in table 5.5.3.3.3.2-3.

Table 5.5.3.3.3.2-2: Data structures supported by the DELETE Request Body on this resource

Data type	P	Cardinality	Description
n/a			

Table 5.5.3.3.3.2-3: Data structures supported by the DELETE Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	Successful case. The Individual DNAI Mapping Subscription resource matching the subscriptionId was deleted.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during subscription termination. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during subscription termination. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the DELETE method listed in table 5.6.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.5.3.3.3.2-4: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	String	M	1	An alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	String	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

Table 5.5.3.3.3.2-5: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	String	M	1	An alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	String	O	0..1	Identifier of the target NEF (service) instance towards which the request is redirected.

5.5.4 Custom Operations without associated resources

None.

5.5.5 Notifications

5.5.5.1 General

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

Table 5.5.5.1-1: Notifications overview

Notification	Callback URI	HTTP method or custom operation	Description (service operation)
Notification of the update of DNAI-EAS address(es) information	{notifUri}	POST	The update of the DNAI-EAS address(es) information is notified to the NF service consumer by the NEF.

5.5.5.2 DNAI Mapping Notification

5.5.5.2.1 Description

The DNAI Mapping Notification is used by the NEF to report the observed DNAI Mapping to an NF service consumer that has subscribed to such Notifications.

5.5.5.2.2 Target URI

The Notification URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.5.5.2.2-1.

Table 5.5.5.2.2-1: Callback URI variables for this resource

Name	Data type	Definition
notifUri	Uri	The Notification URI as assigned by the NF service consumer during the subscription service operation and described within the DnaiMapSub data type.

5.5.5.2.3 Standard Methods

5.5.5.2.3.1 POST

This method shall support the request data structures specified in table 5.5.5.2.3.1-1 and the response data structures and response codes specified in table 5.5.5.2.3.1-2.

Table 5.5.5.2.3.1-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
DnaiMapUpdateNotif	M	1	Represents the update of the DNAI Mapping information to be reported to the NF service consumer.

Table 5.5.5.2.3.1-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
n/a			204 No Content	The receipt of the Notification is acknowledged.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during notification. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection, during notification. (NOTE 2)
NOTE 1: The mandatory HTTP error status codes for the POST method listed in table 5.6.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.5.5.2.3.1-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

Table 5.5.5.2.3.1-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	An alternative URI representing the end point of an alternative NF consumer (service) instance towards which the notification should be redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the target NF (service) instance towards which the notification request is redirected.

5.5.6 Data Model

5.5.6.1 General

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

Table 5.5.6.1-1 specifies the data types defined for the Nnef_DNAIMapping service based interface protocol.

Table 5.5.6.1-1: Nnef_DNAIMapping specific Data Types

Data type	Section defined	Description	Applicability
n/a			

Table 5.5.6.1-2 specifies data types re-used by the Nnef_DNAIMapping service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnef_DNAIMapping service based interface.

Table 5.5.6.1-2: Nnef_DNAIMapping re-used Data Types

Data type	Reference	Comments	Applicability
DnaiMapSub	3GPP TS 29.522 [15]	Represents DNAI Mapping subscription data.	
DnaiMapUpdateNotif	3GPP TS 29.522 [15]	Represents the notification data of the update of DNAI Mapping information.	

5.5.6.2 Structured data types

5.5.6.2.1 Introduction

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

5.5.6.3 Simple data types and enumerations

5.5.6.3.1 Introduction

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

5.5.6.3.2 Simple data types

The simple data types defined in table 5.5.6.3.2-1 shall be supported.

Table 5.5.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.5.7 Error Handling

5.5.7.1 General

For the Nnef_DNAIMapping API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [5]. Protocol errors and application errors specified in table 5.6.7.2-1 of 3GPP TS 29.500 [4] shall be supported for an HTTP method if the corresponding HTTP status codes are specified as mandatory for that HTTP method in table 5.6.7.1-1 of 3GPP TS 29.500 [4].

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

5.5.7.2 Protocol Errors

No specific procedures for the Nnef_DNAIMapping service are specified.

5.5.7.3 Application Errors

The application errors defined for the Nnef_DNAIMapping service are listed in Table 5.5.7.3-1.

Table 5.5.7.3-1: Application errors

Application Error	HTTP status code	Description

5.5.8 Feature negotiation

The optional features in table 5.5.8-1 are defined for the Nnef_DNAIMapping API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.5.8-1: Supported Features

Feature number	Feature Name	Description

5.5.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Nnef_DNAIMapping API may be authorized by means of the Oauth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the “Client Credentials” authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If Oauth2 is used, an NF Service Consumer, prior to consuming services offered by the Nnef_DNAIMapping API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.6.2.2.

5.6 Nnef_UEId Service API

5.6.1 Introduction

The Nnef_UEId service shall use the Nnef_UEId API.

The API URI of the Nnef_UEId API shall be:

{apiRoot}/<apiName>/<apiVersion>

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

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [5].
- The <apiName> shall be "nnef-ueid".
- The <apiVersion> shall be "v1".
- The <apiSpecificResourceUriPart> shall be set as described in clause 5.6.3 and clause 5.6.4.

5.6.2 Usage of HTTP

5.6.2.1 General

HTTP/2, IETF RFC 9113 [11], shall be used as specified in clause 5 of 3GPP TS 29.500 [4].

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

The OpenAPI [6] specification of HTTP messages and content bodies for the Nnef_UEId API is contained in Annex A.7.

5.6.2.2 HTTP standard headers

5.6.2.2.1 General

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

5.6.2.2.2 Content type

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

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 9457 [13].

5.6.2.3 HTTP custom headers

The Nnef_UEId API shall support mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [4] and may support HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [4].

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

5.6.3 Resources

There are no resources defined for this API in this release of the specification.

5.6.4 Custom Operations without associated resources

5.6.4.1 Overview

The structure of the custom operation URIs of the Nnef_UEId API is shown in figure 5.6.4.1-1.

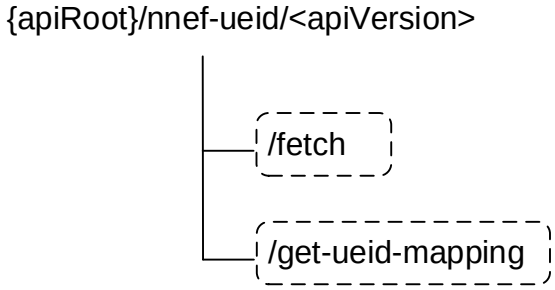

Figure 5.6.4.1-1: Custom operation URI structure of the Nnef_UEId API

Table 5.6.4.1-1 provides an overview of the custom operations and applicable HTTP methods defined for the Nnef_UEId API.

Table 5.6.4.1-1: Custom operations without associated resources

Custom Operation name	Custom operation URI	Mapped HTTP method	Description
fetch	/fetch	POST	Fetch the internal UE identifier from the H-NEF for the roaming UE.
UEIDMappingInfoRetrieval	/get-ueid-mapping	POST	Get the UE ID Mapping information from NEF.

5.6.4.2 Operation: Fetch

5.6.4.2.1 Description

The custom operation allows the NF service consumer (e.g. V-NEF) providing the external UE Identifier to fetch the internal UE Identifier from the H-NEF for the roaming UE under the roaming agreement with the roaming partner(s).

5.6.4.2.2 Operation Definition

This operation shall support the response data structures and response codes specified in tables 5.6.4.2.2-1 and 5.6.4.2.2-2.

Table 5.6.4.2.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
UeIdReq	M	1	Parameters to request to fetch the internal UE Identifier.

Table 5.6.4.2.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response codes	Description
UeIdInfo	M	1	200 OK	The requested internal UE Identifier was returned successfully.
n/a			204 No Content	If the requested data does not exist, the NEF shall respond with "204 No Content".
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection, during fetch procedure. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection during fetch procedure. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.6.4.2.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the NEF (service) instance towards which the request is redirected.

Table 5.6.4.2.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Identifier of the NEF (service) instance towards which the request is redirected.

5.6.4.3 Operation: UEIDMappingInfoRetrieval

5.6.4.3.1 Description

This custom operation allows the NF service consumer to retrieve UE ID mapping information from the NEF.

5.6.4.3.2 Operation Definition

This operation shall support the request data structures specified in table 5.6.4.3.2-1 and the response data structures and response codes specified in table 5.6.4.3.2-2.

Table 5.6.4.3.2-1: Data structures supported by the POST Request Body on this resource

Data type	P	Cardinality	Description
MapUeIdInfo	M	1	Contains the parameters to request to retrieve the UE ID mapping information.

Table 5.6.4.3.2-2: Data structures supported by the POST Response Body on this resource

Data type	P	Cardinality	Response Codes	Description
MapUeIdInfo	M	1	200 OK	Successful case. The requested UE ID mapping information is returned.
n/a			204 No Content	Successful case. There is no UE ID mapping information corresponding to the provided input parameters.
RedirectResponse	O	0..1	307 Temporary Redirect	Temporary redirection. (NOTE 2)
RedirectResponse	O	0..1	308 Permanent Redirect	Permanent redirection. (NOTE 2)
NOTE 1: The mandatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. NOTE 2: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [4]).				

