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Stage 3

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**



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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 Application Function Event Exposure Service of the 5G System. It provides stage 3 protocol definitions, message flows and specifies the API for the Naf\_EventExposure service.

The 5G System stage 2 architecture and the procedures are specified in 3GPP TS 23.501 [2], 3GPP TS 23.502 [3], and 3GPP TS 23.288 [4].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [5] and 3GPP TS 29.501 [6].

The Application Function Event Exposure Service is provided by the Application Function (AF). This service exposes service experience events observed at the AF.

# 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 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

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

[6] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

[7] IETF RFC 9113: "HTTP/2".

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

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

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

[11] 3GPP TR 21.900: "Technical Specification Group working methods".

[12] 3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".

[13] 3GPP TS 29.571: "5G System; Common Data Types for Service Based Interfaces Stage 3".

[14] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

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

[16] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[17] 3GPP TS 29.122: "T8 reference point for northbound Application Programming Interfaces (APIs)".

[18] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[19] 3GPP TS 29.520: "5G System; Network Data Analytics Services; Stage 3".

[20] Void.

[21] IETF RFC 9112: "HTTP/1.1".

[22] IETF RFC 9110: "HTTP Semantics".

[23] Void.

[24] Void.

[25] IETF RFC 9111: "HTTP Caching".

[26] Void.

[27] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[28] 3GPP TS 26.531: "Data Collection and Reporting; General Description and Architecture".

[29] 3GPP TS 26.501: "5G Media Streaming (5GMS); General description and architecture".

[30] 3GPP TS 26.512: "5G Media Streaming (5GMS); Protocols".

[31] 3GPP TS 29.591: "5G System; Network Exposure Function Southbound Services; Stage 3".

[32] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

# 3 Definitions of terms, symbols and abbreviations

## 3.1 Terms

For the purposes of the present document, the terms 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].

(None)

## 3.2 Symbols

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

(None)

## 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

ASP Application Service Provider

DCCF Data Collection Coordination Function

DNAI DN Access Identifier

GPSI Generic Public Subscription Identifier

LCS LoCation Services

LMF Location Management Function

MFAF Messaging Framework Adaptor Function

NEF Network Exposure Function

NF Network Function

NWDAF Network Data Analytics Function

SUPI Subscription Permanent Identifier

URI Uniform Resource Identifier

# 4 Naf\_EventExposure Service

## 4.1 Service Description

### 4.1.1 Overview

The Application Function Exposure Service, as defined in 3GPP TS 23.502 [3] and 3GPP TS 23.288 [4], is provided by the Application Function (AF). When the UE Application data is collected via the Data Collection AF, the Application Function Exposure Service, as defined in 3GPP TS 26.531 [28], 3GPP TS 26.501 [29], and 3GPP TS 26.512 [30], is provided by the Data Collection AF instantiated in 5GMS AF for the Event Consumer AF instantiated in 5GMS ASP.

This service:

- allows NF service consumers to subscribe, modify and unsubscribe for application events; and

- notifies NF service consumers with a corresponding subscription about observed events on the AF.

The types of observed events include:

AF application events exposed by AF:

- Service Experience information for an application;

- UE mobility information;

- UE communication information;

- Exceptions information;

- User Data Congestion information;

- Collective Behaviour information;

- Dispersion information; and

- Performance Data information;

- GNSS Assistance Data information

UE application events exposed via 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.

When the event to which the NF service consumer has subscribed occurs, the AF reports the requested information to the NF service consumer based on the event reporting information definition requested by the NF service consumer (see 3GPP TS 23.502 [3]).

### 4.1.2 Service Architecture

The Data Analytics Architecture is defined in 3GPP TS 23.288 [4]. The Media Streaming UE application data collection via the Data Collection AF is defined in 3GPP TS 26.531 [28]. The architecture for GNSS Assistance Data Collection for LCS is defined in 3GPP TS 23.273 [27].

The Application Function Exposure Service (Naf\_EventExposure) is part of the Naf service-based interface exhibited by the Application Function (AF).

The known NF service consumers of the Naf\_EventExposure service are the Network Exposure Function (NEF), the Network Data Analytics Function (NWDAF), the Location Management Function (LMF), the Data Collection Coordination Function (DCCF), the Messaging Framework Adaptor Function (MFAF), or the Event Consumer AF in the 5GMS ASP.

The Naf\_EventExposure service is provided by the AF and consumed by NF service consumers (e.g. NEF, NWDAF, DCCF, MFAF, Event Consumer AF), as shown in figure 4.1.2-1 for the SBI representation model and in figure 4.1.2-2 for reference point representation model.



Figure 4.1.2-1: Naf\_EventExposure service Architecture, SBI representation



Figure 4.1.2-2: Naf\_EventExposure service Architecture, reference point representation

### 4.1.3 Network Functions

#### 4.1.3.1 Application Function (AF)

The AF is a functional element that provides service or application related information to NF service consumers.

The AF allows NF service consumers to subscribe to and unsubscribe from periodic notifications and/or notifications related to the detection of subscribed event.

#### 4.1.3.2 NF Service Consumers

The Network Data Analytics Function (NWDAF), the Data Collection Coordination Function (DCCF), and the Messaging Framework Adaptor Function (MFAF):

- supports (un)subscribing to notifications of event(s) as described in clause 4.2.2.1;

- supports receiving the notifications of subscribed event(s) from the AF.

The Network Exposure Function (NEF):

- supports (un)subscribing to notifications of event(s) as described in clause 4.2.2.1;

- supports receiving the notifications of subscribed event(s) from the AF.

The Event Consumer Application Function (Event Consumer AF):

- supports (un)subscribing to notifications of event(s) as described in clause 4.2.2.1;

- supports receiving the notifications of subscribed event(s) from the Data Collection AF.

The Location Management Function (LMF):

- supports (un)subscribing to notifications of event(s) as described in clause 4.2.2.1;

- supports receiving the notifications of subscribed event(s) from the AF.

## 4.2 Service Operations

### 4.2.1 Introduction

Service operations defined for the Naf\_EventExposure Service are shown in table 4.2.1-1.

Table 4.2.1-1: Naf\_EventExposure Service Operations

|  |  |  |
| --- | --- | --- |
| Service Operation Name | Description | Initiated by |
| Naf\_EventExposure\_Subscribe | This service operation is used by an NF service consumer to subscribe to, or modify a subscription in the AF for event notifications on a specified application related event for one or more UE(s) or any UE. | NF Consumer (NWDAF, NEF, Event Consumer AF) |
| Naf\_EventExposure\_Unsubscribe | This service operation is used by an NF service consumer to unsubscribe from event notifications. | NF Consumer (NWDAF, NEF, Event Consumer AF) |
| Naf\_EventExposure\_Notify | This service operation is used by the AF to report application related event(s) to the NF service consumer which has subscribed to the event report service. | AF/Data Collection AF |

### 4.2.2 Naf\_EventExposure\_Subscribe service operation

#### 4.2.2.1 General

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

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

- Service Experience information for an application;

- UE mobility information;

- UE communication information;

- Exceptions information;

- User Data Congestion information;

- Collective Behaviour information;

- Dispersion information; and

- Performance Data information.

- End-to-end data volume transfer time information.

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

- Media Streaming QoE metrics.

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

- GNSS Assistance Data information

The following procedures using the Naf\_EventExposure\_Subscribe service operation are supported:

- creating a new subscription;

- modifying an existing subscription.

#### 4.2.2.2 Creating a new subscription

Figure 4.2.2.2-1 illustrates the creation of a subscription.



Figure 4.2.2.2-1: Creation of a subscription

To subscribe to event notifications, the NF service consumer shall send an HTTP POST request to the AF with: "{apiRoot}/naf-eventexposure/<apiVersion>/subscriptions" as request URI as shown in step 1 of figure 4.2.2.2-1, and the "AfEventExposureSubsc" data structure as request body.

The "AfEventExposureSubsc" data structure shall include:

- description of subscribed event information as "eventsSubs" attribute by using one or more "EventsSubs" data;

- description of the event reporting information as "eventsRepInfo" attribute;

- 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.

The "AfEventExposureSubsc" data may include:

- 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 1: 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 "EventsSubs" data shall include:

- a event to subscribe as a "event" attribute; and

- event filter information as "eventFilter" attribute associated with the event.

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".

The "eventFilter" shall include:

- identification of target UE(s) to which the subscription applies via :

1) identification of individual UE(s) via "gpsis" attribute or "supis" attribute; or

2) identification of group(s) of UE(s) via "exterGroupIds" attribute or "interGroupIds" attribute; or

3) identification of any UE via "anyUeInd" attribute; or

4) identification of a UE with a specific IP address via the "ueIpAddr" attribute;

NOTE 2: It is assumed that the AF is provisioned with the list of UE IDs (GPSIs or SUPIs) belonging to an External or Internal Group ID.

Depending on the event type:

- if the feature "ServiceExperience" is supported and the event is "SVC\_EXPERIENCE", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "Exceptions" is supported and the event is "EXCEPTIONS", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute;

- if the feature "UeCommunication" is supported and the event is "UE\_COMM", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "UeMobility" is supported and the event is "UE\_MOBILITY", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "UserDataCongestion" is supported and the event is "USER\_DATA\_CONGESTION", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "PerformanceData" is supported and the event is "PERF\_DATA", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "CollectiveBehaviour" is supported and the event is "COLLECTIVE\_BEHAVIOUR", the "eventFilter" attribute may provide:

1) collective attributes information via "collAttrs" attribute;

2) an area of interest via "locArea" attribute

3) identification of application to which the subscription applies via "appIds" attribute.

- if the feature "Dispersion" is supported and the event is "DISPERSION", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "MSQoeMetrics" is supported and the event is "MS\_QOE\_METRICS", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "MSConsumption" is supported and the event is "MS\_CONSUMPTION", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "MSNetAssInvocation" is supported and the event is "MS\_NET\_ASSIST\_INVOCATION", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "MSDynPolicyInvocation" is supported and the event is "MS\_DYN\_POLICY\_INVOCATION", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "MSAccessActivity" is supported and the event is "MS\_ACCESS\_ACTIVITY", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

- if the feature "DataVolTransferTime" is supported and the event is "E2E\_DATA\_VOL\_TRANS\_TIME", the "eventFilter" attribute may provide:

1) identification of application to which the subscription applies via "appIds" attribute;

2) an area of interest via "locArea" attribute.

If the AF cannot successfully fulfil the received HTTP POST request due to an internal error or an error in the HTTP POST request, the AF shall send the HTTP error response as specified in clause 5.7.

Upon successful reception of the HTTP POST request with "{apiRoot}/naf-eventexposure/<apiVersion>/subscriptions" as request URI and "AfEventExposureSubsc" data structure as request body, the AF shall create a new "Individual Application Event Subscription" resource, store the subscription and send an HTTP "201 Created" response as shown in step 2 of figure 4.2.2.2-1, containing:

- a Location header field; and

- an "AfEventExposureSubsc" data type in the content.

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

The "AfEventExposureSubsc" data type content shall contain the representation of the created "Individual Application Event Subscription".

When the "monDur" attribute is included in the response by the AF, it represents AF 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 AF shall include the reports of the events subscribed, if available, in the HTTP POST response.

When the sampling ratio as, "sampRatio" attribute, is included in the subscription without a "partitionCriteria" attribute, the AF 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 AF 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 the "grpRepTime" attribute is included in the subscription, the AF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then the AF shall notify the NF service consumer using the Naf\_EventExposure\_Notify service operation, as described in clause 4.2.4.2.

When the "notifFlag" attribute is included and set to "DEACTIVATE" in the request, the AF 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 AF 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 AF 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 AF 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 Modifying an existing subscription

Figure 4.2.2.3-1 illustrates the modification of an existing subscription.



Figure 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}/naf-eventexposure/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of figure 4.2.2.3-1, where "{subscriptionId}" is the subscription correlation ID of the existing subscription. The "AfEventExposureSubsc" data structure is included as request body as described in clause 4.2.2.2.

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 AfEventExposureSubsc 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 AfEventExposureSubsc data structure can be modified to extend the expiry time to keep receiving notifications.

If the AF cannot successfully fulfil the received HTTP PUT request due to an internal error or an error in the HTTP PUT request, the AF shall send an HTTP error response as specified in clause 5.7.

If the feature "ES3XX" is supported, and the AF determines the received HTTP PUT request needs to be redirected, the AF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [5].

Upon successful reception of an HTTP PUT request with: "{apiRoot}/naf-eventexposure/<apiVersion>/subscriptions/{subscriptionId}" as request URI and "AfEventExposureSubsc" data structure as request body, the AF shall update the subscription and send either a HTTP "200 OK" response with the "AfEventExposureSubsc" data structure as response body containing the representation of the modified "Individual Application Event Subscription", or an HTTP "204 No Content" response, as shown in step 2 of figure 4.2.2.3-1.

When the "monDur" attribute is included in the response by the AF, it represents AF 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 AF 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 AF 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 AF 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 AF shall accumulate all the event reports for the target UEs until the group reporting guard time expires. Then, the AF shall notify the NF service consumer using the Naf\_EventExposure\_Notify service operation, as described in clause 4.2.4.2.

When the "notifFlag" attribute is included, and set to "DEACTIVATE" in the request, the AF 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 AF 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 AF 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 AF shall unmute the event notification, i.e. start sending again notifications for available events.