Table 5.6.4.3.2-3: Headers supported by the 307 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	String	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	String	O	0..1	Contains the identifier of the NEF (service) instance towards which the request is redirected.

Table 5.6.4.3.2-4: Headers supported by the 308 Response Code on this resource

Name	Data type	P	Cardinality	Description
Location	string	M	1	Contains an alternative URI of the resource located in an alternative NEF (service) instance towards which the request is redirected. For the case where the request is redirected to the same target via a different SCP, refer to clause 6.10.9.1 of 3GPP TS 29.500 [4].
3gpp-Sbi-Target-Nf-Id	string	O	0..1	Contains the identifier of the NEF (service) instance towards which the request is redirected.

5.6.5 Notifications

None.

5.6.6 Data Model

5.6.6.1 General

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

Table 5.6.6.1-1 specifies the data types defined for the Nnef_UEId service-based interface protocol.

Table 5.6.6.1-1: Nnef_UEId specific Data Types

Data type	Section defined	Description	Applicability
MapUeIdInfo	5.6.6.2.4	Contains the UE ID mapping information.	
UeIdReq	5.6.6.2.2	Contains the UE ID request information.	
UeIdInfo	5.6.6.2.3	Contains the UE ID information.	

Table 5.6.6.1-2 specifies data types re-used by the Nnef_UEId service based interface protocol from other specifications, including a reference to their respective specifications and when needed, a short description of their use within the Nnef_UEId service based interface.

Table 5.6.6.1-2: Nnef_UEId re-used Data Types

Data type	Reference	Comments	Applicability
ApplicationlayerId	3GPP TS 29.571 [16]	Identifies an Application Layer ID.	
DnnSnssaiInformation	3GPP TS 29.522 [15]	Identifies a combination of (DNN, S-NSSAI).	
Gpsi	3GPP TS 29.571 [16]	Identifies the GPSI of an UE.	
IpAddr	3GPP TS 29.571 [16]	Identifes an UE IP address.	
Supi	3GPP TS 29.571 [16]	Identifies the SUPI of an UE.	

5.6.6.2 Structured data types

5.6.6.2.1 Introduction

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

5.6.6.2.2 Type: UeIdReq

Table 5.6.6.2.2-1: Definition of type UeIdReq

Attribute name	Data type	P	Cardinality	Description	Applicability
gpsi	Gpsi	C	0..1	The GPSI of an UE. (NOTE)	
uePubIpAddr	IpAddr	C	0..1	Identifies a UE public IP address. (NOTE)	
NOTE: Only one of the "gpsi" or "uePubIpAddr" attribute shall be present.					

5.6.6.2.3 Type: UeIdInfo

Table 5.6.6.2.3-1: Definition of type UeIdInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
hPlmnDnnSnssai	DnnSnssaiInformation	O	0..1	Identifies the HPLMN DNN and S-NSSAI information of the HR-SBO Session. This attribute may be provided if the "uePvtIpAddr" attribute is present.	
supi	Supi	C	0..1	The SUPI of an UE. (NOTE)	
uePvtIpAddr	IpAddr	C	0..1	Identifies a UE private IP address. (NOTE)	
NOTE: Only one of the "supi" or "uePvtIpAddr" attribute shall be present.					

5.6.6.2.4 Type: MapUeIdInfo

Table 5.6.6.2.4-1: Definition of type MapUeIdInfo

Attribute name	Data type	P	Cardinality	Description	Applicability
appLayerId	ApplicationlayerId	C	0..1	Identifies a Ranging/Sidelink Positioning-enabled UE within the context of a specific application. This attribute shall be present in the UE ID mapping information retrieval response only if the "gpsi" attribute was present in the corresponding request. (NOTE)	
gpsi	Gpsi	C	0..1	Contains the GPSI of a UE. This attribute shall be present in the UE ID mapping information retrieval response only if the "appLayerId" attribute was present in the corresponding request. (NOTE)	
NOTE: These attributes are mutually exclusive. Either one of them shall be present.					

5.6.6.3 Simple data types and enumerations

5.6.6.3.1 Introduction

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

5.6.6.3.2 Simple data types

The simple data types defined in table 5.6.6.3.2-1 shall be supported.

Table 5.6.6.3.2-1: Simple data types

Type Name	Type Definition	Description	Applicability

5.6.7 Error Handling

5.6.7.1 General

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

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

5.6.7.2 Protocol Errors

No specific procedures for the Nnef_UEId service are specified.

5.6.7.3 Application Errors

The application errors defined for the Nnef_UEId service are listed in Table 5.6.7.3-1.

Table 5.6.7.3-1: Application errors

Application Error	HTTP status code	Description

5.6.8 Feature negotiation

The optional features in table 5.6.8-1 are defined for the Nnef_UEId API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [4].

Table 5.6.8-1: Supported Features

Feature number	Feature Name	Description

5.6.9 Security

As indicated in 3GPP TS 33.501 [8] and 3GPP TS 29.500 [4], the access to the Nnef_UEId API may be authorized by means of the Oauth2 protocol (see IETF RFC 6749 [9]), based on local configuration, using the “Client Credentials” authorization grant, where the NRF (see 3GPP TS 29.510 [10]) plays the role of the authorization server.

If Oauth2 is used, an NF Service Consumer, prior to consuming services offered by the Nnef_UEId API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [10], clause 5.5.2.2.

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

The Nnef_UEId API defines the following scopes for OAuth2 authorization as described in clause 4.10 of 3GPP TS 29.501 [5].

Table 5.6.9-1: OAuth2 scopes defined in Nnef_UEId API

Scope	Description
"nnef-ueid"	Access to the Nnef_UEId API
"nnef-ueid:fetch"	Access to the Fetch custom operation.
"nnef-ueid:get-ueid-mapping"	Access to UEIDMappingInfoRetrieval custom operation.

Annex A (normative): OpenAPI specification

A.1 General

This Annex specifies the formal definition of the API(s) defined in the present specification. It consists of OpenAPI 3.0.0 specifications in YAML format.