If the EnhDataMgmt feature is supported and the AF 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 AF 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".

### 4.2.3 Naf\_EventExposure\_Unsubscribe service operation

#### 4.2.3.1 General

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

The following procedure using the Naf\_EventExposure\_Unsubscribe service operation is supported:

- unsubscription from event notifications.

#### 4.2.3.2 Unsubscription from event notifications

Figure 4.2.3.2-1 illustrates the unsubscription from event notifications.



Figure 4.2.3.2-1: Unsubscription from event notifications

To unsubscribe from event notifications, the NF service consumer shall send an HTTP DELETE request with "{apiRoot}/naf-eventexposure/<apiVersion>/subscriptions/{subscriptionId}" as request URI, as shown in step 1 of figure 4.2.3.2-1, where "{subscriptionId}" is the subscription correlation identifier of the existing resource subscription that is to be deleted.

If the AF cannot successfully fulfil the received HTTP DELETE request due to an internal error or an error in the HTTP DELETE request, the AF shall send an HTTP error response as specified in clause 5.7.

If the feature "ES3XX" is supported, and the AF determines the received HTTP DELETE request needs to be redirected, the AF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [5].

Upon successful reception of the HTTP DELETE request with: "{apiRoot}/naf-eventexposure/<apiVersion>/subscriptions/{subscriptionId}" as request URI, the AF shall remove the corresponding subscription and send an HTTP "204 No Content" response as shown in step 2 of figure 4.2.3.2-1.

### 4.2.4 Naf\_EventExposure\_Notify service operation

#### 4.2.4.1 General

The Naf\_EventExposure\_Notify service operation enables the AF to notify to the NF service consumer(s) that the previously subscribed application related event occurred.

The following procedure using the Naf\_EventExposure\_Notify service operation is supported:

- notification about subscribed events.

#### 4.2.4.2 Notification about subscribed events

Figure 4.2.4.2-1 illustrates the notification about subscribed events.



Figure 4.2.4.2-1: Notification about subscribed events

If the AF observes application related event(s) for which an NF service consumer has subscribed, the AF shall send an HTTP POST request as shown in step 1 of figure 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 "AfEventExposureNotif" data structure.

The "AfEventExposureNotif" data structure shall include:

a) the notification correlation ID provided by the NF service consumer during the subscription as "notifId" attribute; and

b) information about the observed event(s) within the "eventNotifs" attribute that shall contain for each observed event an "AfEventNotification" data structure that shall include:

1) the application related event as "event" attribute;

2) the time at which the event was observed encoded as "timeStamp" attribute;

3) if the "event" attribute is "SVC\_EXPERIENCE":

- service experience information about the application involved in the reported event in the "svcExprcInfos" attribute;

4) if the "event" attribute is "UE\_MOBILITY":

- UE mobility information associated with the application as "ueMobilityInfos" attribute;

5) if the "event" attribute is "UE\_COMM":

- application communication information associated with the application as "ueCommInfos" attribute;

6) if the "event" attribute is "EXCEPTIONS":

- exceptions information associated with a service flow as "excepInfos" attribute;

7) if the "event" attribute is "COLLECTIVE\_BEHAVIOUR":

- collective beahviour information associated with the UEs and its applications as "collBhvrInfs" attribute;

8) if the "event" attribute is "PERF\_DATA":

- performance data information associated with the application as "perfDataInfos" attribute;

9) if the "event" attribute is "USER\_DATA\_CONGESTION":

- user data congestion information collected for an AF application as "congestionInfos" attribute; and

10) if the "event" attribute is "DISPERSION":

- UE dispersion information collected for an AF application as "dispersionInfos" attribute.

11) 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.

12) if the "event" attribute is "MS\_CONSUMPTION":

- Media Streaming Consumption reports collected for an UE application via the Data Collection AF as "msConsumpInfos" attribute. This attribute is deprecated; the attribute "msConsumpRpts" 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 "msConsumpRpts" attribute.

13) if the "event" attribute is "MS\_NET\_ASSIST\_INVOCATION":

- Media Streaming Network Assistance invocation collected for an UE application via the Data Collection AF as "msNetAssInvInfos" attribute. This attribute is deprecated; the attribute "msNetAssistInvs" 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 "msNetAssistInvs" attribute.

14) if the "event" attribute is "MS\_DYN\_POLICY\_INVOCATION":

- Media Streaming Dynamic Policy invocation collected for an UE application via the Data Collection AF as "msDynPlyInvInfos" attribute. This attribute is deprecated; the attribute "msDynPlyInvs" 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 "msDynPlyInvs" attribute.

15) if the "event" attribute is "MS\_ACCESS\_ACTIVITY":

- Media Streaming access activity collected for an UE application via the Data Collection AF as "msAccActInfos" attribute. This attribute is deprecated; the attribute "msAccesses" 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 "msAccesses" attribute.

16) if the "event" attribute is "GNSS\_ASSISTANCE\_DATA":

- GNSS Assistance Data information within the "gnssAssistDataInfo" attribute;

17) if the "event" attribute is "E2E\_DATA\_VOL\_TRANS\_TIME":

- data volume transfer information associated 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 5.7.

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 [5].

Upon successful reception of the HTTP POST request with "{notifUri}" as request URI and "AfEventExposureNotif" data structure as request body, the NF service consumer shall send a "204 No Content" HTTP response, as shown in step 2 of figure 4.2.4.2-1.

# 5 Naf\_EventExposure Service API

## 5.1 Introduction

The Naf\_EventExposure Service shall use the Naf\_EventExposure API.

The API URI of the Naf\_EventExposure API shall be:

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

The request URIs used in HTTP requests from the NF service consumer towards the AF shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [6], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [6].

- The **<**apiName**>** shall be "naf-eventexposure".

- The **<**apiVersion**>** shall be "v1".

- The **<**apiSpecificResourceUriPart**>** shall be set as described in clause 5.3.

## 5.2 Usage of HTTP

### 5.2.1 General

If the AF is untrusted, support of HTTP/1.1 (IETF RFC 9112 [21], IETF RFC 9110 [22] and IETF RFC 9111[25] over TLS is mandatory and support of HTTP/2 (IETF RFC 9113 [7]) over TLS is recommended. TLS shall be used as specified in clause 12.3 and clause 13.1 of 3GPP TS 33.501 [14].

If the AF is trusted, HTTP/2, IETF RFC 9113 [7], shall be used as specified in clause 5.2 of 3GPP TS 29.500 [5].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [5].

The OpenAPI [8] specification of HTTP messages and content bodies for the Naf\_EventExposure is contained in Annex A.

### 5.2.2 HTTP standard headers

#### 5.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [5] for the usage of HTTP standard headers.

#### 5.2.2.2 Content type

JSON, IETF RFC 8259 [9], 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 [5]. 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 [10].

### 5.2.3 HTTP custom headers

#### 5.2.3.1 General

The Naf\_EventExposure API shall support mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [5] 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 Naf\_EventExposure API.

## 5.3 Resources

### 5.3.1 Resource Structure

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

Figure 5.3.1-1 depicts the resource URIs structure for the Naf\_EventExposure API.



Figure 5.3.1-1: Resource URI structure of the Naf\_EventExposure API

Table 5.3.1-1 provides an overview of the resources and applicable HTTP methods.

Table 5.3.1-1: Resources and methods overview

|  |  |  |  |
| --- | --- | --- | --- |
| Resource name | Resource URI | HTTP method or custom operation | Description |
| Application Event Subscriptions | /subscriptions | POST | Subscription to the notification of application events and creation of an Individual Application Event Subscription resource. |
| Individual Application Event Subscription | /subscriptions/{subscriptionId} | GET | Reads an Individual Application Event Subscription resource. |
| PUT | Modifies an Individual Application Event Subscription. |
| DELETE | Cancels an individual subscription to notifications of application event. |

### 5.3.2 Resource: Application Event Subscriptions

#### 5.3.2.1 Description

The Application Event Subscriptions resource represents all subscriptions of the Naf\_EventExposure service at a given AF.

#### 5.3.2.2 Resource definition

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

This resource shall support the resource URI variables defined in table 5.3.2.2-1.

Table 5.3.2.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.1 |

#### 5.3.2.3 Resource Standard Methods

##### 5.3.2.3.1 POST

This method shall support the URI query parameters specified in table 5.3.2.3.1-1.

Table 5.3.2.3.1-1: URI query parameters supported by the POST method on this resource

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

This method shall support the request data structures specified in table 5.3.2.3.1-2 and the response data structures and response codes specified in table 5.3.2.3.1-3.

Table 5.3.2.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| AfEventExposureSubsc | M | 1 | Contains the information required for the creation of a new individual application event subscription. |

Table 5.3.2.3.1-3: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Data type | | P | | Cardinality | | Response codes | | Description | |
| AfEventExposureSubsc | | M | | 1 | | 201 Created | | Contains the representation of the Individual Application Event Subscription resource. | |
| ProblemDetails | | O | | 0..1 | | 403 Forbidden | | (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 [5] also apply.  NOTE 2: Failure cases are described in clause 5.7. | | | | | | | | | |

Table 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}/naf-eventexposure/<apiVersion>/subscriptions/{subscriptionId} |

### 5.3.3 Resource: Individual Application Event Subscription

#### 5.3.3.1 Description

The Individual Application Event Subscription resource represents a single subscription of the Naf\_EventExposure service at a given AF.

#### 5.3.3.2 Resource definition

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

This resource shall support the resource URI variables defined in table 5.3.3.2-1.

Table 5.3.3.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.1 |
| subscriptionId | string | Identifies a subscription to the AF event exposure service. |

#### 5.3.3.3 Resource Standard Methods

##### 5.3.3.3.1 GET

This method shall support the URI query parameters specified in table 5.3.3.3.1-1.

Table 5.3.3.3.1-1: 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 5.3.3.3.1-2 and the response data structures and response codes specified in table 5.3.3.3.1-3.

Table 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 5.3.3.3.1-3: Data structures supported by the GET Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| AfEventExposureSubsc | M | 1 | 200 OK | Contains the representation of the Individual Application Event Subscription resource. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during subscription retrieval.  Applicable if the feature "ES3XX" is supported.  (NOTE 2, NOTE 3) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during subscription retrieval.  Applicable if the feature "ES3XX" is supported.  (NOTE 2, NOTE 3) |
| 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 [5] also apply.  NOTE 2: If the AF is untrusted, the Redirection handling described in clause 5.2.10 of 3GPP TS 29.122 [17] should apply.  NOTE 3: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [5]). | | | | |

Table 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 AF (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 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target AF (service) instance towards which the request is redirected. |

Table 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 AF (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 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target AF (service) instance towards which the request is redirected. |

##### 5.3.3.3.2 PUT

This method shall support the URI query parameters specified in table 5.3.3.3.2-1.

Table 5.3.3.3.2-1: 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 5.3.3.3.2-2 and the response data structures and response codes specified in table 5.3.3.3.2-3.

Table 5.3.3.3.2-2: Data structures supported by the PUT Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| AfEventExposureSubsc | M | 1 | Modifies the existing Individual Application Event Subscription resource. |

Table 5.3.3.3.2-3: Data structures supported by the PUT Response Body on this resource

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Data type | | P | | Cardinality | | Response codes | | Description | |
| AfEventExposureSubsc | | M | | 1 | | 200 OK | | Successful case.  The Individual Application Event Subscription resource was modified and a representation is returned. | |
| n/a | |  | |  | | 204 No Content | | Successful case.  The Individual Application 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 2, NOTE 4) | |
| RedirectResponse | | O | | 0..1 | | 308 Permanent Redirect | | Permanent redirection, during subscription modification.  Applicable if the feature "ES3XX" is supported.  (NOTE 2, NOTE 4) | |
| ProblemDetails | | O | | 0..1 | | 403 Forbidden | | (NOTE 3) | |
| 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 [5] also apply.  NOTE 2: If the AF is untrusted, the Redirection handling described in clause 5.2.10 of 3GPP TS 29.122 [17] should apply.  NOTE 3: Failure cases are described in clause 5.7.  NOTE 4: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [5]). | | | | | | | | | |

Table 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 | Contains an alternative URI of the resource located in an alternative AF (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 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target AF (service) instance towards which the request is redirected. |

Table 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 | Contains an alternative URI of the resource located in an alternative AF (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 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target AF (service) instance towards which the request is redirected. |

##### 5.3.3.3.3 DELETE

This method shall support the URI query parameters specified in table 5.3.3.3.3-1.

Table 5.3.3.3.3-1: 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 5.3.3.3.3-2 and the response data structures and response codes specified in table 5.3.3.3.3-3.

Table 5.3.3.3.3-2: 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: 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 Application 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, NOTE 3) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during subscription termination.  Applicable if the feature "ES3XX" is supported.  (NOTE 2, NOTE 3) |
| 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 [5] also apply.  NOTE 2: If the AF is untrusted, the Redirection handling described in clause 5.2.10 of 3GPP TS 29.122 [17] should apply.  NOTE 3: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [5]). | | | | |

Table 5.3.3.3.3-4: 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 AF (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 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target AF (service) instance towards which the request is redirected. |

Table 5.3.3.3.3-5: 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 AF (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 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target AF (service) instance towards which the request is redirected. |

## 5.4 Custom Operations without associated resources

No custom operation is defined in this Release of the specification.

## 5.5 Notifications

### 5.5.1 General

Notifications shall comply with clause 6.2 of 3GPP TS 29.500 [5] and clause 4.6.2.3 of 3GPP TS 29.501 [6].

Table 5.5.1-1: Notifications overview

|  |  |  |  |
| --- | --- | --- | --- |
| Notification | Callback URI | HTTP method or custom operation | Description  (service operation) |
| Application Event Notification | {notifUri} | POST | Notification of application related event reporting. |

### 5.5.2 Application Event Notification

#### 5.5.2.1 Description

The Application Event Notification is used by the AF to report one or several observed application related events to the NF service consumer that has subscribed to such notifications.

#### 5.5.2.2 Target URI

The callback URI **"{notifUri}"** shall be used with the callback URI variables defined in table 5.5.2.2-1.

Table 5.5.2.2-1: Callback URI variables

|  |  |  |
| --- | --- | --- |
| 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 AfEventExposureSubsc data type (see table 5.6.2.2-1). |

#### 5.5.2.3 Standard Methods

##### 5.5.2.3.1 POST

This method shall support the URI query parameters specified in table 5.5.2.3.1-1.

Table 5.5.2.3.1-1: URI query parameters supported by the POST method on this resource

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

This method shall support the request data structures specified in table 5.5.2.3.1-2 and the response data structures and response codes specified in table 5.5.2.3.1-3.

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

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| AfEventExposureNotif | M | 1 | Provides Information about observed application related events. |

Table 5.5.2.3.1-3: 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, NOTE 3) |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during event notification  Applicable if the feature "ES3XX" is supported.  (NOTE 2, NOTE 3) |
| NOTE 1: In addition, the HTTP status codes which are specified as mandatory in table 5.2.7.1-1 of 3GPP TS 29.500 [5] for the POST method shall also apply.  NOTE 2: If the AF is untrusted, the Redirection handling described in clause 5.2.10 of 3GPP TS 29.122 [17] should apply.  NOTE 3: The RedirectResponse data structure may be provided by an SCP (cf. clause 6.10.9.1 of 3GPP TS 29.500 [5]). | | | | |

Table 5.5.2.3.1-4: 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 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected. |

Table 5.5.2.3.1-5: 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 [5]. |
| 3gpp-Sbi-Target-Nf-Id | string | O | 0..1 | Identifier of the target NF (service) instance towards which the notification request is redirected. |

## 5.6 Data Model

### 5.6.1 General

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

Table 5.6.1-1 specifies the data types defined for the Naf\_EventExposure service based interface protocol.

Table 5.6.1-1: Naf\_EventExposure specific Data Types

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Data type | | Section defined | | Description | | Applicability | |
| AddrFqdn | | 5.6.2.18 | | IP address and/or FQDN. | | PerformanceData  ServiceExperienceExt  DataVolTransferTime | |
| AfEvent | | 5.6.3.3 | | Represents Application Events. | |  | |
| AfEventExposureSubsc | | 5.6.2.2 | | Represents an Individual Application Event Subscription resource. | |  | |
| AfEventExposureNotif | | 5.6.2.3 | | Describes notifications about application event that occurred in an Individual Application Event Subscription resource. | |  | |
| AfEventNotification | | 5.6.2.6 | | Represents information related to an event to be reported. | |  | |
| CollectiveBehaviourFilter | | 5.6.2.19 | | Contains the parameter type and value pair to express the collective behaviour event filters. | | CollectiveBehaviour | |
| CollectiveBehaviourFilterType | | 5.6.3.4 | |  | | CollectiveBehaviour | |
| CollectiveBehaviourInfo | | 5.6.2.20 | | Contains the collective behaviour analytics information. | | CollectiveBehaviour | |
| CommunicationCollection | | 5.6.2.13 | | Contains communication information. | | UeCommunication | |
| DataProcessingType | | 5.6.3.5 | | Represents a type of data processing. | | ExtEventFilters | |
| DatVolTransTimeCollection | | 5.6.2.28 | | Contains data volume transfer time information. | | DataVolTransferTime | |
| DispersionCollection | | 5.6.2.21 | | Contains Dispersion information collected. | | Dispersion | |
| EventFilter | | 5.6.2.5 | | Represents event filter information. | |  | |
| EventsSubs | | 5.6.2.4 | | Represents an event to be subscribed and the related event filter information. | |  | |
| ExceptionInfo | | 5.6.2.14 | | Describes the exceptions information provided by AF. | | Exceptions | |
| MSAccessActivityCollection | | 5.6.2.27 | | Represents the Media Streaming access activities of UE Application collected via Data Collection AF. | | MSAccessActivity | |
| MsConsumptionCollection | | 5.6.2.24 | | Represents the Media Streaming Consumption reports of UE Application collected via Data Collection AF. | | MSConsumption | |
| MsDynPolicyInvocationCollection | | 5.6.2.26 | | Represents the Media Streaming Dynamic Policy invocation of UE Application collected via Data Collection AF. | | MSDynPolicyInvocation | |
| MsQoeMetricsCollection | | 5.6.2.23 | | Represents the Media Streaming QoE Metrics of UE Application collected via Data Collection AF. | | MSQoeMetrics | |
| MsNetAssInvocationCollection | | 5.6.2.25 | | Represents the Media Streaming Network Assistance invocation of UE Application collected via Data Collection AF. | | MSNetAssInvocation | |
| PerformanceData | | 5.6.2.17 | | Indicates the performance data. | | PerformanceData | |
| PerformanceDataCollection | | 5.6.2.16 | | Represents the performance data information collected for an AF application. | | PerformanceData | |
| PerUeAttribute | | 5.6.2.22 | | UE application data collected per UE. | | CollectiveBehaviour | |
| ServiceExperienceInfoPerApp | | 5.6.2.7 | | Contains service experience associated with the application. | | ServiceExperience | |
| ServiceExperienceInfoPerFlow | | 5.6.2.8 | | Contains service experience associated with the service flow. | | ServiceExperience | |
| SvcExperience | | 5.6.2.9 | | Contains a mean opinion score with the customized range. | | ServiceExperience | |
| UeCommunicationCollection | | 5.6.2.11 | | Contains UE communication information associated with the application. | | UeCommunication | |
| UeMobilityCollection | | 5.6.2.10 | | Contains UE mobility information associated with the application. | | UeMobility | |
| UeTrajectoryCollection | | 5.6.2.12 | | Contains UE trajectory information associated with the application. | | UeMobility | |
| UserDataCongestionCollection | | 5.6.2.15 | | Contains User Data Congestion Analytics related information collected. | | UserDataCongestion | |

Table 5.6.1-2 specifies data types re-used by the Naf\_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 Naf\_EventExposure service based interface.

Table 5.6.1-2: Naf\_EventExposure re-used Data Types

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Data type | | Reference | | Comments | | Applicability | |
| ApplicationId | | 3GPP TS 29.571 [13] | | Application Identifier. | |  | |
| BitRate | | 3GPP TS 29.571 [13] | | String representing a bit rate that shall be formatted as follows:  pattern: "^\d+(\.\d+)? (bps|Kbps|Mbps|Gbps|Tbps)$"  Examples:  "125 Mbps", "0.125 Gbps", "125000 Kbps". | | UserDataCongestion  CollectiveBehaviour | |
| ConsumptionReportingUnitsCollection | | 3GPP TS 26.512 [30] | | Represents the collection of Media Streaming Consumption event records. | | MSEventExposure | |
| CpParameterSet | | 3GPP TS 29.122 [17] | | The Expected UE Behaviour parameters. | | UeCommunicationExt\_eNA | |
| DateTime | | 3GPP TS 29.571 [13] | | Contains a date and a time. | |  | |
| Dnai | | 3GPP TS 29.571 [13] | | Identifies a DNAI. | |  | |
| DurationSec | | 3GPP TS 29.571 [13] | | Indicates a period of time in units of seconds. | | Dispersion | |
| DynamicPolicy | | 3GPP TS 26.512 [30] | | Represents the Media Streaming Dynamic Policy. | | MSDynPolicyInvocation | |
| DynamicPolicyInvocationsCollection | | 3GPP TS 26.512 [30] | | Represents the collection of Media Streaming Dynamic Policy invocation event records. | | MSEventExposure | |
| EthFlowDescription | | 3GPP TS 29.514 [18] | | Defines a packet filter for an Ethernet flow. | |  | |
| Exception | | 3GPP TS 29.520 [19] | | Describes the Exception information. | |  | |
| ExtGroupId | | 3GPP TS 29.503 [27] | | External Group Identifier for a user group. | |  | |
| Float | | 3GPP TS 29.571 [13] | | Number with format "float" as defined in OpenAPI Specification [8]. | |  | |
| FlowDescription | | 3GPP TS 29.514 [18] | | Only IP 5-tuple (protocol, source and destination IP address, Source and destination port) is applicable. | | Dispersion | |
| FlowInfo | | 3GPP TS 29.122 [17] | | Represents flow information. | |  | |
| GNSSAssistDataInfo | | 3GPP TS 29.591 [31] | | Represents GNSS Assistance Data information. | | GNSSAssistData | |
| Gpsi | | 3GPP TS 29.571 [13] | | Identifies a GPSI. | |  | |
| GroupId | | 3GPP TS 29.571 [13] | | Contains a Group identifier. | |  | |
| IpAddr | | 3GPP TS 29.571 [13] | | Identifies IP address. | | Dispersion  EnPerformanceData | |
| LocationArea5G | | 3GPP TS 29.122 [17] | | Represents a user location area when the UE is attached to 5G. | |  | |
| MediaStreamingAccessesCollection | | 3GPP TS 26.512 [30] | | Represents the collection of Media Streaming access event records. | | MSEventExposure | |
| MediaStreamingAccessRecord | | 3GPP TS 26.512 [30] | | Represents the Media Streaming Access activity record. | | MSAccessActivity | |
| NetworkAssistanceInvocationsCollection | | 3GPP TS 26.512 [30] | | Represents the collection of Media Streaming Network Assistance invocation event records. | | MSEventExposure | |
| NetworkAssistanceSession | | 3GPP TS 26.512 [30] | | Represents the Media Streaming Network Assistance Session Recommendation. | | MSNetAssInvocation | |
| PacketDelBudget | | 3GPP TS 29.571 [13] | | Indicates average Packet Delay. | | PerformanceData | |
| PacketLossRate | | 3GPP TS 29.571 [13] | | Indicates average Loss Rate. | | PerformanceData | |
| QoEMetricsCollection | | 3GPP TS 26.512 [30] | | Represents the collection of Media Streaming QoE metrics event records. | | MSEventExposure | |
| RedirectResponse | | 3GPP TS 29.571 [13] | | Contains redirection related information. | | ES3XX | |
| ReportingInformation | | 3GPP TS 29.523 [12] | | Represents the requirements of reporting the subscription. | |  | |
| Supi | | 3GPP TS 29.571 [13] | | Contains a SUPI. | |  | |
| SupportedFeatures | | 3GPP TS 29.571 [13] | | Indicates the features supported. | |  | |
| TimeWindow | | 3GPP TS 29.122 [17] | | Represents a time window identified by a start time and a stop time. | |  | |
| Uinteger | | 3GPP TS 29.571 [13] | | Unsigned integer. | | ServiceExperienceExt2\_eNA | |
| Uri | | 3GPP TS 29.571 [13] | | Contains a URI. | |  | |
| UsageThreshold | | 3GPP TS 29.122 [17] | | data volume during the period | | Dispersion | |
| Volume | | 3GPP TS 29.122 [17] | | Unsigned integer identifying a volume in units of bytes. | |  | |

### 5.6.2 Structured data types

#### 5.6.2.1 Introduction

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

#### 5.6.2.2 Type AfEventExposureSubsc

Table 5.6.2.2-1: Definition of type AfEventExposureSubsc

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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(EventsSubs) | M | 1..N | Subscribed events and the related event filters. |  |
| eventsRepInfo | ReportingInformation | M | 1 | Represents the reporting requirements of the subscription.  (NOTE 2) |  |
| notifUri | Uri | M | 1 | Notification URI for event reporting. |  |
| notifId | string | M | 1 | Notification Correlation ID assigned by the NF service consumer. |  |
| eventNotifs | array(AfEventNotification) | 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. |  |
| suppFeat | SupportedFeatures | 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 AF.  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. | | | | | |

#### 5.6.2.3 Type AfEventExposureNotif

Table 5.6.2.3-1: Definition of type AfEventExposureNotif

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

#### 5.6.2.4 Type EventsSubs

Table 5.6.2.4-1: Definition of type EventsSubs

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| event | AfEvent | M | 1 | Subscribed event. |  |
| eventFilter | EventFilter | M | 1 | Represents the event filter information associated with each event. |  |