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

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

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

A.2 Nnef_EventExposure API

```
openapi: 3.0.0

info:
  title: Nnef_EventExposure
  version: 1.3.1
  description: |
    NEF Event Exposure Service.
    © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.591 V18.9.0; 5G System; Network Exposure Function Southbound Services; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.591/

servers:
  - url: '{apiRoot}/nnef-eventexposure/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:
  - {}
  - oAuth2ClientCredentials:
    - nnef-eventexposure

paths:
  /subscriptions:
    post:
      summary: subscribe to notifications
      operationId: CreateIndividualSubcription
      tags:
        - Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NefEventExposureSubsc'
      responses:
        '201':
          description: Success
          content:
            application/json:
              schema:
```

```
              $ref: '#/components/schemas/NefEventExposureSubsc'
        headers:
          Location:
            description: >
              Contains the URI of the newly created resource, according to the structure
              {apiRoot}/nnef-eventexposure/<apiVersion>/subscriptions/{subscriptionId}
            required: true
            schema:
              type: string
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    callbacks:
      myNotification:
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/NefEventExposureNotif'
            responses:
              '204':
                description: No Content, Notification was succesfull
              '307':
                $ref: 'TS29571_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29571_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '502':
                $ref: 'TS29571_CommonData.yaml#/components/responses/502'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}:
    get:
      summary: retrieve subscription
```

```
    operationId: GetIndividualSubcription
    tags:
      - IndividualSubscription (Document)
    parameters:
      - name: subscriptionId
        in: path
        description: Event Subscription ID
        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. Resource representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NefEventExposureSubsc'
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29571_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  put:
    summary: update subscription
    operationId: ReplaceIndividualSubcription
    tags:
      - IndividualSubscription (Document)
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/NefEventExposureSubsc'
    parameters:
      - name: subscriptionId
        in: path
        description: Event Subscription ID
        required: true
        schema:
          type: string
    responses:
      '200':
        description: OK. Resource was succesfully modified and representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/NefEventExposureSubsc'
      '204':
        description: No Content. Resource was succesfully modified
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

    delete:
      summary: unsubscribe from notifications
      operationId: DeleteIndividualSubcription
      tags:
        - IndividualSubscription (Document)
      parameters:
        - name: subscriptionId
          in: path
          description: Event Subscription ID
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content. Resource was succesfully deleted
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'


components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nnef-eventexposure: Access to the Nnef_EventExposure API

  schemas:
    NefEventExposureSubsc:
      description: Represents an Individual Network Exposure Event Subscription resource.
```

```
      type: object
      properties:
        dataAccProfId:
          type: string
        eventsSubs:
          type: array
          items:
            $ref: '#/components/schemas/NefEventSubs'
          minItems: 1
        eventsRepInfo:
          $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        notifId:
          type: string
        eventNotifs:
          type: array
          items:
            $ref: '#/components/schemas/NefEventNotification'
          minItems: 1
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - eventsSubs
        - notifId
        - notifUri

    NefEventExposureNotif:
      description: >
        Represents notifications on network exposure event(s) that occurred for an Individual
Network
        Exposure Event Subscription resource.
      type: object
      properties:
        notifId:
          type: string
        eventNotifs:
          type: array
          items:
            $ref: '#/components/schemas/NefEventNotification'
          minItems: 1
      required:
        - notifId
        - eventNotifs

    NefEventNotification:
      description: Represents information related to an event to be reported.
      type: object
      properties:
        event:
          $ref: '#/components/schemas/NefEvent'
        timeStamp:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
        svcExprcInfos:
          type: array
          items:
            $ref: '#/components/schemas/ServiceExperienceInfo'
          minItems: 1
        ueMobilityInfos:
          type: array
          items:
            $ref: '#/components/schemas/UeMobilityInfo'
          minItems: 1
        ueCommInfos:
          type: array
          items:
            $ref: '#/components/schemas/UeCommunicationInfo'
          minItems: 1
        excepInfos:
          type: array
          items:
            $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/ExceptionInfo'
          minItems: 1
        congestionInfos:
          type: array
          items:
            $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/UserDataCongestionCollection'
          minItems: 1
```

```
        perfDataInfos:
          type: array
          items:
            $ref: '#/components/schemas/PerformanceDataInfo'
          minItems: 1
        dispersionInfos:
          type: array
          items:
            $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/DispersionCollection'
          minItems: 1
        collBhvrInfs:
          type: array
          items:
            $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/CollectiveBehaviourInfo'
          minItems: 1
        msQoeMetrInfos:
          type: array
          items:
            $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/MsQoeMetricsCollection'
          minItems: 1
          deprecated: true
        msQoeMetrics:
          type: array
          items:
            $ref: 'TS26512_EventExposure.yaml#/components/schemas/QoEMetricsCollection'
          minItems: 1
          description: Represents the Media Streaming QoE metrics event notification.
        msConsumpInfos:
          type: array
          items:
            $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/MsConsumptionCollection'
          minItems: 1
          deprecated: true
        msConsumpReports:
          type: array
          items:
            $ref:
'TS26512_EventExposure.yaml#/components/schemas/ConsumptionReportingUnitsCollection'
          minItems: 1
          description: Represents the Media Streaming Consumption event notification.
        msNetAssInvInfos:
          type: array
          items:
            $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/MsNetAssInvocationCollection'
          minItems: 1
          deprecated: true
        msNetAssistInvocation:
          type: array
          items:
            $ref:
'TS26512_EventExposure.yaml#/components/schemas/NetworkAssistanceInvocationsCollection'
          minItems: 1
          description: >
            Represents the Media Streaming Network Assistance Invocations event notification.
        msDynPlyInvInfos:
          type: array
          items:
            $ref:
'TS29517_Naf_EventExposure.yaml#/components/schemas/MsDynPolicyInvocationCollection'
          minItems: 1
          deprecated: true
        msDynPlyInvocation:
          type: array
          items:
            $ref:
'TS26512_EventExposure.yaml#/components/schemas/DynamicPolicyInvocationsCollection'
          minItems: 1
          description: Represents the Media Streaming Dynamic Policy Invocations event notification.
        msAccActInfos:
          type: array
          items:
            $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/MSAccessActivityCollection'
          minItems: 1
          deprecated: true
        msAccess:
          type: array
          items:
            $ref: 'TS26512_EventExposure.yaml#/components/schemas/MediaStreamingAccessesCollection'
```

```
        minItems: 1
        description: Represents the Media Streaming access event notification.
      gnssAssistDataInfo:
        $ref: '#/components/schemas/GNSSAssistDataInfo'
      datVolTransTimeInfos:
        type: array
        items:
          $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/DatVolTransTimeCollection'
        minItems: 1
    required:
      - event
      - timeStamp

  NefEventSubs:
    description: Represents an event to be subscribed and the related event filter information.
    type: object
    properties:
      event:
        $ref: '#/components/schemas/NefEvent'
      eventFilter:
        $ref: '#/components/schemas/NefEventFilter'
      eventRepInfo:
        $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
    required:
      - event

  NefEventFilter:
    description: Represents event filter information for an event.
    type: object
    properties:
      tgtUe:
        $ref: '#/components/schemas/TargetUeIdentification'
      appIds:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
        minItems: 1
      locArea:
        $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
      collAttrs:
        type: array
        items:
          $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/CollectiveBehaviourFilter'
        minItems: 1
    required:
      - tgtUe

  TargetUeIdentification:
    description: Identifies the UE to which the request applies.
    type: object
    properties:
      supis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        minItems: 1
      interGroupIds:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        minItems: 1
      anyUeId:
        type: boolean
      ueIpAddr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'

  ServiceExperienceInfo:
    description: Contains service experience information associated with an application.
    type: object
    properties:
      appId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
      supis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        minItems: 1
      svcExpPerFlows:
```

```
        type: array
        items:
          $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/ServiceExperienceInfoPerFlow'
        minItems: 1
      contrWeights:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
        minItems: 1
    required:
      - svcExpPerFlows

  UeMobilityInfo:
    description: >
      Contains UE mobility information associated with an application. If the "appId" attribute is
      not present, then indicates the collected UE mobility information is applicable to all the
      applications for the UE.
    type: object
    properties:
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      appId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
      ueTrajs:
        type: array
        items:
          $ref: '#/components/schemas/UeTrajectoryInfo'
        minItems: 1
      areas:
        type: array
        items:
          $ref: 'TS29554_Npcf_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'
        minItems: 1
    required:
      - supi
      - ueTrajs

  UeCommunicationInfo:
    description: Contains UE communication information associated with an application.
    type: object
    properties:
      supi:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
      interGroupId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
      appId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
      comms:
        type: array
        items:
          $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/CommunicationCollection'
        minItems: 1
    required:
      - comms

  UeTrajectoryInfo:
    description: Contains UE trajectory information.
    type: object
    properties:
      ts:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      location:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
    required:
      - ts
      - location

  PerformanceDataInfo:
    description: Contains Performance Data Analytics related information collection.
    type: object
    properties:
      appId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationId'
      ueIpAddr:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
      ipTrafficFilter:
        $ref: 'TS29122_CommonData.yaml#/components/schemas/FlowInfo'
      userLoc:
```

```
          $ref: 'TS29571_CommonData.yaml#/components/schemas/UserLocation'
        appLocs:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnai'
          minItems: 1
        asAddr:
          $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/AddrFqdn'
        perfData:
          $ref: 'TS29517_Naf_EventExposure.yaml#/components/schemas/PerformanceData'
        timeStamp:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/DateTime'
      required:
        - perfData
        - timeStamp

    GNSSAssistDataInfo:
      description: Represents GNSS Assistance Data related information.
      type: object
      properties:
        gnssAssistData:
          $ref: '#/components/schemas/GNSSAssistData'
        servArea:
          $ref: '#/components/schemas/GNSSServArea'
        sourceInfo:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicalCoordinates'
      required:
        - gnssAssistData
        - servArea

    GNSSServArea:
      description: Represents the serving area of the GNSS Assistance Data.
      type: object
      properties:
        geographicalArea:
          $ref: 'TS29572_Nlmf_Location.yaml#/components/schemas/GeographicArea'
        taiList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Tai'
          minItems: 1
      oneOf:
        - required: [geographicalArea]
        - required: [taiList]

# Simple data types and Enumerations

    NefEvent:
      anyOf:
      - type: string
        enum:
          - SVC_EXPERIENCE
          - UE_MOBILITY
          - UE_COMM
          - EXCEPTIONS
          - USER_DATA_CONGESTION
          - PERF_DATA
          - DISPERSION
          - COLLECTIVE_BEHAVIOUR
          - MS_QOE_METRICS
          - MS_CONSUMPTION
          - MS_NET_ASSIST_INVOCATION
          - MS_DYN_POLICY_INVOCATION
          - MS_ACCESS_ACTIVITY
          - GNSS_ASSISTANCE_DATA
          - DATA_VOLUME_TRANSFER_TIME
      - 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: |
        Represents a Network Exposure Event.
        Possible values are:
        - SVC_EXPERIENCE: Indicates that the subscribed/notified event is service experience
          information for an application.
        - UE_MOBILITY: Indicates that the subscribed/notified event is UE mobility information.
        - UE_COMM: Indicates that the subscribed/notified event is UE communication information.
        - EXCEPTIONS: Indicates that the subscribed/notified event is exceptions information.
```

```
        - USER_DATA_CONGESTION: Indicates that the subscribed/notified event is user data congestion
          analytics related information.
        - PERF_DATA: Indicates that the subscribed/notified event is performance data information.
        - DISPERSION: Indicates that the subscribed/notified event is dispersion information.
        - COLLECTIVE_BEHAVIOUR: Indicates that the subscribed/notified event is collective behaviour
          information.
        - MS_QOE_METRICS: Indicates that the subscribed/notified event is Media Streaming QoE
          metrics.
        - MS_CONSUMPTION: Indicates that the subscribed/notified event is Media Streaming
          consumption reports.
        - MS_NET_ASSIST_INVOCATION: Indicates that the subscribed/notified event is Media Streaming
          network assistance invocation.
        - MS_DYN_POLICY_INVOCATION: Indicates that the subscribed/notified event is Media Streaming
          dynamic policy invocation.
        - MS_ACCESS_ACTIVITY: Indicates that the subscribed/notified event is Media Streaming access
          activity.
        - GNSS_ASSISTANCE_DATA: Indicates that the subscribed/notified event is GNSS Assistance Data
          Collection.
        - DATA_VOLUME_TRANSFER_TIME: Indicates that the event subscribed is data volume transfer
          time information.

    GNSSAssistData:
      type: string
      description: >
        Represents GNSS Assistance Data encoded as specified in clause 6.5.2.1 of
        3GPP TS 37.355 [31].
```