#### 5.6.2.5 Type EventFilter

Table 5.6.2.5-1: Definition of type EventFilter

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | P | | Cardinality | | Description | | Applicability  (NOTE 4) | |
| gpsis | | array(Gpsi) | | O | | 1..N | | Each element represents external UE identifier.  (NOTE 1, NOTE 2) | |  | |
| supis | | array(Supi) | | O | | 1..N | | Each element represents a SUPI identifying a UE (NOTE 1, NOTE 2) | |  | |
| exterGroupIds | | array(ExtGroupId) | | O | | 1..N | | Each element represents a group of UEs identified by an External Group Identifier.  (NOTE 1, NOTE 2) | |  | |
| interGroupIds | | array(GroupId) | | O | | 1..N | | Each element represents a group of UEs identified by an Internal Group Identifier. (NOTE 1, NOTE 2) | |  | |
| anyUeInd | | 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".  May only be present and sets to "true" if "AfEvent" sets to "SVC\_EXPERIENCE", "EXCEPTIONS" or "USER\_DATA\_CONGESTION".  (NOTE 2) | | ServiceExperience  Exceptions  UserDataCongestion | |
| ueIpAddr | | IpAddr | | O | | 0..1 | | Identifies the UE IP address. (NOTE 2) | | EnPerformanceData | |
| appIds | | array(ApplicationId) | | O | | 1..N | | Each element indicates an application identifier.  If absent, the EventFilter data applies to any application (i.e. all applications).  (NOTE 3) | | ServiceExperience  UeMobility  UeCommunication  Exceptions  UserDataCongestion  PerformanceData  Dispersion  CollectiveBehaviour  MSQoeMetrics  MSConsumption  MSNetAssInvocation  MSDynPolicyInvocation  MSAccessActivity  DataVolTransferTime | |
| locArea | | LocationArea5G | | O | | 0..1 | | Represents area of interest. (NOTE 5) | | ServiceExperience  UeMobility  UeCommunication  Exceptions  UserDataCongestion  PerformanceData  Dispersion  CollectiveBehaviour  MSQoeMetrics  MSConsumption  MSNetAssInvocation  MSDynPolicyInvocation  MSAccessActivity  DataVolTransferTime | |
| collAttrs | | array(CollectiveBehaviourFilter) | | O | | 1..N | | Each element indicates a collective attribute parameter type and value.  This attribute may be included when the subscribed event is "COLLECTIVE\_BEHAVIOUR". | | CollectiveBehaviour | |
| exceptionReqs | | array(Exception) | | O | | 1..N | | Each element indicates an Exception Id with associated threshold. This attribute may be included when the subscribed event is "EXCEPTIONS".  (NOTE 6) | | EnPerformanceData | |
| NOTE 1: For untrusted AF, only gpsis and exterGroupIds are applicable. For trusted AF, only supis and interGroupIds are applicable.  NOTE 2: For an applicable feature, only one attribute identifying the target UE shall be provided.  NOTE 3: For event "UE\_COMM", "UE\_MOBILITY", "EXCEPTIONS" and "PERF\_DATA", the "appIds" attribute, if present, shall include only one element.  NOTE 4: Properties marked with a feature as defined in clause 5.8 are applicable as described in clause 6.6 of 3GPP TS 29.500 [5]. If no features are indicated, the related property applies for all the features.  NOTE 5: The NetworkAreaInfo data within the LocationArea5G data is only applicable for trusted AF. In addition, for event "SVC\_EXPERIENCE", only the "tais" attribute within the NetworkAreaInfo data is applicable for the trusted AF.  NOTE 6: Only "excepId" and "excepLevel" attributes within the Exception data type are applicable to this attribute. | | | | | | | | | | | |

Editor's note: Futher event filter information is FFS.

#### 5.6.2.6 Type AfEventNotification

Table 5.6.2.6-1: Definition of type AfEventNotification

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | | P | Cardinality | | Description | | Applicability | |
| event | | AfEvent | | | M | 1 | | Represents the reported application related event. | |  | |
| timeStamp | | DateTime | | | M | 1 | | Time at which the event is observed. | |  | |
| svcExprcInfos | | array(ServiceExperienceInfoPerApp) | | | C | 1..N | | Contains the service experience information.  Shall be present if the "event" attribute sets to "SVC\_EXPERIENCE". | | ServiceExperience | |
| ueMobilityInfos | | array(UeMobilityCollection) | | | C | 1..N | | Contains the UE mobility information.  Shall be present if the "event" attribute sets to "UE\_MOBILITY". | | UeMobility | |
| ueCommInfos | | array(UeCommunicationCollection) | | | 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 collected for an AF application.  Shall be present if the "event" attribute sets to "USER\_DATA\_CONGESTION". | | UserDataCongestion | |
| perfDataInfos | | array(PerformanceDataCollection) | | | C | 1..N | | Each element represents the performance data information collected for an AF application.  Shall be present if the "event" attribute sets to "PERF\_DATA". | | PerformanceData | |
| 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". | | CollectiveBehaviour | |
| dispersionInfos | | array(DispersionCollection) | | | C | 1..N | | Each element represents the UE dispersion information collected for an AF application.  Shall be present if the "event" attribute sets to "DISPERSION". | | Dispersion | |
| 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 record.  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 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 "msConsumpRpts" should be used instead. | | MSConsumption | |
| msConsumpRpts | | array(ConsumptionReportingUnitsCollection) | | C | 1..N | | | Each element represents the Media Streaming Consumption event record.  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 "NET\_ASSIST\_INVOCATION".  This attribute is deprecated; the attribute "msNetAssistInvs" should be used instead. | | MSNetAssInvocation | |
| msNetAssistInvs | | array(NetworkAssistanceInvocationsCollection) | | C | 1..N | | | Each element represents the Media Streaming Network Assistance invocation event record.  Shall be present if the "event" attribute sets to "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 "msDynPlyInvs" should be used instead. | | MSDynPolicyInvocation | |
| msDynPlyInvs | | array(DynamicPolicyInvocationsCollection) | | C | 1..N | | | Each element represents the Media Streaming Dynamic Policy invocation event record.  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 "msAccesses" should be used instead. | | MSAccessActivity | |
| msAccesses | | array(MediaStreamingAccessesCollection) | | C | 1..N | | | Each element represents the Media Streaming access eventrecord.  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 a UE. Shall be present if the "event" attribute sets to "DATA\_VOLUME\_TRANSFER\_TIME". | | DataVolTransferTime | |

#### 5.6.2.7 Type ServiceExperienceInfoPerApp

Table 5.6.2.7-1: Definition of type ServiceExperienceInfoPerApp

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | | P | Cardinality | | Description | | Applicability | |
| appId | | ApplicationId | | | C | 0..1 | | Indicates an application identifier.  Shall be present if the AF event exposure service request applies to more than one application. | |  | |
| appServerIns | | AddrFqdn | | | O | 0..1 | | Represents the Application Server Instance (IP address or FQDN of the Application Server). | | ServiceExperienceExt | |
| svcExpPerFlows | | array(ServiceExperienceInfoPerFlow) | | | M | 1..N | | Each element represents service experience for each service flow. | |  | |
| gpsis | | array(Gpsi) | | | O | 1..N | | Each element represents external UE identifier. (NOTE) | |  | |
| supis | | array(Supi) | | | O | 1..N | | SUPI identifying a UE. (NOTE) | |  | |
| contrWeights | | array(Uinteger) | | C | 1..N | | | Indicates the Service Experience Contribution Weights of a list of UEs in the same sequence as in the presented gpsis or supis list of UEs. The weights indicate the relative importance among the elements of this array. The higher the number, the higher the importance. | | ServiceExperienceExt2\_eNA | |
| NOTE: Either "gpsis" or "supis" shall be present. For untrusted AF, only "gpsis" is applicable. For trusted AF, only "supis" is applicable. | | | | | | | | | | | |

#### 5.6.2.8 Type ServiceExperienceInfoPerFlow

Table 5.6.2.8-1: Definition of type ServiceExperienceInfoPerFlow

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| svcExprc | SvcExperience | M | 1 | Service experience. |  |
| timeIntev | TimeWindow | M | 1 | Represents a start and stop time of the measurement period for the AF service experience. |  |
| dnai | Dnai | O | 0..1 | Indicates the DN Access Identifiers representing location of the service flow. |  |
| ipTrafficFilter | FlowInfo | O | 0..1 | Identifies IP packet filter.(NOTE) |  |
| ethTrafficFilter | EthFlowDescription | O | 0..1 | Identifies Ethernet packet filter.(NOTE) |  |
| NOTE: Either "ipTrafficFilter" or "ethTrafficFilter" shall be provided. | | | | | |

#### 5.6.2.9 Type SvcExperience

Table 5.6.2.9-1: Definition of type SvcExperience

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| mos | Float | M | 1 | Mean opinion score. |  |
| upperRange | Float | M | 1 | The upper value within the rating scale range. |  |
| lowerRange | Float | M | 1 | The lower value within the [rating scale](https://en.wikipedia.org/wiki/Rating_scale) range. |  |

#### 5.6.2.10 Type UeMobilityCollection

Table 5.6.2.10-1: Definition of type UeMobilityCollection

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | P | | Cardinality | | Description | | Applicability | |
| gpsi | | Gpsi | | O | | 0..1 | | Identifies a UE. (NOTE 1) | |  | |
| supi | | Supi | | O | | 0..1 | | SUPI identifying a UE. (NOTE 1) | |  | |
| appId | | ApplicationId | | M | | 1 | | Identifies an application identifier. | |  | |
| allAppInd | | boolean | | O | | 0..1 | | Indicates applicable to all applications if set to "true", otherwise set to "false". Default value is "false" if omitted. (NOTE 2) | | AllApplications | |
| ueTrajs | | array(UeTrajectoryCollection) | | M | | 1..N | | Identifies a list of UE moving trajectories. | |  | |
| areas | | array(LocationArea5G) | | O | | 1..N | | Indicates a list of areas used by the AF for the application service. | | UeMobilityExt\_AIML | |
| NOTE 1: Either gpsi or supi shall be present. For untrusted AF, only gpsi is applicable. For trusted AF, only supi is applicable.  NOTE 2: If the "allAppInd" attribute is present and set to "true", then the value in the "appId" shall be ignored, which indicates the collected UE mobility information is applicable to all the applications for the UE. | | | | | | | | | | | |

#### 5.6.2.11 Type UeCommunicationCollection

Table 5.6.2.11-1: Definition of type UeCommunicationCollection

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | P | | Cardinality | | Description | | Applicability | |
| gpsi | | Gpsi | | O | | 0..1 | | Identifies a UE. (NOTE 1) | |  | |
| supi | | Supi | | O | | 0..1 | | SUPI identifying a UE. (NOTE 1) | |  | |
| exterGroupId | | ExtGroupId | | O | | 0..1 | | Identifies an external group of UEs. (NOTE 2) | |  | |
| interGroupId | | GroupId | | O | | 0..1 | | Identifies an internal group of UEs. (NOTE 2) | |  | |
| appId | | ApplicationId | | M | | 1 | | Identifies an application identifier. | |  | |
| expectedUeBehavePara | | CpParameterSet | | O | | 0..1 | | Indicates the Expected UE Behaviour parameters. (NOTE 3) | | UeCommunicationExt\_eNA | |
| comms | | array(CommunicationCollection) | | M | | 1..N | | This attribute contains a list of communication information. | |  | |
| NOTE 1: Either "gpsi" or "supi" shall be present. For untrusted AF, only "gpsi" is applicable. For trusted AF, only "supi" is applicable.  NOTE 2: "interGroupId" attribute only applies to trusted AF and "exterGroupId" only applies to untrusted AF.  NOTE 3: The "setId", "self" and "validityTime" attributes included in CpParameterSet data type are not applicable to this attribute. | | | | | | | | | | | |

#### 5.6.2.12 Type UeTrajectoryCollection

Table 5.6.2.12-1: Definition of type UeTrajectoryCollection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ts | DateTime | M | 1 | This attribute identifies the timestamp when the UE enters the location. |  |
| locArea | LocationArea5G | M | 1 | This attribute includes the location information of the UE. |  |

#### 5.6.2.13 Type CommunicationCollection

Table 5.6.2.13-1: Definition of type CommunicationCollection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| startTime | DateTime | M | 1 | Identifies the timestamp this communication starts. |  |
| endTime | DateTime | M | 1 | Identifies the timestamp this communication stops. |  |
| ulVol | Volume | O | 0..1 | Identifies the uplink traffic volume. (NOTE) |  |
| dlVol | Volume | O | 0..1 | Identifies the downlink traffic volume. (NOTE) |  |
| NOTE: At least one of "ulVol" or "dlVol" shall be provided. | | | | | |

#### 5.6.2.14 Type ExceptionInfo

Table 5.6.2.14-1: Definition of type ExceptionInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ipTrafficFilter | FlowInfo | C | 0..1 | Identifies IP flow.(NOTE 1) |  |
| ethTrafficFilter | EthFlowDescription | C | 0..1 | Identifies Ethernet flow.(NOTE 1) |  |
| exceps | array(Exception) | M | 1..N | Contains the description of one or more exception information. (NOTE 2) |  |
| NOTE 1: Either "ipTrafficFilter" or "ethTrafficFilter" shall be provided.  NOTE 2: Only "excepId", "excepLevel" and "excepTrend" within the Exception data type as defined in 3GPP TS 29.520 [19] apply to the ExceptionInfo data type. | | | | | |

#### 5.6.2.15 Type UserDataCongestionCollection

Table 5.6.2.15-1: Definition of type UserDataCongestionCollection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| appId | ApplicationId | C | 0..1 | Indicates an application identifier.  (NOTE) |  |
| ipTrafficFilter | FlowInfo | C | 0..1 | Identifies IP packet filter. (NOTE) |  |
| timeInterv | TimeWindow | O | 0..1 | Represents a start and stop time interval of the measurement period for the AF application. |  |
| thrputUl | BitRate | O | 0..1 | Indicates the average uplink throughput over the measurement period. |  |
| thrputDl | BitRate | O | 0..1 | Indicates the average downlink throughput over the measurement period. |  |
| thrputPkUl | BitRate | O | 0..1 | Indicates the peak uplink throughput over the measurement period. |  |
| thrputPkDl | BitRate | O | 0..1 | Indicates the peak uplink throughput over the measurement period. |  |
| NOTE: Either "appId" or "ipTrafficFilter" shall be provided. | | | | | |

#### 5.6.2.16 Type PerformanceDataCollection

Table 5.6.2.16-1: Definition of type PerformanceDataCollection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 an UE. |  |
| ipTrafficFilter | FlowInfo | O | 0..1 | Identifies IP packet filter. |  |
| ueLoc | LocationArea5G | O | 0..1 | Represents the UE 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 when the provided data is generated. |  |
| 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. | | | | | |

#### 5.6.2.17 Type PerformanceData

Table 5.6.2.17-1: Definition of type PerformanceData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| pdb | PacketDelBudget | O | 0..1 | Indicates average Packet Delay. |  |
| pdbDl | PacketDelBudget | O | 0..1 | Indicates average downlink Packet Delay. | PerformanceDataExt\_AIML |
| maxPdbUl | PacketDelBudget | O | 0..1 | Indicates Maximum uplink Packet Delay. | PerformanceDataExt\_AIML |
| maxPdbDl | PacketDelBudget | O | 0..1 | Indicates Maximum downlink Packet Delay. | PerformanceDataExt\_AIML |
| plr | PacketLossRate | O | 0..1 | Indicates average Loss Rate. |  |
| plrDl | PacketLossRate | O | 0..1 | Indicates average downlink Loss Rate. | PerformanceDataExt\_AIML |
| maxPlrUl | PacketLossRate | O | 0..1 | Indicates Maximum uplink Loss Rate. | PerformanceDataExt\_AIML |
| maxPlrDl | PacketLossRate | O | 0..1 | Indicates Maximum downlink Loss Rate. | PerformanceDataExt\_AIML |
| thrputUl | BitRate | O | 0..1 | Indicates the average uplink throughput. |  |
| maxThrputUl | BitRate | O | 0..1 | Indicates the Maximum uplink throughput. | PerformanceDataExt\_AIML |
| minThrputUl | BitRate | O | 0..1 | Indicates the Minimum uplink throughput. | PerformanceDataExt\_AIML |
| thrputDl | BitRate | O | 0..1 | Indicates the average downlink throughput. |  |
| maxThrputDl | BitRate | O | 0..1 | Indicates the Maximum downlink throughput. | PerformanceDataExt\_AIML |
| minThrputDl | BitRate | O | 0..1 | Indicates the Minimum downlink throughput. | PerformanceDataExt\_AIML |

#### 5.6.2.18 Type AddrFqdn

Table 5.6.2.18-1: Definition of type AddrFqdn

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ipAddr | IpAddr | O | 0..1 | Indicates an IP address. |  |
| fqdn | string | O | 0..1 | Indicates an FQDN. |  |

#### 5.6.2.19 Type CollectiveBehaviourFilter

Table 5.6.2.19-1: Definition of type CollectiveBehaviourFilter

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | P | | Cardinality | | Description | | Applicability | |
| type | | CollectiveBehaviourFilterType | | M | | 1 | | Parameter type for collective behaviour information event filter. | |  | |
| value | | string | | M | | 1 | | Value of the parameter type as in "type" attribute. | |  | |
| collBehAttr | | array(PerUeAttribute) | | O | | 1..N | | Contains values of collective behaviour attributes, at least one of which shall match for an AF event to be sent. If provided, the attributes "type" and "value" may be ignored. | | ExtEventFilters | |
| dataProcType | | DataProcessingType | | O | | 0..1 | | Contains the type of processing that shall have been performed on the data for an AF event to be sent. If provided, the attributes "type" and "value" may be ignored. | | ExtEventFilters | |
| listOfUeInd | | boolean | | O | | 0..1 | | Indicates whether request list of UE IDs that fulfill a collective behaviour within the area of interest.  This attribute shall set to "true" if request the list of UE IDs, otherwise, set to "false". | |  | |

#### 5.6.2.20 Type CollectiveBehaviourInfo

Table 5.6.2.20-1: Definition of type CollectiveBehaviourInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| colAttrib | array(PerUeAttribute) | M | 1..N | The list of collective attribute values. If the "colAttrib" attribute contains multiple entries, then a UE is considered to fulfil the behaviour if it fulfils the behaviour described by at least one of the elements of the array. |  |
| noOfUes | integer | O | 0..1 | Identifies the total number of UEs that fulfil a collective behaviour within the area of interest. |  |
| appIds | array(ApplicationId) | O | 1..N | Indicates the identifiers of the applications providing this information. |  |
| extUeIds | array(Gpsi) | C | 1..N | Gpsi information of the UEs that fulfil the collective behaviour with in the area of the interest. May only be present if the "listOfUe" attribute is subscribed and sets to "true".  (NOTE) |  |
| ueIds | array(Supi) | C | 1..N | Supis of UEs that fulfil the collective behaviour with in the area of the interest. May only be present if the "listOfUe" attribute is subscribed and sets to "true". (NOTE) |  |
| NOTE: Only one of "extUeIds" or "ueIds" shall be provided. "ueIds" attribute may only be provided by trusted AF. | | | | | |

#### 5.6.2.21 Type DispersionCollection

**Table 5.6.2.21-1: Definition of type DispersionCollection**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | **Applicability** |
| gpsi | Gpsi | C | 0..1 | Indicates external UE identifier. (NOTE 1) |  |
| supi | Supi | C | 0..1 | Indicates internal UE identifier, represents a SUPI identifying a UE. (NOTE 1) |  |
| ueAddr | IpAddr | C | 0..1 | Indicates UE IP address. (NOTE 1) |  |
| timeStamp | DateTime | C | 0..1 | It defines the time stamp when the data volume information is generated.  Shall be present if available. | EnhDataMgmt |
| dataUsage | UsageThreshold | M | 1 | Data volume exchanged for the UE. (NOTE 3) |  |
| flowDesp | FlowDescription | C | 0..1 | Represents IP 5-tuple with protocol, IP address and port for UL/DL application traffic. (NOTE 2) |  |
| appId | ApplicationId | C | 0..1 | Indicates an Application Identifier. (NOTE 2) |  |
| dnais | array(Dnai) | O | 1..N | Indicates the DN Access Identifiers representing location of the service flow.  May only be provided if the "ueAddr" attribute is provided. |  |
| appDur | DurationSec | O | 0..1 | Indicates the duration for the application. |  |
| NOTE 1: One of the "supi", "gpsi" or "ueAddr" attribute shall be provided.  NOTE 2: If the "ueAddr" attribute is provided, either the "appId" or "flowDesp" attribute shall be provided.  NOTE 3: The "duration" attribute within the UsageThreshold data type is not applicable. | | | | | |

#### 5.6.2.22 Type PerUeAttribute

Table 5.6.2.22-1: Definition of type PerUeAttribute

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ueDest | LocationArea5G | M | 1 | Expected final location of UE based on the route planned. |  |
| route | string | O | 0..1 | Planned path of movement by a UE application (e.g. a navigation app). The format is based on the SLA. |  |
| avgSpeed | BitRate | O | 0..1 | Expected speed over the route planned by a UE application. |  |
| timeOfArrival | DateTime | O | 0..1 | Expected Time of arrival to destination based on the route planned. |  |

#### 5.6.2.23 Type MsQoeMetricsCollection

**Table 5.6.2.23-1: Definition of type MsQoeMetricsCollection**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | **Applicability** |
| msQoeMetrics | array(string) | M | 1..N | Represents the Media Streaming Quality of Experience metrics with formatting as specified in clause 11.4.3 of 3GPP TS 26.512 [30], if required for the QoE metrics for Media Streaming UE Application. |  |

#### 5.6.2.24 Type MsConsumptionCollection

**Table 5.6.2.24-1: Definition of type MsConsumptionCollection**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | **Applicability** |
| msConsumps | array(string) | M | 1..N | Represents the Media Streaming Consumption reports with formatting as specified in clause 11.3.3 of 3GPP TS 26.512 [30], if required for Media Streaming UE Application. |  |

#### 5.6.2.25 Type MsNetAssInvocationCollection

**Table 5.6.2.25-1: Definition of type MsNetAssInvocationCollection**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | **Applicability** |
| msNetAssInvocs | array(NetworkAssistanceSession) | M | 1..N | Indicate Media Streaming Network Assistance invocation information as specified in clause 11.6.3.1 of 3GPP TS 26.512 [30]. |  |

#### 5.6.2.26 Type MsDynPolicyInvocationCollection

**Table 5.6.2.26-1: Definition of type MsDynPolicyInvocationCollection**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | **Applicability** |
| msDynPlyInvocs | array(DynamicPolicy) | M | 1..N | Represent the Media Streaming Dynamic Policy invocation as specified in clause 11.5.3.1 of 3GPP TS 26.512 [30]. |  |

#### 5.6.2.27 Type MSAccessActivityCollection

**Table 5.6.2.27-1: Definition of type MSAccessActivityCollection**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | **Applicability** |
| msAccActs | array(MediaStreamingAccessRecord) | M | 1..N | Indicate Media Streaming access activities information as specified in clause 17.2 of 3GPP TS 26.512 [30]. |  |

#### 5.6.2.28 Type DatVolTransTimeCollection

Table 5.6.2.28-1: Definition of type DatVolTransTimeCollection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| appId | ApplicationId | O | 0..1 | Identifier of the application at the AF. |  |
| appServerInst | AddrFqdn | O | 0..1 | Represents the Application Server Instance (IP address/FQDN of the Application Server). |  |
| gpsi | Gpsi | O | 0..1 | Each element represents a GPSI for a UE. |  |
| supi | Supi | O | 0..1 | Each element represents a SUPI for a UE. |  |
| ulTransVol | Volume | O | 0..1 | The volume of the uplink transmitted data. (NOTE 1) |  |
| dlTransVol | Volume | O | 0..1 | The volume of the downlink transmitted data. (NOTE 1) |  |
| ulTransTimeDur | TimeWindow | O | 0..1 | Indicates the start and end time for sending the volume of uplink data. (NOTE 2) |  |
| dlTransTimeDur | TimeWindow | O | 0..1 | Indicates the start and end time for sending the volume of downlink data. (NOTE 2) |  |
| NOTE 1: At least one of "ulTransVol" or "dlTransVol" shall be provided.  NOTE 2: At least one of "ulTransTimeDur" or "dlTransTimeDur" shall be provided. | | | | | |

### 5.6.3 Simple data types and enumerations

#### 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.

#### 5.6.3.2 Simple data types

The simple data types defined in table 5.6.3.2-1 shall be supported.

Table 5.6.3.2-1: Simple data types

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

#### 5.6.3.3 Enumeration: AfEvent

The enumeration AfEvent represents the application events that can be subscribed/notified. It shall comply with the provisions defined in table 5.6.3.3-1.

Table 5.6.3.3-1: Enumeration AfEvent

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| SVC\_EXPERIENCE | Indicates that the event subscribed/notified is service experience information for an application. | ServiceExperience |
| UE\_MOBILITY | Indicates that the event subscribed/notified is UE mobility information. | UeMobility |
| UE\_COMM | Indicates that the event subscribed/notified is UE communication information. | UeCommunication |
| EXCEPTIONS | Indicates that the event subscribed/notified is exceptions information. | Exceptions |
| USER\_DATA\_CONGESTION | Indicates that the event subscribed/notified is user data congestion analytics related information. | UserDataCongestion |
| PERF\_DATA | Indicates that the event subscribed/notified is performance data information. | PerformanceData |
| COLLECTIVE\_BEHAVIOUR | Indicates that the event subscribed/notified is collective behaviour information. | CollectiveBehaviour |
| DISPERSION | Indicates that the event subscribed/notified is dispersion information. | Dispersion |
| MS\_QOE\_METRICS | Indicates that the event subscribed/notified is Media Streaming QoE metrics. | MSQoeMetrics |
| MS\_CONSUMPTION | Indicates that the event subscribed/notified is Media Streaming Consumption reports. | MSConsumption |
| MS\_NET\_ASSIST\_INVOCATION | Indicates that the event subscribed/notified is Media Streaming Network Assistance invocation. | MSNetAssInvocation |
| MS\_DYN\_POLICY\_INVOCATION | Indicates that the event subscribed/notified is Media Streaming Dynamic Policy invocation. | MSDynPolicyInvocation |
| MS\_ACCESS\_ACTIVITY | Indicates that the event subscribed/notified 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 |

#### 5.6.3.4 Enumeration: CollectiveBehaviourFilterType

The enumeration CollectiveBehaviourFilterType represents the parameter type for collective behaviour information filtering. It shall comply with the provisions defined in table 5.6.3.4-1.

Table 5.6.3.4-1: Enumeration CollectiveBehaviourFilterType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| COLLECTIVE\_ATTRIBUTE | Indicates that the parameter type is collective attributes. |  |
| DATA\_PROCESSING | Indicates that the parameter type is data processing. |  |

5.6.3.5 Enumeration: DataProcessingType

The enumeration DataProcessingType represents the type of data processing performed by the AF during UE data collection. It shall comply with the provisions defined in table 5.6.3.5-1.