A.3 Nnef_EASDeployment API

```
openapi: 3.0.0

info:
  title: Nnef_EASDeployment
  version: 1.1.1
  description: |
    NEF EAS Deployment service.
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    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.591 V18.8.1; 5G System; Network Exposure Function Southbound Services; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.591/

servers:
  - url: '{apiRoot}/nnef-eas-deployment/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:
  - {}
  - oAuth2ClientCredentials:
    - nnef-eas-deployment

paths:
  /subscriptions:
    post:
      summary: subscribe to notifications
      operationId: CreateIndividualSubcription
      tags:
        - Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EasDeploySubData'
      responses:
        '201':
          description: Success
          content:
            application/json:
              schema:
```

```
              $ref: '#/components/schemas/EasDeploySubData'
        headers:
          Location:
            description: >
              Contains the URI of the newly created resource, according to the structure:
              {apiRoot}/nnef-eas-deployment/<apiVersion>/subscriptions/{subscriptionId}.
            required: true
            schema:
              type: string
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    callbacks:
      notifUri:
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/EasDeployInfoNotif'
            responses:
              '204':
                description: No Content, Notification was succesfull
              '307':
                $ref: 'TS29571_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29571_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '502':
                $ref: 'TS29571_CommonData.yaml#/components/responses/502'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}:
    get:
      summary: retrieve subscription
```

```
    operationId: GetIndividualSubcription
    tags:
      - IndividualSubscription (Document)
    parameters:
      - name: subscriptionId
        in: path
        description: Event Subscription ID
        required: true
        schema:
          type: string
    responses:
      '200':
        description: OK. Resource representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EasDeploySubData'
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29571_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  delete:
    summary: unsubscribe from notifications
    operationId: DeleteIndividualSubcription
    tags:
      - IndividualSubscription (Document)
    parameters:
      - name: subscriptionId
        in: path
        description: Event Subscription ID
        required: true
        schema:
          type: string
    responses:
      '204':
        description: No Content. Resource was succesfully deleted
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
```

```
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'


components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nnef-eas-deployment: Access to the Nnef_EASDeployment API

  schemas:
    EasDeploySubData:
      description: Represents an Individual EAS Deployment Event Subscription resource.
      type: object
      properties:
        appId:
          type: string
        dnnSnssaiInfos:
          type: array
          items:
            $ref: 'TS29522_AMInfluence.yaml#/components/schemas/DnnSnssaiInformation'
          minItems: 1
          description: Each of the element identifies a (DNN, S-NSSAI) combination.
        eventId:
          $ref: '#/components/schemas/EasEvent'
        eventsNotifs:
          type: array
          items:
            $ref: '#/components/schemas/EasDeployInfoData'
          minItems: 1
          description: >
            Represents the EAS Deployment Information changes event(s) to be reported.
            Shall only be present if the "immRep" attribute is included and sets to true,
            and the current status of EAS Deployment Information is available.
        immRep:
          type: boolean
          description: >
            Indication of immediate reporting. Set to true: requires the immediate reporting of the
            current status of EAS Deployment Information, if available. Set to false (default): EAS
            Deployment Information event report occurs when the event is met.
        interGroupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        notifId:
          type: string
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        suppFeat:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - eventId
        - notifId
        - notifUri

    EasDeployInfoNotif:
      description: >
        Represents notifications on EAS Deployment Information changes event(s) that occurred for an
        Individual EAS Deployment Event Subscription resource.
      type: object
      properties:
        easDepNotifs:
          type: array
          items:
            $ref: '#/components/schemas/EasDepNotification'
          minItems: 1
        notifId:
          type: string
      required:
        - easDepNotifs
        - notifId

    EasDepNotification:
      description: Represents the EAS Deployment Notifcation.
      type: object
      properties:
        easDepInfo:
```

```
          $ref: '#/components/schemas/EasDeployInfoData'
        eventId:
          $ref: '#/components/schemas/EasEvent'
      required:
        - easDepInfo
        - eventId

    EasDeployInfoData:
      description: Represents the EAS Deployment Information to be reported.
      type: object
      properties:
        appId:
          type: string
        dnaiInfos:
          type: object
          additionalProperties:
            $ref: 'TS29522_EASDeployment.yaml#/components/schemas/DnaiInformation'
          minProperties: 1
          description: >
            list of DNS server identifier (consisting of IP address and port) and/or IP address(s)
            of the EAS in the local DN for each DNAI. The key of map is the DNAI.
        dnn:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        fqdnPatternList:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/FqdnPatternMatchingRule'
          minItems: 1
        internalGroupId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/GroupId'
        snssai:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        targetAfId:
          type: string
          description: >
            Identifier of the AF that is responsible for the EAS associated with this EAS
            deployment information.
      required:
        - fqdnPatternList

# Simple data types and Enumerations

    EasEvent:
      anyOf:
      - type: string
        enum:
          - EAS_INFO_CHG
      - type: string
      description: |
        Represents the EAS event.
        Possible values are:
        - EAS_INFO_CHG: Indicates that the EAS Deployment Information is changed.
```

A.4 Nnef_TrafficInfluenceData API

```
openapi: 3.0.0

info:
  title: Nnef_TrafficInfluenceData
  version: 1.0.0
  description: |
    NEF Traffic Influence Data Service.
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    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.591 V18.6.0; 5G System; Network Exposure Function Southbound Services; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.591/

servers:
  - url: '{apiRoot}/nnef-traffic-influence-data/v1'
    variables:
      apiRoot:
        default: https://example.com
```

```
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:
  - {}
  - oAuth2ClientCredentials:
    - nnef-traffic-influence-data

paths:

  /subscriptions:
    post:
      summary: subscribe to notifications
      operationId: CreateIndividualSubcription
      tags:
        - Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TrafficInfluDataSub'
      responses:
        '201':
          description: >
            Created. A representation of the created Individual Traffic Influence Data
            Subscription resource is returned in the response body.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TrafficInfluDataSub'
          headers:
            Location:
              description: >
                Contains the URI of the newly created resource, according to the structure
                {apiRoot}/nnef-traffic-influence-data/<apiVersion>/subscriptions/{subscriptionId}
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
      callbacks:
        myNotification:
          '{$request.body#/notifUri}':
            post:
              requestBody:
                required: true
                content:
                  application/json:
                    schema:
                      $ref: '#/components/schemas/TrafficInfluDataNotify'
              responses:
                '204':
                  description: No Content, Notification was succesfull
                '307':
                  $ref: 'TS29571_CommonData.yaml#/components/responses/307'
                '308':
```

```
                $ref: 'TS29571_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '502':
                $ref: 'TS29571_CommonData.yaml#/components/responses/502'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'

/subscriptions/{subscriptionId}:
  parameters:
    - name: subscriptionId
      in: path
      description: Subscription ID
      required: true
      schema:
        type: string
  get:
    summary: retrieve subscription
    operationId: GetIndividualSubcription
    tags:
      - IndividualSubscription (Document)
    responses:
      '200':
        description: OK. Resource representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TrafficInfluDataSub'
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29571_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  put:
    summary: update subscription
    operationId: ReplaceIndividualSubcription
    tags:
      - IndividualSubscription (Document)
    requestBody:
      required: true
```

```
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/TrafficInfluDataSub'
      responses:
        '200':
          description: OK. Resource was succesfully modified and representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/TrafficInfluDataSub'
        '204':
          description: No Content. Resource was succesfully modified
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

    delete:
      summary: unsubscribe from notifications
      operationId: DeleteIndividualSubcription
      tags:
        - IndividualSubscription (Document)
      responses:
        '204':
          description: No Content. Resource was succesfully deleted
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
```

```
      clientCredentials:
        tokenUrl: '{nrfApiRoot}/oauth2/token'
        scopes:
          nnef-traffic-influence-data: Access to the Nnef_TrafficInfluenceData API

schemas:
  TrafficInfluDataSub:
    description: Represents an Individual Traffic Influence Subscription data.
    type: object
    properties:
      notifUri:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
      notifCorrId:
        type: string
        description: Notification correlation identifier.
      dnns:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
        minItems: 1
        description: Each element identifies a DNN.
      snssais:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
        minItems: 1
        description: Each element identifies a slice.
      supis:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        minItems: 1
        description: Each element identifies the user.
      anyUe:
        type: boolean
        description: >
          Identifies any UE when setting to true. Default value is false if omitted.
      hplmnId:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/PlmnId'
      ipv4Addrs:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv4Addr'
        minItems: 1
        description: Each element identifies an IPv4 address.
      ipv6Addrs:
        type: array
        items:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Ipv6Addr'
        minItems: 1
        description: Each element identifies an IPv6 address.
      rptInfo:
        $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
      immReports:
        type: array
        items:
          $ref: 'TS29519_Application_Data.yaml#/components/schemas/TrafficInfluData'
        minItems: 1
        description: Immediate report with Traffic Influence Data that match this subscription.
      supportedFeatures:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
    required:
      - notifUri
      - notifCorrId
    anyOf:
      - required: [dnns]
      - required: [snssais]

  TrafficInfluDataNotify:
    description: Represents notifications for traffic influence data.
    type: object
    properties:
      notifCorrId:
        type: string
        description: Notification correlation identifier.
      eventNotifications:
        type: array
        items:
```

```
            $ref: 'TS29519_Application_Data.yaml#/components/schemas/TrafficInfluDataNotif'
          minItems: 1
          description: Notifications about Individual Events.
      required:
        - notifCorrId
        - eventNotifications
```

A.5 Nnef_ECSAddress API

```
openapi: 3.0.0

info:
  title: Nnef_ECSAddressConfigurationInformation
  version: 1.0.1
  description: |
    NEF ECS Address Service.
    © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.591 V18.7.0; 5G System; Network Exposure Function Southbound Services; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.591/

servers:
  - url: '{apiRoot}/nnef-ecs-addr-cfg-info/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:
  - {}
  - oAuth2ClientCredentials:
    - nnef-ecs-addr-cfg-info

paths:

  /subscriptions:
    post:
      summary: subscribe to notifications
      operationId: CreateIndividualSubcription
      tags:
        - Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EcsAddrCfgInfoSub'
      responses:
        '201':
          description: Success
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/EcsAddrCfgInfoSub'
          headers:
            Location:
              description: >
                Contains the URI of the newly created resource, according to the structure
                {apiRoot}/nnef-ecs-addr-cfg-info/<apiVersion>/subscriptions/{subscriptionId}
              required: true
              schema:
                type: string
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
```

```
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    callbacks:
      myNotification:
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: '#/components/schemas/EcsAddrCfgInfoNotification'
            responses:
              '204':
                description: No Content, Notification was succesfull
              '307':
                $ref: 'TS29571_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29571_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '502':
                $ref: 'TS29571_CommonData.yaml#/components/responses/502'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}:
    parameters:
      - name: subscriptionId
        in: path
        description: Subscription ID
        required: true
        schema:
          type: string

    get:
      summary: retrieve subscription
      operationId: GetIndividualSubcription
      tags:
        - IndividualSubscription (Document)
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/EcsAddrCfgInfoSub'
```

```
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '406':
        $ref: 'TS29571_CommonData.yaml#/components/responses/406'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  put:
    summary: fully update subscription
    operationId: ReplaceIndividualSubcription
    tags:
      - IndividualSubscription (Document)
    requestBody:
      required: true
      content:
        application/json:
          schema:
            $ref: '#/components/schemas/EcsAddrCfgInfoSub'
    responses:
      '200':
        description: OK. Resource was succesfully modified and representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EcsAddrCfgInfoSub'
      '204':
        description: No Content. Resource was succesfully modified
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  patch:
    summary: Partially update subscription
    operationId: ModifyIndividualSubcription
    tags:
```

```
      - IndividualSubscription (Document)
    requestBody:
      required: true
      content:
        application/merge-patch+json:
          schema:
            $ref: '#/components/schemas/EcsAddrCfgInfoSubPatch'
    parameters:
      - name: subscriptionId
        in: path
        description: Subscription ID
        required: true
        schema:
          type: string
    responses:
      '200':
        description: OK. Resource was succesfully modified and representation is returned
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/EcsAddrCfgInfoSub'
      '204':
        description: No Content. Resource was succesfully modified
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  delete:
    summary: unsubscribe from notifications
    operationId: DeleteIndividualSubcription
    tags:
      - IndividualSubscription (Document)
    responses:
      '204':
        description: No Content. Resource was succesfully deleted
      '307':
        $ref: 'TS29571_CommonData.yaml#/components/responses/307'
      '308':
        $ref: 'TS29571_CommonData.yaml#/components/responses/308'
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
```

```
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:

  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nnef-ecs-addr-cfg-info: Access to the Nnef_ECSAddress API

  schemas:
    EcsAddrCfgInfoSub:
      description: Represents an Individual ECS Address Configuration Information subscription data.
      type: object
      properties:
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        notifCorrId:
          type: string
          description: Notification correlation identifier.
        dnns:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
          minItems: 1
          description: Each element identifies a DNN.
        snssais:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
          minItems: 1
          description: Each element identifies a slice.
        immRepInd:
          type: boolean
          description: >
            Indication of immediate reporting. If included, when it is set to true it indicates
            immediate reporting of the subscribed events, if available. Otherwise, reporting will
            occur when the event is met.
        immReports:
          type: array
          items:
            $ref: '#/components/schemas/EcsAddrCfgInfoNotification'
          minItems: 1
          description: >
            Immediate report with ECS Address Configuration Information that match this
subscription.
        supportedFeatures:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/SupportedFeatures'
      required:
        - notifUri
        - notifCorrId

    EcsAddrCfgInfoNotification:
      description: Represents notifications for ECS Address Configuration Information data.
      type: object
      properties:
        notifCorrId:
          type: string
          description: Notification correlation identifier.
        ecsAddrCfgInfo:
          type: array
          items:
            $ref: 'TS29522_ECSAddress.yaml#/components/schemas/EcsAddrInfo'
          minItems: 1
          description: Contains the ECS Address Configuration Information.
      required:
        - notifCorrId
        - ecsAddrCfgInfo

    EcsAddrCfgInfoSubPatch:
      description: Represents an updated ECS Address Configuration Information subscription data.
      type: object
```

```
      properties:
        notifUri:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Uri'
        notifCorrId:
          type: string
          description: Notification correlation identifier.
        dnns:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Dnn'
          minItems: 1
          description: Each updated element identifies a DNN.
        snssais:
          type: array
          items:
            $ref: 'TS29571_CommonData.yaml#/components/schemas/Snssai'
          minItems: 1
          description: Each updated element identifies a slice.
        immRepInd:
          type: boolean
          description: >
            Indication of immediate reporting. If included, when it is set to true it indicates
            immediate reporting of the subscribed events, if available. Otherwise, reporting will
            occur when the event is met.
```

A.6 Nnef_DNAIMapping API

```
openapi: 3.0.0
info:
  title: Nnef_DNAIMapping
  version: 1.0.0
  description: |
    NEF DNAI Mapping Service.
    © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: >
    3GPP TS 29.591 V18.6.0; 5G System; Network Exposure Function Southbound Services; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.591/
servers:
  - url: '{apiRoot}/nnef-dnai-mapping/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501
security:
  - {}
  - oAuth2ClientCredentials:
    - nnef-dnai-mapping
paths:

  /subscriptions:
    post:
      summary: subscribe to notifications
      operationId: CreateIndividualSubcription
      tags:
        - Subscriptions (Collection)
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: 'TS29522_DNAIMapping.yaml#/components/schemas/DnaiMapSub'
      responses:
        '201':
          description: Success
          content:
            application/json:
              schema:
                $ref: 'TS29522_DNAIMapping.yaml#/components/schemas/DnaiMapSub'
          headers:
            Location:
              description: >
                Contains the URI of the newly created resource, according to the structure
                {apiRoot}/nnef-dnai-mapping/<apiVersion>/subscriptions/{subscriptionId}
              required: true
```

```
            schema:
              type: string
      '400':
        $ref: 'TS29571_CommonData.yaml#/components/responses/400'
      '401':
        $ref: 'TS29571_CommonData.yaml#/components/responses/401'
      '403':
        $ref: 'TS29571_CommonData.yaml#/components/responses/403'
      '404':
        $ref: 'TS29571_CommonData.yaml#/components/responses/404'
      '411':
        $ref: 'TS29571_CommonData.yaml#/components/responses/411'
      '413':
        $ref: 'TS29571_CommonData.yaml#/components/responses/413'
      '415':
        $ref: 'TS29571_CommonData.yaml#/components/responses/415'
      '429':
        $ref: 'TS29571_CommonData.yaml#/components/responses/429'
      '500':
        $ref: 'TS29571_CommonData.yaml#/components/responses/500'
      '502':
        $ref: 'TS29571_CommonData.yaml#/components/responses/502'
      '503':
        $ref: 'TS29571_CommonData.yaml#/components/responses/503'
      default:
        $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    callbacks:
      myNotification:
        '{$request.body#/notifUri}':
          post:
            requestBody:
              required: true
              content:
                application/json:
                  schema:
                    $ref: 'TS29522_DNAIMapping.yaml#/components/schemas/DnaiMapUpdateNotif'
            responses:
              '204':
                description: No Content, Notification was succesfull
              '307':
                $ref: 'TS29571_CommonData.yaml#/components/responses/307'
              '308':
                $ref: 'TS29571_CommonData.yaml#/components/responses/308'
              '400':
                $ref: 'TS29571_CommonData.yaml#/components/responses/400'
              '401':
                $ref: 'TS29571_CommonData.yaml#/components/responses/401'
              '403':
                $ref: 'TS29571_CommonData.yaml#/components/responses/403'
              '404':
                $ref: 'TS29571_CommonData.yaml#/components/responses/404'
              '411':
                $ref: 'TS29571_CommonData.yaml#/components/responses/411'
              '413':
                $ref: 'TS29571_CommonData.yaml#/components/responses/413'
              '415':
                $ref: 'TS29571_CommonData.yaml#/components/responses/415'
              '429':
                $ref: 'TS29571_CommonData.yaml#/components/responses/429'
              '500':
                $ref: 'TS29571_CommonData.yaml#/components/responses/500'
              '502':
                $ref: 'TS29571_CommonData.yaml#/components/responses/502'
              '503':
                $ref: 'TS29571_CommonData.yaml#/components/responses/503'
              default:
                $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /subscriptions/{subscriptionId}:
    get:
      summary: retrieve subscription
      operationId: GetIndividualSubcription
      tags:
        - IndividualSubscription (Document)
      parameters:
        - name: subscriptionId
          in: path
          description: Subscription ID
```

```
          required: true
          schema:
            type: string
      responses:
        '200':
          description: OK. Resource representation is returned
          content:
            application/json:
              schema:
                $ref: 'TS29522_DNAIMapping.yaml#/components/schemas/DnaiMapSub'
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '406':
          $ref: 'TS29571_CommonData.yaml#/components/responses/406'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
    delete:
      summary: unsubscribe from notifications
      operationId: DeleteIndividualSubcription
      tags:
        - IndividualSubscription (Document)
      parameters:
        - name: subscriptionId
          in: path
          description: Subscription ID
          required: true
          schema:
            type: string
      responses:
        '204':
          description: No Content. Resource was succesfully deleted
        '307':
          $ref: 'TS29571_CommonData.yaml#/components/responses/307'
        '308':
          $ref: 'TS29571_CommonData.yaml#/components/responses/308'
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'
components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
```

```
          scopes:
            nnef-dnai-mapping: Access to the Nnef_DNAIMapping API
```