**Table 5.6.3.5-1: Enumeration DataProcessingType**

|  |  |  |
| --- | --- | --- |
| **Enumeration value** | **Description** | **Applicability** |
| AGGREGATION | Used for aggregated data. |  |
| NORMALIZATION | Used for normalized data. |  |
| ANONYMIZATION | Used for anonymized data. |  |

## 5.7 Error handling

### 5.7.1 General

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

For the Naf\_EventExposure API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [6]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [5] 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 [5].

In addition, the requirements in the following clauses are applicable for the Naf\_EventExposure API.

### 5.7.2 Protocol Errors

In this Release of the specification, there are no service specific protocol errors applicable for the Naf\_EventExposure API.

### 5.7.3 Application Errors

The application errors defined for the Naf\_EventExposure service are listed in table 5.7.3-1.

Table 5.7.3-1: 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. |

## 5.8 Feature negotiation

The optional features in table 5.8-1 are defined for the Naf\_EventExposure API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [5].

Table 5.8-1: Supported Features

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Feature number | | Feature Name | | Description | |
| 1 | | ServiceExperience | | This feature indicates support for the event related to service experience. | |
| 2 | | UeMobility | | This feature indicates support for the event related to UE mobility. | |
| 3 | | UeCommunication | | This feature indicates support for the event related to UE communication information. | |
| 4 | | Exceptions | | This feature indicates support for the event related to exception information. | |
| 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 [5] and according to HTTP redirection principles for indirect communication, as specified in clause 6.10.9 of 3GPP TS 29.500 [5]. | |
| 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 for the event related to collective behaviour information. | |
| 11 | | ServiceExperienceExt | | This feature indicates support for the extensions to the event related to service experience, including reporting Application Server Instance. Supporting this feature also requires the support of feature ServiceExperience. | |
| 12 | | MSQoeMetrics | | This feature indicates support for the event related to Media Streaming QoE metrics for UE Application collected via the Data Collection AF. | |
| 13 | | MSConsumption | | This feature indicates support for the event related to Media Streaming Consumption reports for UE Application collected via the Data Collection AF. | |
| 14 | | MSNetAssInvocation | | This feature indicates support for the event related to Media Streaming Network Assistance invocation for UE Application collected via the Data Collection AF. | |
| 15 | | MSDynPolicyInvocation | | This feature indicates support for the event related to Media Streaming Dynamic Policy invocation for UE Application collected via the Data Collection AF. | |
| 16 | | MSAccessActivity | | This feature indicates support for the event related to Media Streaming access activity for UE Application collected via the Data Collection AF. | |
| 17 | | DataAccProfileId | | This feature indicates support for Data Access Profile Identifier. | |
| 18 | | AllApplications | | This feature indicates applicable to all the applications. | |
| 19 | | 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. | |
| 20 | | 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. | |
| 21 | | UeMobilityExt\_AIML | | 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. | |
| 22 | | EnPerformanceData | | This feature indicates support for the enhancements of performance data. This feature requires the support of the PerformanceData feature. | |
| 23 | | UeCommunicationExt\_eNA | | This feature indicates support for the enhancements of UE Communication, including support of ordering criterion. Supporting this feature also requires the support of UeCommunication feature. | |
| 24 | | ServiceExperienceExt2\_eNA | | This feature indicates support for the extensions to the event related to service experience supporting eNA, including Service Experience Contribution Weights. Supporting this feature also requires the support of feature ServiceExperience. | |
| 25 | | EnhDataMgmt | | Indicates the support of enhanced data management mechanisms. Supporting this feature also requires the support of feature EneNA. | |
| 26 | | ExtEventFilters | | Indicates support of extended AF event filters. | |
| 27 | | DataVolTransferTime | | This feature indicates support for the event related to data volume transfer time. | |
| 28 | | 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. | |

## 5.9 Security

TLS shall be used to support the security communication between the NF Service Consumer and the AF as defined in clause 12.3 and clause 13.1 of 3GPP TS 33.501 [14].

If the AF is trusted, as indicated in 3GPP TS 33.501 [14] and 3GPP TS 29.500 [5], the access to the Naf\_EventExposure API may be authorized by means of the OAuth 2.0 protocol (see IETF RFC 6749 [15]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [16]) plays the role of the authorization server.

If OAuth 2.0 is used, an NF Service Consumer, prior to consuming services offered by the Naf\_EventExposure API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [16], 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 Naf\_EventExposure service.

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

If the AF is untrusted, the access to Naf\_EventExposure API shall be authorized by means of OAuth2 protocol (see IETF RFC 6749 [15]), based on local configuration, using the "Client Credentials" authorization grant. If OAuth2 is used, a NF Service Consumer (e.g. NEF), prior to consuming services offered by the Naf\_EventExposure API, shall obtain a "token" from the authorization server.

Annex A (normative):  
OpenAPI specification

# A.1 General

This Annex is based on the OpenAPI Specification [8] and provides corresponding representations of all APIs defined in the present specification.

NOTE 1: An OpenAPIs representation embeds JSON Schema representations of HTTP message bodies.

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

NOTE 2: The semantics and procedures, as well as conditions, e.g. for the applicability and allowed combinations of attributes or values, not expressed in the OpenAPI definitions but defined in other parts of the specification also apply.

Informative copies of the OpenAPI specification files contained in this 3GPP Technical Specification are available on a Git-based repository that uses the GitLab software version control system (see clause 5B of the 3GPP TR 21.900 [11] and clause 5.3.1 of the 3GPP TS 29.501 [6] for further information).

The security scheme defined below for the Naf\_EventExposure API shows the case when the AF is in untrusted domain and the "scopes" and "tokenUrl" are undefined. For the trusted AF, the "scopes" definition shall use "naf-eventexposure" and the "tokenUrl" definition shall use "{nrfApiRoot}/oauth2/token".

# A.2 Naf\_EventExposure API

openapi: 3.0.0

info:

version: 1.3.0-alpha.5

title: Naf\_EventExposure

description: |

AF Event Exposure Service.

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externalDocs:

description: >

3GPP TS 29.517 V18.4.0; 5G System; Application Function Event Exposure Service; Stage 3.

url: https://www.3gpp.org/ftp/Specs/archive/29\_series/29.517/

servers:

- url: '{apiRoot}/naf-eventexposure/v1'

variables:

apiRoot:

default: https://example.com

description: apiRoot as defined in clause 4.4 of 3GPP TS 29.501

security:

- {}

- oAuth2ClientCredentials: []

paths:

/subscriptions:

post:

summary: Creates a new Individual Application Event Exposure Subscription resource

operationId: PostAfEventExposureSubsc

tags:

- Application Event Subscription (Collection)

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/AfEventExposureSubsc'

responses:

'201':

description: Success

content:

application/json:

schema:

$ref: '#/components/schemas/AfEventExposureSubsc'

headers:

Location:

description: >

Contains the URI of the created individual application event subscription resource

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:

AfEventExposureNotif:

'{$request.body#/notifUri}':

post:

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/AfEventExposureNotif'

responses:

'204':

description: No Content, Notification was successful

'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: "Reads an existing Individual Application Event Subscription"

operationId: GetAfEventExposureSubsc

tags:

- Individual Application Event Subscription (Document)

parameters:

- name: subscriptionId

in: path

description: Application 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/AfEventExposureSubsc'

'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: "Modifies an existing Individual Application Event Subscription "

operationId: PutAfEventExposureSubsc

tags:

- Individual Application Event Subscription (Document)

requestBody:

required: true

content:

application/json:

schema:

$ref: '#/components/schemas/AfEventExposureSubsc'

parameters:

- name: subscriptionId

in: path

description: Application Event Subscription ID

required: true

schema:

type: string

responses:

'200':

description: OK. Resource was successfully modified and representation is returned

content:

application/json:

schema:

$ref: '#/components/schemas/AfEventExposureSubsc'

'204':

description: No Content. Resource was successfully modified

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'411':

$ref: 'TS29571\_CommonData.yaml#/components/responses/411'

'413':

$ref: 'TS29571\_CommonData.yaml#/components/responses/413'

'415':

$ref: 'TS29571\_CommonData.yaml#/components/responses/415'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'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: "Cancels an existing Individual Application Event Subscription "

operationId: DeleteAfEventExposureSubsc

tags:

- Individual Application Event Subscription (Document)

parameters:

- name: subscriptionId

in: path

description: Application Event Subscription ID

required: true

schema:

type: string

responses:

'204':

description: No Content. Resource was successfully deleted

'307':

$ref: 'TS29571\_CommonData.yaml#/components/responses/307'

'308':

$ref: 'TS29571\_CommonData.yaml#/components/responses/308'

'400':

$ref: 'TS29571\_CommonData.yaml#/components/responses/400'

'401':

$ref: 'TS29571\_CommonData.yaml#/components/responses/401'

'403':

$ref: 'TS29571\_CommonData.yaml#/components/responses/403'

'404':

$ref: 'TS29571\_CommonData.yaml#/components/responses/404'

'429':

$ref: 'TS29571\_CommonData.yaml#/components/responses/429'

'500':

$ref: 'TS29571\_CommonData.yaml#/components/responses/500'

'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: '{tokenUri}'

scopes: {}

description: >

For trusted AF, the 'naf-eventexposure' shall be used as 'scopes' and

'{nrfApiRoot}/oauth2/token' shall be used as 'tokenUri'.

schemas:

AfEventExposureNotif:

description: >

Represents notifications on application event(s) that occurred for an Individual Application

Event Subscription resource.

type: object

properties:

notifId:

type: string

eventNotifs:

type: array

items:

$ref: '#/components/schemas/AfEventNotification'

minItems: 1

required:

- notifId

- eventNotifs

AfEventExposureSubsc:

description: Represents an Individual Application Event Subscription resource.

type: object

properties:

dataAccProfId:

type: string

eventsSubs:

type: array

items:

$ref: '#/components/schemas/EventsSubs'

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/AfEventNotification'

minItems: 1

suppFeat:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/SupportedFeatures'

required:

- eventsSubs

- eventsRepInfo

- notifId

- notifUri

AfEventNotification:

description: Represents information related to an event to be reported.

type: object

properties:

event:

$ref: '#/components/schemas/AfEvent'

timeStamp:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

svcExprcInfos:

type: array

items:

$ref: '#/components/schemas/ServiceExperienceInfoPerApp'

minItems: 1

ueMobilityInfos:

type: array

items:

$ref: '#/components/schemas/UeMobilityCollection'

minItems: 1

ueCommInfos:

type: array

items:

$ref: '#/components/schemas/UeCommunicationCollection'

minItems: 1

excepInfos:

type: array

items:

$ref: '#/components/schemas/ExceptionInfo'

minItems: 1

congestionInfos:

type: array

items:

$ref: '#/components/schemas/UserDataCongestionCollection'

minItems: 1

perfDataInfos:

type: array

items:

$ref: '#/components/schemas/PerformanceDataCollection'

minItems: 1

dispersionInfos:

type: array

items:

$ref: '#/components/schemas/DispersionCollection'

minItems: 1

collBhvrInfs:

type: array

items:

$ref: '#/components/schemas/CollectiveBehaviourInfo'

minItems: 1

msQoeMetrInfos:

type: array

items:

$ref: '#/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 records.

msConsumpInfos:

type: array

items:

$ref: '#/components/schemas/MsConsumptionCollection'

minItems: 1

deprecated: true

msConsumpRpts:

type: array

items:

$ref: 'TS26512\_EventExposure.yaml#/components/schemas/ConsumptionReportingUnitsCollection'

minItems: 1

description: Represents the Media Streaming Consumption event records.

msNetAssInvInfos:

type: array

items:

$ref: '#/components/schemas/MsNetAssInvocationCollection'

minItems: 1

deprecated: true

msNetAssistInvs:

type: array

items:

$ref: 'TS26512\_EventExposure.yaml#/components/schemas/NetworkAssistanceInvocationsCollection'

minItems: 1

description: >

Represents the Media Streaming Network Assistance Invocations event records.

msDynPlyInvInfos:

type: array

items:

$ref: '#/components/schemas/MsDynPolicyInvocationCollection'

minItems: 1

deprecated: true

msDynPlyInvs:

type: array

items:

$ref: 'TS26512\_EventExposure.yaml#/components/schemas/DynamicPolicyInvocationsCollection'

minItems: 1

description: Represents the Media Streaming Dynamic Policy Invocations event records.

msAccActInfos:

type: array

items:

$ref: '#/components/schemas/MSAccessActivityCollection'

minItems: 1

deprecated: true

msAccesses:

type: array

items:

$ref: 'TS26512\_EventExposure.yaml#/components/schemas/MediaStreamingAccessesCollection'

minItems: 1

description: Represents the Media Streaming access event records.

gnssAssistDataInfo:

$ref: 'TS29591\_Nnef\_EventExposure.yaml#/components/schemas/GNSSAssistDataInfo'

datVolTransTimeInfos:

type: array

items:

$ref: '#/components/schemas/DatVolTransTimeCollection'

minItems: 1

required:

- event

- timeStamp

EventsSubs:

description: Represents an event to be subscribed and the related event filter information.

type: object

properties:

event:

$ref: '#/components/schemas/AfEvent'

eventFilter:

$ref: '#/components/schemas/EventFilter'

required:

- event

- eventFilter

EventFilter:

description: Represents event filter information for an event.