A.7 Nnef_UEId API

```
openapi: 3.0.0
info:
  title: Nnef_UEId
  version: 1.0.1
  description: |
    NEF Traffic Correlation Service.
    © 2024, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.
externalDocs:
  description: >
    3GPP TS 29.591 V18.7.0; 5G System; Network Exposure Function Southbound Services; Stage 3.
  url: https://www.3gpp.org/ftp/Specs/archive/29_series/29.591/
servers:
  - url: '{apiRoot}/nnef-ueid/v1'
    variables:
      apiRoot:
        default: https://example.com
        description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501
security:
  - {}
  - oAuth2ClientCredentials:
    - nnef-ueid

paths:
  /fetch:
    post:
      summary: fetch the Internal UE Identifier for roaming UE(s).
      operationId: FetchUEId
      tags:
        - UE ID (Document)
      security:
        - {}
        - oAuth2ClientCredentials:
          - nnef-ueid
        - oAuth2ClientCredentials:
          - nnef-ueid
          - nnef-ueid:fetch:read
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/UeIdReq'
      responses:
        '200':
          description: The requested information was returned successfully.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/UeIdInfo'
        '204':
          description: No Content (The requested Internal UE Identifier does not exist.)
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
```

```
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

  /get-ueid-mapping:
    post:
      summary: Retrieve the UE ID mapping information.
      operationId: UEIDMappingInfoRetrieval
      tags:
        - UE ID Mapping Info Retrieval Request
      security:
        - {}
        - oAuth2ClientCredentials:
          - nnef-ueid
        - oAuth2ClientCredentials:
          - nnef-ueid
          - nnef-ueid:get-ueid-mapping:read
      requestBody:
        required: true
        content:
          application/json:
            schema:
              $ref: '#/components/schemas/MapUeIdInfo'
      responses:
        '200':
          description: Successful case. The requested UE ID mapping information is returned.
          content:
            application/json:
              schema:
                $ref: '#/components/schemas/MapUeIdInfo'
        '204':
          description: No Content (The requested UE ID mapping information does not exist.)
        '400':
          $ref: 'TS29571_CommonData.yaml#/components/responses/400'
        '401':
          $ref: 'TS29571_CommonData.yaml#/components/responses/401'
        '403':
          $ref: 'TS29571_CommonData.yaml#/components/responses/403'
        '404':
          $ref: 'TS29571_CommonData.yaml#/components/responses/404'
        '411':
          $ref: 'TS29571_CommonData.yaml#/components/responses/411'
        '413':
          $ref: 'TS29571_CommonData.yaml#/components/responses/413'
        '415':
          $ref: 'TS29571_CommonData.yaml#/components/responses/415'
        '429':
          $ref: 'TS29571_CommonData.yaml#/components/responses/429'
        '500':
          $ref: 'TS29571_CommonData.yaml#/components/responses/500'
        '502':
          $ref: 'TS29571_CommonData.yaml#/components/responses/502'
        '503':
          $ref: 'TS29571_CommonData.yaml#/components/responses/503'
        default:
          $ref: 'TS29571_CommonData.yaml#/components/responses/default'

components:
  securitySchemes:
    oAuth2ClientCredentials:
      type: oauth2
      flows:
        clientCredentials:
          tokenUrl: '{nrfApiRoot}/oauth2/token'
          scopes:
            nnef-ueid: Access to the UE ID API
            nnef-ueid:fetch:read: >
              Access to service operation applying to retrieve the internal UE identifier from the
              H-NEF for the roaming UE.
            nnef-ueid:get-ueid-mapping:read: >
              Access to service operation applying to retrieve the UE ID.

  schemas:
    UeIdReq:
      description: Contains parameters to request to fetch the Internal UE Identifier.
```

```
      type: object
      properties:
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
        uePubIpAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
      oneOf:
        - required: [gpsi]
        - required: [uePubIpAddr]

    UeIdInfo:
      description: Contains the UE ID Information.
      type: object
      properties:
        hPlmnDnnSnssai:
          $ref: 'TS29522_AMInfluence.yaml#/components/schemas/DnnSnssaiInformation'
        supi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Supi'
        uePvtIpAddr:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/IpAddr'
      oneOf:
        - required: [supi]
        - required: [uePvtIpAddr]

    MapUeIdInfo:
      description: Contains the UE ID mapping information.
      type: object
      properties:
        appLayerId:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/ApplicationlayerId'
        gpsi:
          $ref: 'TS29571_CommonData.yaml#/components/schemas/Gpsi'
      oneOf:
        - required: [appLayerId]
        - required: [gpsi]
```