type: object

properties:

gpsis:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

minItems: 1

supis:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

minItems: 1

exterGroupIds:

type: array

items:

$ref: 'TS29503\_Nudm\_SDM.yaml#/components/schemas/ExtGroupId'

minItems: 1

interGroupIds:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/GroupId'

anyUeInd:

type: boolean

ueIpAddr:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/IpAddr'

appIds:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'

minItems: 1

locArea:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/LocationArea5G'

collAttrs:

type: array

items:

$ref: '#/components/schemas/CollectiveBehaviourFilter'

minItems: 1

exceptionReqs:

type: array

items:

$ref: 'TS29520\_Nnwdaf\_EventsSubscription.yaml#/components/schemas/Exception'

minItems: 1

oneOf:

- required: [gpsis]

- required: [supis]

- required: [exterGroupIds]

- required: [interGroupIds]

- required: [anyUeInd]

- required: [ueIpAddr]

ServiceExperienceInfoPerApp:

description: Contains service experience information associated with an application.

type: object

properties:

appId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'

appServerIns:

$ref: '#/components/schemas/AddrFqdn'

svcExpPerFlows:

type: array

items:

$ref: '#/components/schemas/ServiceExperienceInfoPerFlow'

minItems: 1

gpsis:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

minItems: 1

supis:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

minItems: 1

contrWeights:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Uinteger'

minItems: 1

required:

- svcExpPerFlows

ServiceExperienceInfoPerFlow:

description: Contains service experience information associated with a service flow.

type: object

properties:

svcExprc:

$ref: '#/components/schemas/SvcExperience'

timeIntev:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/TimeWindow'

dnai:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Dnai'

ipTrafficFilter:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/FlowInfo'

ethTrafficFilter:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

SvcExperience:

description: Contains a mean opinion score with the customized range.

type: object

properties:

mos:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Float'

upperRange:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Float'

lowerRange:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Float'

UeMobilityCollection:

description: >

Contains UE mobility information associated with an application. If the allAppInd attribute

is present and set to true, then the value in the appId shall be ignored, which indicates

the collected UE mobility information is applicable to all the applications for the UE.

type: object

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

appId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'

allAppInd:

type: boolean

description: >

Indicates applicable to all applications if set to true, otherwise set to false.

Default value is false if omitted.

ueTrajs:

type: array

items:

$ref: '#/components/schemas/UeTrajectoryCollection'

minItems: 1

areas:

type: array

items:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/LocationArea5G'

minItems: 1

required:

- appId

- ueTrajs

UeCommunicationCollection:

description: Contains UE communication information associated with an application.

type: object

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

exterGroupId:

$ref: 'TS29503\_Nudm\_SDM.yaml#/components/schemas/ExtGroupId'

interGroupId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/GroupId'

appId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'

expectedUeBehavePara:

$ref: 'TS29122\_CpProvisioning.yaml#/components/schemas/CpParameterSet'

comms:

type: array

items:

$ref: '#/components/schemas/CommunicationCollection'

minItems: 1

required:

- appId

- comms

UeTrajectoryCollection:

description: Contains UE trajectory information associated with an application.

type: object

properties:

ts:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

locArea:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/LocationArea5G'

required:

- ts

- locArea

CommunicationCollection:

description: Contains communication information.

type: object

properties:

startTime:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

endTime:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

ulVol:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Volume'

dlVol:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Volume'

required:

- startTime

- endTime

- ulVol

- dlVol

ExceptionInfo:

description: Represents the exceptions information provided by the AF.

type: object

properties:

ipTrafficFilter:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/FlowInfo'

ethTrafficFilter:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/EthFlowDescription'

exceps:

type: array

items:

$ref: 'TS29520\_Nnwdaf\_EventsSubscription.yaml#/components/schemas/Exception'

minItems: 1

required:

- exceps

oneOf:

- required: [ipTrafficFilter]

- required: [ethTrafficFilter]

UserDataCongestionCollection:

description: Contains User Data Congestion Analytics related information collection.

type: object

properties:

appId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'

ipTrafficFilter:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/FlowInfo'

timeInterv:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/TimeWindow'

thrputUl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

thrputDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

thrputPkUl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

thrputPkDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

oneOf:

- required: [appId]

- required: [ipTrafficFilter]

PerformanceDataCollection:

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'

ueLoc:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/LocationArea5G'

appLocs:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Dnai'

minItems: 1

asAddr:

$ref: '#/components/schemas/AddrFqdn'

perfData:

$ref: '#/components/schemas/PerformanceData'

timeStamp:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

required:

- perfData

- timeStamp

PerformanceData:

description: Contains Performance Data.

type: object

properties:

pdb:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PacketDelBudget'

pdbDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PacketDelBudget'

maxPdbUl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PacketDelBudget'

maxPdbDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PacketDelBudget'

plr:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PacketLossRate'

plrDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PacketLossRate'

maxPlrUl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PacketLossRate'

maxPlrDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/PacketLossRate'

thrputUl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

maxThrputUl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

minThrputUl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

thrputDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

maxThrputDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

minThrputDl:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

AddrFqdn:

description: IP address and/or FQDN.

type: object

properties:

ipAddr:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/IpAddr'

fqdn:

type: string

description: Indicates an FQDN.

DispersionCollection:

description: Contains the dispersion information collected for an AF.

type: object

properties:

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

ueAddr:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/IpAddr'

timeStamp:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

dataUsage:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/UsageThreshold'

flowDesp:

$ref: 'TS29514\_Npcf\_PolicyAuthorization.yaml#/components/schemas/FlowDescription'

appId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'

dnais:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Dnai'

minItems: 1

appDur:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DurationSec'

required:

- dataUsage

oneOf:

- required: [gpsi]

- required: [supi]

- required: [ueAddr]

CollectiveBehaviourFilter:

description: Contains the collective behaviour filter information to be collected from UE.

type: object

properties:

type:

$ref: '#/components/schemas/CollectiveBehaviourFilterType'

value:

type: string

description: Value of the parameter type as in the type attribute.

collBehAttr:

type: array

items:

$ref: '#/components/schemas/PerUeAttribute'

minItems: 1

description: >

Contains the values of collective behaviour attributes at least one of which shall

match for an AF event to be sent.

dataProcType:

$ref: '#/components/schemas/DataProcessingType'

listOfUeInd:

type: boolean

description: >

Indicates whether request list of UE IDs that fulfill a collective behaviour within the

area of interest. This attribute shall set to "true" if request the list of UE IDs,

otherwise, set to "false". May only be present and sets to "true" if "AfEvent" sets to

"COLLECTIVE\_BEHAVIOUR".

required:

- type

- value

CollectiveBehaviourInfo:

description: Contains the collective behaviour information to be reported to the subscriber.

type: object

properties:

colAttrib:

type: array

items:

$ref: '#/components/schemas/PerUeAttribute'

minItems: 1

noOfUes:

type: integer

description: Total number of UEs that fulfil a collective within the area of interest.

appIds:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'

minItems: 1

extUeIds:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

minItems: 1

ueIds:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

minItems: 1

required:

- colAttrib

oneOf:

- required: [extUeIds]

- required: [ueIds]

PerUeAttribute:

description: UE application data collected per UE.

type: object

properties:

ueDest:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/LocationArea5G'

route:

type: string

avgSpeed:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/BitRate'

timeOfArrival:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/DateTime'

MsQoeMetricsCollection:

description: >

Contains the Media Streaming QoE metrics information collected for an UE Application via AF.

type: object

properties:

msQoeMetrics:

type: array

items:

type: string

minItems: 1

required:

- msQoeMetrics

MsConsumptionCollection:

description: >

Contains the Media Streaming Consumption information collected for an UE Application via AF.

type: object

properties:

msConsumps:

type: array

items:

type: string

description: >

Represents the Media Streaming Consumption reports with formatting as specified in

clause 11.3.3 of 3GPP TS 26.512 [30], if required for Media Streaming UE Application.

minItems: 1

required:

- msConsumps

MsNetAssInvocationCollection:

description: >

Contains the Media Streaming Network Assistance invocation collected for an UE Application

via AF.

type: object

properties:

msNetAssInvocs:

type: array

items:

$ref: 'TS26512\_M5\_NetworkAssistance.yaml#/components/schemas/NetworkAssistanceSession'

minItems: 1

required:

- msNetAssInvocs

MsDynPolicyInvocationCollection:

description: >

Contains the Media Streaming Dynamic Policy invocation collected for an UE

Application via AF.

type: object

properties:

msDynPlyInvocs:

type: array

items:

$ref: 'TS26512\_M5\_DynamicPolicies.yaml#/components/schemas/DynamicPolicy'

minItems: 1

required:

- msDynPlyInvocs

MSAccessActivityCollection:

description: Contains Media Streaming access activity collected for an UE Application via AF.

type: object

properties:

msAccActs:

type: array

items:

$ref: 'TS26512\_R4\_DataReporting.yaml#/components/schemas/MediaStreamingAccessRecord'

minItems: 1

required:

- msAccActs

DatVolTransTimeCollection:

description: Contains the collective data volume transfer time information to be reported to the subscriber.

type: object

properties:

appId:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/ApplicationId'

appServerInst:

$ref: '#/components/schemas/AddrFqdn'

gpsi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Gpsi'

supi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Supi'

ulTransVol:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Volume'

dlTransVol:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/Volume'

ulTransTimeDur:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/TimeWindow'

dlTransTimeDur:

$ref: 'TS29122\_CommonData.yaml#/components/schemas/TimeWindow'

anyOf:

- anyOf:

- required: [ulTransVol]

- required: [dlTransVol]

- anyOf:

- required: [ulTransTimeDur]

- required: [dlTransTimeDur]

# Simple data types and Enumerations

AfEvent:

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 an application's 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.

CollectiveBehaviourFilterType:

anyOf:

- type: string

enum:

- COLLECTIVE\_ATTRIBUTE

- DATA\_PROCESSING

- 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 the parameter type for collective behaviour information filtering.

Possible values are:

- COLLECTIVE\_ATTRIBUTE: Indicates that the parameter type is collective attributes.

- DATA\_PROCESSING: Indicates that the parameter type is data processing.

DataProcessingType:

description: Represents a type of data processing.

anyOf:

- type: string

enum:

- AGGREGATION

- NORMALIZATION

- ANONYMIZATION

- 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.

Annex B (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2019-03 |  |  |  |  |  | TS skeleton of Application Function Event Exposure Service | 0.0.0 |
| 2019-04 | CT3#102 |  |  |  |  | Inclusion of C3-191230, C3-191374 and editorial change from Rapporteur. | 0.1.0 |
| 2019-05 | CT3#103 |  |  |  |  | Inclusion of C3-192194, C3-192393, C3-192260 and C3-192261. | 0.2.0 |
| 2019-08 | CT3#105 |  |  |  |  | Inclusion of C3-193373, C3-193440, C3-193441 and C3-193446. | 0.3.0 |
| 2019-10 | CT3#106 |  |  |  |  | Inclusion of C3-194263, C3-194264, C3-194393 and C3-194439. | 0.4.0 |
| 2019-11 | CT3#107 |  |  |  |  | Inclusion of C3-195068, C3-195226, C3-195238. | 0.5.0 |
| 2019-12 | CT#86 | CP-193178 |  |  |  | Presented for information | 1.0.0 |
| 2019-12 | CT#86 | CP-193295 |  |  |  | A title corrected | 1.0.1 |
| 2020-02 | CT3#108e |  |  |  |  | Inclusion of C3-201297, C3-201369, C3-201385, C3-201399, C3-201440 and C3-201466. | 1.1.0 |
| 2020-03 | CT#87e | CP-200188 |  |  |  | TS sent to plenary for approval | 2.0.0 |
| 2020-03 | CT#87e | CP-200188 |  |  |  | TS approved by plenary | 16.0.0 |
| 2020-06 | CT#88e | CP-201234 | 0001 |  | F | Update service operation for Ue Communication | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0002 |  | F | Corrections in TS 29.517 | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0003 |  | F | Definition of AfEventExposureSubsc in OpenAPI | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0004 | 1 | D | Unsubscribe service operation | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0005 | 1 | F | Correction to event description | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0006 | 1 | F | Correction to target UE description | 16.1.0 |
| 2020-06 | CT#88e | CP-201244 | 0007 | 1 | F | Storage of YAML files in ETSI Forge | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0008 |  | F | Service operation description for UE mobility | 16.1.0 |
| 2020-06 | CT#88e | CP-201256 | 0009 | 1 | F | URI of the Naf\_EventExposure service | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0010 |  | F | Support of immediate reporting | 16.1.0 |
| 2020-06 | CT#88e | CP-201077 | 0012 | 1 | F | Supported features definition | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0013 | 1 | F | Target UE information | 16.1.0 |
| 2020-06 | CT#88e | CP-201234 | 0014 | 1 | F | Supported headers, Resource Data type and yaml mapping | 16.1.0 |
| 2020-06 | CT#88e | CP-201255 | 0015 |  | F | Update of OpenAPI version and TS version in externalDocs field | 16.1.0 |
| 2020-09 | CT#89e | CP-202066 | 0017 | 1 | F | Missed data type definition | 16.2.0 |
| 2020-09 | CT#89e | CP-202066 | 0018 |  | F | Corrections on UE Mobility | 16.2.0 |
| 2020-09 | CT#89e | CP-202066 | 0019 |  | F | Missed response code | 16.2.0 |
| 2020-09 | CT#89e | CP-202066 | 0020 | 1 | F | Any UE indication applies to EXCEPTIONS | 16.2.0 |
| 2020-12 | CT#90e | CP-203139 | 0021 | 1 | F | Essential Corrections and alignments | 16.3.0 |
| 2020-12 | CT#90e | CP-203139 | 0022 |  | F | Storage of YAML files in 3GPP Forge | 16.3.0 |
| 2020-12 | CT#90e | CP-203129 | 0023 | 1 | F | Removal of trailing forward slash in resource URI | 16.3.0 |
| 2020-12 | CT#90e | CP-203139 | 0024 | 1 | F | Callback URI correction | 16.3.0 |
| 2020-12 | CT#90e | CP-203152 | 0027 |  | F | Update of OpenAPI version and TS version in externalDocs field | 16.3.0 |
| 2020-12 | CT#90e | CP-203130 | 0025 | 1 | F | Corrections to location area usage | 17.0.0 |
| 2021-03 | CT#91e | CP-210206 | 0029 |  | A | Correction to anyUeInd attribute | 17.1.0 |
| 2021-03 | CT#91e | CP-210191 | 0031 | 1 | A | Support Stateless NFs | 17.1.0 |
| 2021-03 | CT#91e | CP-210218 | 0032 |  | F | OpenAPI reference | 17.1.0 |
| 2021-03 | CT#91e | CP-210219 | 0033 |  | F | Adding some missing description fields to data type definitions in OpenAPI specification files | 17.1.0 |
| 2021-03 | CT#91e | CP-210220 | 0034 |  | F | Optional header clarification | 17.1.0 |
| 2021-03 | CT#91e | CP-210206 | 0036 |  | F | Resource URI correction | 17.1.0 |
| 2021-03 | CT#91e | CP-210240 | 0038 |  | F | Update of OpenAPI version and TS version in externalDocs field | 17.1.0 |
| 2021-06 | CT#92e | CP-211221 | 0039 | 1 | B | Partitioning criteria for applying sampling in specific UE partitions in AF exposure | 17.2.0 |
| 2021-06 | CT#92e | CP-211221 | 0040 |  | B | Support of Mute reporting | 17.2.0 |
| 2021-06 | CT#92e | CP-211200 | 0041 | 1 | A | Redirection responses | 17.2.0 |
| 2021-06 | CT#92e | CP-211221 | 0043 | 1 | B | Extensions to User Data Congestion Analytics | 17.2.0 |
| 2021-06 | CT#92e | CP-211265 | 0045 |  | F | Update of OpenAPI version and TS version in externalDocs field | 17.2.0 |
| 2021-09 | CT#93e | CP-212203 | 0046 | 2 | B | Support of Performance Data event | 17.3.0 |
| 2021-09 | CT#93e | CP-212220 | 0047 |  | F | Resource URI correction on Naf\_EventExposure API | 17.3.0 |
| 2021-09 | CT#93e | CP-212203 | 0048 | 1 | B | Collective Behaviour analytics | 17.3.0 |
| 2021-09 | CT#93e | CP-212203 | 0049 | 2 | B | Support UE data volume dispersion collection | 17.3.0 |
| 2021-09 | CT#93e | CP-212223 | 0050 |  | F | Update of OpenAPI version and TS version in externalDocs field | 17.3.0 |
| 2021-12 | CT#94e | CP-213227 | 0052 | 1 | B | Updates to UE data volume dispersion collection | 17.4.0 |
| 2021-12 | CT#94e | CP-213256 | 0055 |  | B | Collective Behaviour Analytics update | 17.4.0 |
| 2021-12 | CT#94e | CP-213227 | 0051 | 1 | F | Updates to User Data Congestion | 17.4.0 |
| 2021-12 | CT#94e | CP-213227 | 0053 |  | F | Adding collective behaviour analytics feature | 17.4.0 |
| 2021-12 | CT#94e | CP-213227 | 0054 | 2 | F | Update of notification procedure with description of USER\_DATA\_CONGESTION and DISPERSION events | 17.4.0 |
| 2021-12 | CT#94e | CP-213220 | 0056 |  | B | Alignment with SA3 supported TLS profiles | 17.4.0 |
| 2021-12 | CT#94e | [CP-213246](https://www.3gpp.org/ftp/tsg_ct/tsg_ct/TSGC_94e/Docs/CP-213246.zip) | 0057 |  | F | Update of OpenAPI version and TS version in externalDocs field | 17.4.0 |
| 2022-03 | CT#95e | CP-220190 | 0058 | 1 | B | Update UE Application collective behaviour for NF Load analytics | 17.5.0 |
| 2022-03 | CT#95e | CP-220190 | 0059 | 1 | F | type attribute in CollectiveBehaviourFilter data type | 17.5.0 |
| 2022-03 | CT#95e | CP-220190 | 0060 | 1 | F | Miscellaneous corrections | 17.5.0 |
| 2022-03 | CT#95e | CP-220191 | 0062 | 1 | F | Formatting of description fields | 17.5.0 |
| 2022-03 | CT#95e | CP-220201 | 0061 | 1 | F | Corrections to Data Model of AF Event Exposure service | 17.5.0 |
| 2022-03 | CT#95e | CP-220194 | 0063 |  | F | Update of info and externalDocs field | 17.5.0 |
| 2022-06 | CT#96 | CP-221131 | 0064 | 1 | B | Add Application duration for Dispersion | 17.6.0 |
| 2022-06 | CT#96 | CP-221131 | 0065 | 1 | B | Add Application Server Instance for Service Experience | 17.6.0 |
| 2022-06 | CT#96 | CP-221155 | 0068 | 1 | F | Remove the apiVersion placeholder from the resource URI variables table | 17.6.0 |
| 2022-06 | CT#96 | CP-221133 | 0066 | - | F | Muting notifications correction | 17.6.0 |
| 2022-06 | CT#96 | CP-221134 | 0067 | - | F | Presence condition on the data types of Naf\_EventExposure service | 17.6.0 |
| 2022-06 | CT#96 | CP-221142 | 0069 | 1 | B | Support UE Application event exposure via Data Collection AF | 17.6.0 |
| 2022-06 | CT#96 | CP-221296 | 0070 | 1 | B | Support QoE metrics in AF Event Exposure | 17.6.0 |
| 2022-06 | CT#96 | CP-221142 | 0071 | 1 | B | Support Consumption reports in AF Event Exposure | 17.6.0 |
| 2022-06 | CT#96 | CP-221142 | 0072 | 1 | B | Support Network Assistance invocations in AF Event Exposure | 17.6.0 |
| 2022-06 | CT#96 | CP-221142 | 0073 | 1 | B | Support Charging and Policy invocations in AF Event Exposure | 17.6.0 |
| 2022-06 | CT#96 | CP-221142 | 0074 | 1 | B | Support Media Streaming access activity in AF Event Exposure | 17.6.0 |
| 2022-06 | CT#96 | CP-221151 | 0075 | - | F | Update of info and externalDocs fields | 17.6.0 |
| 2022-09 | CT#97e | CP-222101 | 0083 | - | F | clarification on dataUsage in DispersionCollection | 17.7.0 |
| 2022-09 | CT#97e | CP-222103 | 0084 | 1 | F | Add NOTE for 3xx response codes | 17.7.0 |
| 2022-09 | CT#97e | CP-222102 | 0085 | 1 | F | Missing description field for enumeration data types | 17.7.0 |
| 2022-09 | CT#97e | CP-222103 | 0082 | 1 | F | Correcting the events to which certain event consumers can subscribe | 17.7.0 |
| 2022-09 | CT#97e | CP-222110 | 0076 | 1 | B | Updates to Media Streaming QoE metrics Event | 17.7.0 |
| 2022-09 | CT#97e | CP-222110 | 0077 | 1 | F | Updates to Media Streaming Consumption Event | 17.7.0 |
| 2022-09 | CT#97e | CP-222110 | 0078 | 1 | F | Updates to Media Streaming Network Assistance Invocation Event | 17.7.0 |
| 2022-09 | CT#97e | CP-222110 | 0079 | 1 | F | Updates to Media Streaming Dynamic Policy Invocation Event | 17.7.0 |
| 2022-09 | CT#97e | CP-222110 | 0080 | 1 | F | Updates to Media Streaming Access Event | 17.7.0 |
| 2022-09 | CT#97e | CP-222121 | 0086 | - | F | Update of info and externalDocs fields | 17.7.0 |
| 2022-12 | CT#98e | C3-225534 | 0088 | 1 | F | Corrections to procedures of MS Event Exposure | 17.8.0 |
| 2022-12 | CT#98e | CP-223191 | 0087 | - | F | Adding the mandatory error code 502 Bad Gateway | 18.0.0 |
| 2022-12 | CT#98e | CP-223176 | 0089 | 1 | F | Corrections to UE Mobility event | 18.0.0 |
| 2022-12 | CT#98e | CP-223176 | 0090 | 1 | F | Correct the name of the data structure | 18.0.0 |
| 2022-12 | CT#98e | CP-223189 | 0091 | - | F | Update of info and externalDocs fields | 18.0.0 |
| 2023-03 | CT#99 | CP-230145 | 0093 | 1 | A | Adding DCCF and MFAF to the NF service consumers | 18.1.0 |
| 2023-03 | CT#99 | CP-230134 | 0094 | 1 | B | Update to Data Type PerformanceData for DN Performance | 18.1.0 |
| 2023-03 | CT#99 | CP-230134 | 0095 | 1 | B | Updates to Data Type UeMobilityCollection for UE Mobility | 18.1.0 |
| 2023-03 | CT#99 | CP-230134 | 0096 | 1 | B | Enhance the performance data collection for DN performance | 18.1.0 |
| 2023-03 | CT#99 | CP-230148 | 0097 | 1 | B | Enhance the filter for performance data collection | 18.1.0 |
| 2023-03 | CT#99 | CP-230149 | 0098 | 1 | B | Support of collecting expected UE behaviour parameters from AF | 18.1.0 |
| 2023-03 | CT#99 | CP-230125 | 0100 | 1 | B | Updates to support GNSS assistance data collection from AF via NEF | 18.1.0 |
| 2023-03 | CT#99 | CP-230161 | 0101 | - | F | Update of info and externalDocs fields | 18.1.0 |
| 2023-06 | CT#100 | CP-231124 | 0099 | 2 | B | Improving the Correctness of Service Experience Analytics with Contribution Weights | 18.2.0 |
| 2023-06 | CT#100 | CP-231137 | 0102 | 1 | B | Adding UE address to the target UE information | 18.2.0 |
| 2023-06 | CT#100 | CP-231124 | 0103 | - | F | Missing feature dependency for performance data | 18.2.0 |
| 2023-06 | CT#100 | CP-231125 | 0104 | 1 | B | Event muting enhancements for AF event exposure | 18.2.0 |
| 2023-06 | CT#100 | CP-231137 | 0105 | 1 | B | Implementing required AF event filters | 18.2.0 |
| 2023-06 | CT#100 | CP-231131 | 0107 | 1 | F | Corrections to the description fields of the Naf\_EventExposure API enumerations | 18.2.0 |
| 2023-06 | CT#100 | CP-231166 | 0109 | 1 | F | Changing the feature name for the GNSS Assistance Data Collection functionality | 18.2.0 |
| 2023-06 | CT#100 | CP-231166 | 0110 | - | B | Continuing the definition of the content of the GNSS Assistance Data Collection information | 18.2.0 |
| 2023-06 | CT#100 | CP-231249 | 0112 | 1 | B | Update to Naf\_EventExposure API for E2E Data Volume Transfer Time Analytics | 18.2.0 |
| 2023-06 | CT#100 | CP-231131 | 0114 | - | F | Corrections to the redirection mechanism description | 18.2.0 |
| 2023-06 | CT#100 | CP-231141 | 0115 | - | F | Update of info and externalDocs fields | 18.2.0 |
| 2023-09 | CT#101 | CP-232097 | 0116 | 1 | B | Support of providing the time stamp for the data volume dispersion information | 18.3.0 |
| 2023-09 | CT#101 | CP-232109 | 0117 |  | F | Corrections to GNSS Assistance Data Collection | 18.3.0 |
| 2023-09 | CT#101 | CP-232087 | 0118 | 1 | F | Adding missing feature for appIds and locArea attributes | 18.3.0 |
| 2023-09 | CT#101 | CP-232085 | 0119 |  | F | Update of info and externalDocs fields | 18.3.0 |
| 2023-12 | CT#102 | CP-233262 | 0120 | 1 | B | Complete the definition of the content of the GNSS Assistance Data Collection information | 18.4.0 |
| 2023-12 | CT#102 | CP-233228 | 0121 | 1 | B | HTTP RFC uplifting | 18.4.0 |
| 2023-12 | CT#102 | CP-233246 | 0122 | - | F | corrections to CollectiveBehaviour | 18.4.0 |
| 2023-12 | CT#102 | CP-233229 | 0124 | 1 | B | Updating the obsoleted IETF HTTP RFCs | 18.4.0 |
| 2023-12 | CT#102 | CP-233247 | 0125 | 1 | B | Update the data types of the Media Steaming attributes | 18.4.0 |
| 2023-12 | CT#102 | CP-233237 | 0126 | - | F | Update of info and externalDocs fields | 18.4.0 |