Annex B (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2019-10	CT3#106					TS Skeleton	0.0.0
2019-10	CT3#106	C3-194392				Removed some subclauses and editorial changes	0.1.0
2019-10	CT3#106					Inclusion of C3-194271, C3-194396, C3-194397 and C3-194399.	0.2.0
2019-11	CT3#107					Inclusion of C3-195234, C3-195235, C3-195236 and C3-195274.	0.3.0
2020-02	CT3#108e					Inclusion of C3-201284, C3-201288, C3-201367, C3-201368, C3-201370, C3-201407, C3-201409, C3-201413 and C3-201516.	0.4.0
2020-03	CT#87e	CP-200187				TS sent to plenary for approval	1.0.0
2020-03	CT#87e	CP-200187				TS approved by plenary	16.0.0
2020-06	CT#88e	CP-201234	0001	1	F	Correction on resource usage	16.1.0
2020-06	CT#88e	CP-201234	0002		F	Data type used during event subscription	16.1.0
2020-06	CT#88e	CP-201234	0007	1	F	Correction to service operation description	16.1.0
2020-06	CT#88e	CP-201244	0008	1	F	Storage of YAML files in ETSI Forge	16.1.0
2020-06	CT#88e	CP-201210	0009	1	F	Removal of Ninef_EventExposure service	16.1.0
2020-06	CT#88e	CP-201256	0011	1	F	URI of the Nnef_EventExposure service	16.1.0
2020-06	CT#88e	CP-201234	0012		F	Event Reporting Information data usage	16.1.0
2020-06	CT#88e	CP-201234	0013		F	Support of immediate reporting	16.1.0
2020-06	CT#88e	CP-201234	0014		F	Supported features definition	16.1.0
2020-06	CT#88e	CP-201234	0015		F	Correction on the ueCommInfos	16.1.0
2020-06	CT#88e	CP-201234	0016		F	Applicabilities for UE communication	16.1.0
2020-06	CT#88e	CP-201234	0017	1	F	Supported headers, Resource Data type and yaml mapping	16.1.0
2020-06	CT#88e	CP-201255	0018		F	Update of OpenAPI version and TS version in externalDocs field	16.1.0
2020-09	CT#89e	CP-202066	0019	1	F	Defalt value for eventsRepInfo attribute	16.2.0
2020-09	CT#89e	CP-202066	0022		F	Missed response code	16.2.0
2020-09	CT#89e	CP-202066	0023		F	Applicabilities of appIds and locArea	16.2.0
2020-09	CT#89e	CP-202084	0024		F	Update of OpenAPI version and TS version in externalDocs field	16.2.0
2020-12	CT#90e	CP-203139	0025	1	F	Essential Corrections and alignments	16.3.0
2020-12	CT#90e	CP-203139	0026		F	Storage of YAML files in 3GPP Forge	16.3.0
2020-12	CT#90e	CP-203139	0028	1	F	Callback URI correction	16.3.0
2020-12	CT#90e	CP-203152	0030		F	Update of OpenAPI version and TS version in externalDocs field	16.3.0
2020-12	CT#90e	CP-203130	0029	1	F	Corrections to location area usage	17.0.0
2021-03	CT#91e	CP-210191	0032		F	Support Stateless NFs	17.1.0
2021-03	CT#91e	CP-210218	0033		F	OpenAPI reference	17.1.0
2021-03	CT#91e	CP-210230	0034	2	F	Correction to location information usage	17.1.0
2021-03	CT#91e	CP-210221	0035	1	F	Adding some missing description fields to data type definitions in OpenAPI	17.1.0
2021-03	CT#91e	CP-210230	0036	1	F	Adding description fields to the data types in the Nnef_EventExposure specific and reused Data Types tables	17.1.0
2021-03	CT#91e	CP-210230	0037	1	F	Specifying the Applicability field for some data types in the Nnef_EventExposure Data Types tables	17.1.0
2021-03	CT#91e	CP-210220	0038		F	Optional header clarification	17.1.0
2021-03	CT#91e	CP-210206	0040		A	Resource URI correction	17.1.0
2021-03	CT#91e	CP-210240	0042		F	Update of OpenAPI version and TS version in externalDocs field	17.1.0
2021-06	CT#92e	CP-211221	0043		B	Support of Mute reporting	17.2.0
2021-06	CT#92e	CP-211221	0044		B	Partitioning criteria for applying sampling in specific UE partitions in NEF event exposure	17.2.0
2021-06	CT#92e	CP-211220	0046	1	A	Presence condition of eventsRepInfo attribute	17.2.0
2021-06	CT#92e	CP-211200	0048	1	A	Redirection responses	17.2.0
2021-06	CT#92e	CP-211173	0049	2	B	Extensions to User Data Congestion Analytics	17.2.0
2021-06	CT#92e	CP-211265	0051		F	Update of OpenAPI version and TS version in externalDocs field	17.2.0
2021-09	CT#93e	CP-212220	0052		F	Resource URI correction on Nnef_EventExposure API	17.3.0
2021-09	CT#93e	CP-212245	0053	1	B	Implementation for Performance Data event	17.3.0
2021-09	CT#93e	CP-212203	0054		B	Support UE data volume dispersion collection	17.3.0
2021-09	CT#93e	CP-214553	0055		F	Update of OpenAPI version and TS version in externalDocs field	17.3.0
2021-12	CT#94e	CP-213227	0057	1	F	Updates to User Data Congestion	17.4.0
2021-12	CT#94e	CP-213227	0058	1	F	Updates to UE data volume dispersion collection	17.4.0
2021-12	CT#94e	CP-213227	0059	2	F	Update of notification procedure with description of USER_DATA_CONGESTION and DISPERSION events	17.4.0
2021-12	CT#94e	CP-213233	0060		B	Clarification on Nnef_Authentication service	17.4.0
2021-12	CT#94e	CP-213223	0063		B	Procedures to support Nnef_EASDeployment_Subscribe service opertion	17.4.0

2021-12	CT#94e	CP-213228	0061		B	Collective Behaviour Analytics	17.4.0
2021-12	CT#94e	CP-213246	0062		F	Update of OpenAPI version and TS version in externalDocs field	17.4.0
2022-03	CT#95e	CP-220185	0064	3	B	Procedures to support Nnef_EASDeployment_Unsubscribe service opertion	17.5.0
2022-03	CT#95e	CP-220185	0065	4	B	Procedures to support Nnef_EASDeployment_Notify service opertion	17.5.0
2022-03	CT#95e	CP-220186	0067		B	Service Architecture for Nnef_EASDeployment service	17.5.0
2022-03	CT#95e	CP-220186	0068	1	B	Update procedures to support Nnef_EASDeployment_Subscribe service opertion	17.5.0
2022-03	CT#95e	CP-220186	0069	1	B	API definition to support Nnef_EASDeployment service	17.5.0
2022-03	CT#95e	CP-220361	0070	2	B	OpenAPI to support Nnef_EASDeployment service	17.5.0
2022-03	CT#95e	CP-220190	0071	1	F	Corrections to Data Model of NEF Event Exposure service	17.5.0
2022-03	CT#95e	CP-220201	0072		F	Corrections to Nnef_EventExposure_Subscribe Service Operation	17.5.0
2022-03	CT#95e	CP-220185	0073	1	F	Formatting of description fields	17.5.0
2022-03	CT#95e	CP-220194	0074		F	Update of info and externalDocs field	17.5.0
2022-06	CT#96	CP-221126	0078	1	F	Updates to EasDeploySubData data type	17.6.0
2022-06	CT#96	CP-221155	0081	1	F	Remove the apiVersion placeholder from the resource URI variables table	17.6.0
2022-06	CT#96	CP-221127	0080	2	F	Defining FQDN information for EAS deployment	17.6.0
2022-06	CT#96	CP-221133	0079	-	F	Muting notifications correction	17.6.0
2022-06	CT#96	CP-221142	0082	1	B	Support new NF service consumer in the Nnef_EventExposure API	17.6.0
2022-06	CT#96	CP-221142	0083	1	B	Support QoE metrics in NEF Event Exposure	17.6.0
2022-06	CT#96	CP-221142	0084	1	B	Support Consumption reports in NEF Event Exposure	17.6.0
2022-06	CT#96	CP-221142	0085	1	B	Support Network Assistance invocations in NEF Event Exposure	17.6.0
2022-06	CT#96	CP-221142	0086	1	B	Support Consumption reports in NEF Event Exposure	17.6.0
2022-06	CT#96	CP-221142	0087	1	B	Support Consumption reports in NEF Event Exposure	17.6.0
2022-06	CT#96	CP-221152	0088	-	F	Update of info and externalDocs fields	17.6.0
2022-09	CT#97e	CP-222102	0094	1	F	Missing description field for enumeration data types	17.7.0
2022-09	CT#97e	CP-222110	0089	1	B	Updates to Media Streaming QoE metrics Event	17.7.0
2022-09	CT#97e	CP-222110	0090	1	F	Updates to Media Streaming Consumption Event	17.7.0
2022-09	CT#97e	CP-222110	0091	1	F	Updates to Media Streaming Network Assistance Invocation Event	17.7.0
2022-09	CT#97e	CP-222110	0092	1	F	Updates to Media Streaming Dynamic Policy Event	17.7.0
2022-09	CT#97e	CP-222110	0093	1	F	Updates to Media Streaming Access Event	17.7.0
2022-09	CT#97e	CP-222121	0095	-	F	Update of info and externalDocs fields	17.7.0
2022-12	CT#98e	CP-223179	0097	1	F	Corrections to procedures of MS Event Exposure	17.8.0
2022-12	CT#98e	CP-223179	0100	-	F	Correct the data type of the attributeV	17.8.0
2022-12	CT#98e	CP-223179	0101	-	F	Correct the events and features in the data structures	17.8.0
2022-12	CT#98e	CP-223191	0096	-	F	Adding the mandatory error code 502 Bad Gateway	18.0.0
2022-12	CT#98e	CP-223198	0098	-	F	Updates to introduce SMS service in NEF southbound API	18.0.0
2022-12	CT#98e	CP-223176	0099	1	F	Corrections to UE Mobility event	18.0.0
2022-12	CT#98e	CP-223190	0104	-	F	Update of info and externalDocs fields	18.0.0
2023-03	CT#99	CP-230145	0106	1	A	Adding DCCF and MFAF to the NF service consumers	18.1.0
2023-03	CT#99	CP-230134	0108	1	B	Updates to Data Type UeMobilityInfo for UE Mobility	18.1.0
2023-03	CT#99	CP-230166	0109	-	F	Correction of the description fields in enumerations	18.1.0
2023-03	CT#99	CP-230125	0110	1	B	Updates to support GNSS assistance data collection from AF via NEF	18.1.0
2023-03	CT#99	CP-230162	0112	-	F	Update of info and externalDocs fields	18.1.0
2023-06	CT#100	CP-231127	0107	3	B	Update to Data Type PerformanceDataInfo for DN Performance	18.2.0
2023-06	CT#100	CP-231124	0111	2	B	Improving the Correctness of Service Experience Predictions with Contribution Weights	18.2.0
2023-06	CT#100	CP-231135	0113	1	B	Adding target AF ID to the EAS deployment information	18.2.0
2023-06	CT#100	CP-231137	0114	1	B	Adding UE address to the target UE information	18.2.0
2023-06	CT#100	CP-231125	0115	1	B	Event muting enhancements for NEF event exposure	18.2.0
2023-06	CT#100	CP-231137	0116	1	B	Implementing required AF event filters	18.2.0
2023-06	CT#100	CP-231131	0118	1	F	Corrections to the description fields of the enumerations defined for the NEF southbound APIs	18.2.0
2023-06	CT#100	CP-231166	0119	1	F	Changing the feature name for the GNSS Assistance Data Collection functionality	18.2.0
2023-06	CT#100	CP-231166	0120	1	B	Continuing the definition of the content of the GNSS Assistance Data Collection information	18.2.0
2023-06	CT#100	CP-231307	0121	1	B	Define OpenAPI for the new TrafficInfluenceData API	18.2.0
2023-06	CT#100	CP-231308	0122	1	B	Define service description for the new TrafficInfluenceData API	18.2.0
2023-06	CT#100	CP-231297	0123	4	B	Definition of the new TrafficInfluenceData API	18.2.0
2023-06	CT#100	CP-231154	0125	-	A	Wrong attribute name for EAS deployment information	18.2.0
2023-06	CT#100	CP-231154	0127	-	A	EAS Deployment immediate reporting procedure correction	18.2.0

2023-06	CT#100	CP-231128	0129	1	B	Update to Nnef_EventExposure API for E2E Data Volume Transfer Time Analytics	18.2.0
2023-06	CT#100	CP-231293	0130	1	B	Definition of OpenAPI file for the new Nnef_ECSAddress API	18.2.0
2023-06	CT#100	CP-231294	0131	1	B	Definition of resource and data model for the new Nnef_ECSAddress API	18.2.0
2023-06	CT#100	CP-231295	0132	1	B	Definition of service description for the new Nnef_ECSAddress	18.2.0
2023-06	CT#100	CP-231132	0133	1	F	Corrections to the redirection mechanism description	18.2.0
2023-06	CT#100	CP-231154	0134	-	F	Update of info and externalDocs fields	18.2.0
2023-09	CT#101	CP-232257	0135	1	F	Data model corrections for TrafficInfluenceData and ECSAddress APIs	18.3.0
2023-09	CT#101	CP-232086	0136	-	F	Corrections to Nnef_EASDeployment service	18.3.0
2023-09	CT#101	CP-232257	0140	1	F	Corrections to Nnef_TrafficInfluenceData and Nnef_ECSAddress services	18.3.0
2023-09	CT#101	CP-232095	0141	1	B	Nnef_DNAIMapping service description and procedures	18.3.0
2023-09	CT#101	CP-232095	0142	1	B	Nnef_DNAIMapping API definitions	18.3.0
2023-09	CT#101	CP-232095	0143	1	B	Nnef_DNAIMapping OpenAPI file definitions	18.3.0
2023-09	CT#101	CP-232106	0145	-	A	aligning the name of internalGroupId attribute	18.3.0
2023-09	CT#101	CP-232257	0146	1	F	Complete description for EDGE_Ph2	18.3.0
2023-09	CT#101	CP-232257	0147	1	F	Correction on immediate report for Nnef_TrafficInfluenceData Service	18.3.0
2023-09	CT#101	CP-232180	0148	1	F	Corrections to Nnef_ECSAddress Service	18.3.0
2023-09	CT#101	CP-232109	0149	1	F	Corrections to GNSS Assistance Data Collection	18.3.0
2023-09	CT#101	CP-232085	0151		F	Update of info and externalDocs fields	18.3.0
2023-12	CT#102	CP-233239	0137	2	B	Nnef_UEId service descriptions supporting HR-SBO	18.4.0
2023-12	CT#102	CP-233239	0138	1	B	Nnef_UEId API definitions	18.4.0
2023-12	CT#102	CP-233239	0139	2	B	Nnef_UEId API OpenAPI file definitions	18.4.0
2023-12	CT#102	CP-233239	0152	1	F	Remove the EN for the Traffic Influence Data Subscription	18.4.0
2023-12	CT#102	CP-233262	0153	1	B	Complete the definition of the content of the GNSS Assistance Data Collection information	18.4.0
2023-12	CT#102	CP-233277	0159	-	A	Correct the data type of eventNotifs	18.4.0
2023-12	CT#102	CP-233239	0160	-	F	Data types of error responses for TrafficInfluenceData	18.4.0
2023-12	CT#102	CP-233249	0161	-	B	Updates in the DNAIMapping procedure	18.4.0
2023-12	CT#102	CP-233239	0163	1	F	Correction to Traffic Influence Data change notification procedure	18.4.0
2023-12	CT#102	CP-233249	0164	-	F	Incorrect description of error handling in subscription creation procedure	18.4.0
2023-12	CT#102	CP-233246	0165	-	F	Missing applicable feature for appIds	18.4.0
2023-12	CT#102	CP-233229	0167	1	B	ProblemDetails RFC 7807 obsoleted by RFC 9457	18.4.0
2023-12	CT#102	CP-233229	0168	1	B	Updating the obsoleted IETF HTTP RFC	18.4.0
2023-12	CT#102	CP-233137	0169	1	B	Update the data types of the Media Steaming attributes	18.4.0
2023-12	CT#102	CP-233238	0170	-	F	Update of info and externalDocs fields	18.4.0
2024-03	CT#103	CP-240180	0172	1	B	Support per event reporting requirements management	18.5.0
2024-03	CT#103	CP-240167	0174	-	F	Update of info and externalDocs fields	18.5.0
2024-03	CT#104	CP-241107	0173	3	B	Add GPSI and Application Layer ID mapping information	18.6.0
2024-06	CT#104	CP-241087	0175	-	F	ECSAddress contents correction	18.6.0
2024-06	CT#104	CP-241087	0176	1	B	UP path change notification for HR-SBO	18.6.0
2024-06	CT#104	CP-241137	0177	-	F	Miscellaneous corrections on Nnef_EASDeployment API	18.6.0
2024-06	CT#104	CP-241087	0178	1	F	Removal of the Editor's note about ECS Address Configuration Information	18.6.0
2024-06	CT#104	CP-241087	0179	2	F	Removal of the Editor's note about traffic influence service	18.6.0
2024-06	CT#104	CP-241087	0180	1	F	Removal of the Editor's note and enhacement about ECSAddress API	18.6.0
2024-06	CT#104	CP-241088	0181	3	B	Update the Nnef_UEId service for HR-SBO	18.6.0
2024-06	CT#104	CP-241107	0182	2	B	Updates to Service Descriptions in Nnef_UEId API	18.6.0
2024-06	CT#104	CP-241270	0183	2	B	Updates to Security and custom operations overview in Nnef_UEId API	18.6.0
2024-06	CT#104	CP-241091	0185	1	F	NefEvent update in Nnef_EventExposure API	18.6.0
2024-06	CT#104	CP-241094	0186	1	F	Reference update	18.6.0
2024-06	CT#104	CP-241088	0187	1	B	Updates to Traffic Influence Data subscriptions for HR-SBO	18.6.0
2024-06	CT#104	CP-241087	0188	-	F	Various corrections to the Nnef APIs	18.6.0
2024-06	CT#104	CP-241088	0189	1	F	Various corrections to the Nnef_TrafficInfluenceData API	18.6.0
2024-06	CT#104	CP-241252	0192	1	B	Support of providing the relative proximity data collected from the AF	18.6.0
2024-06	CT#104	CP-241086	0194	-	F	Update of info and externalDocs fields	18.6.0
2024-09	CT#105	CP-242126	0198	-	F	Corrections to the EcsAddrCfgInfoSubPatch data type definition	18.7.0
2024-09	CT#105	CP-242126	0201	-	F	Corrections on Nnef_UEId API	18.7.0
2024-09	CT#105	CP-242126	0204	1	F	Corrections to EDGE supporting in Nnef_UEId service	18.7.0
2024-09	CT#105	CP-242125	0196	-	F	Corrections on the event name of data volume transfer time	18.7.0
2024-09	CT#105	CP-242125	0205	1	F	Corrections on the non-existent feature	18.7.0
2024-09	CT#105	CP-242119	0199	1	F	Relative Proximity data applicability	18.7.0

2024-09	CT#105	CP-242119	0202	1	F	Corrections on the attribute name	18.7.0
2024-09	CT#105	CP-242120	0206	-	F	Update of info and externalDocs fields	18.7.0
2024-12	CT#106	CP-243135	0218	-	F	EASDeployment feature negotiation	18.8.0
2024-12	CT#106	CP-243116	0219	1	F	Corrections to the GNSS Assistance Data information collection	18.8.0
2024-12	CT#106	CP-243146	0225	-	F	Update of info and externalDocs fields	18.8.0
2025-01	CT#106	-	-	-	-	Implements missing CR0225 and corrects YAML file of EASDeployment API	18.8.1
2025-03	CT#107	CP-250096	0228	-	F	Corrections on the event name	18.9.0
2025-03	CT#107	CP-250128	0230	-	F	Update of info and externalDocs fields	18.9.0

History

Document history		
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