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TECHNICAL SPECIFICATION

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650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00 Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - APE 7112B
Association à but non lucratif enregistrée à la
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Contents

Foreword

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

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  - 1 presented to TSG for information;
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  - 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;
- Performance Data information; and
- 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.

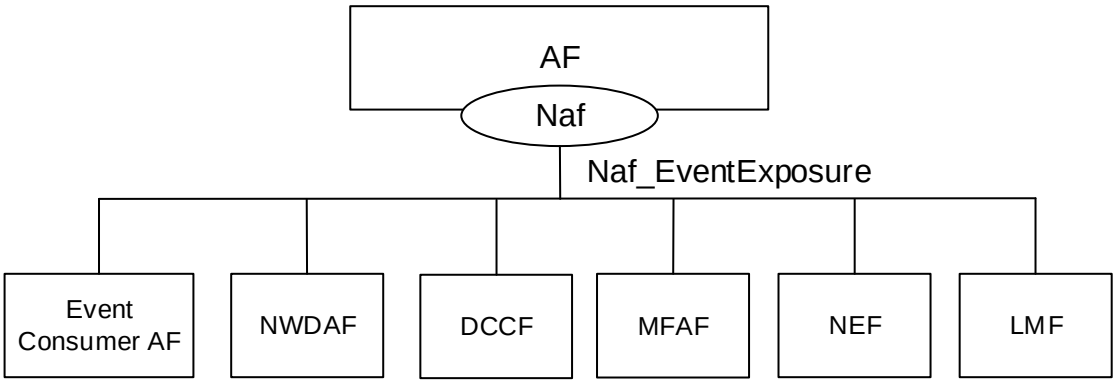

Figure 4.1.2-1: Naf_EventExposure service Architecture, SBI representation

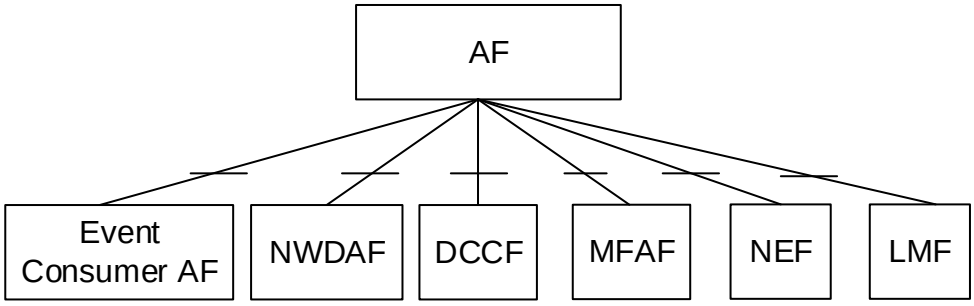

Figure 4.1.2-2: Naf_EventExposure service Architecture, reference point representation

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;
- Performance Data information; and
- 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; and
- modifying an existing subscription.

4.2.2.2 Creating a new subscription

Figure 4.2.2.2-1 illustrates the creation of a subscription.

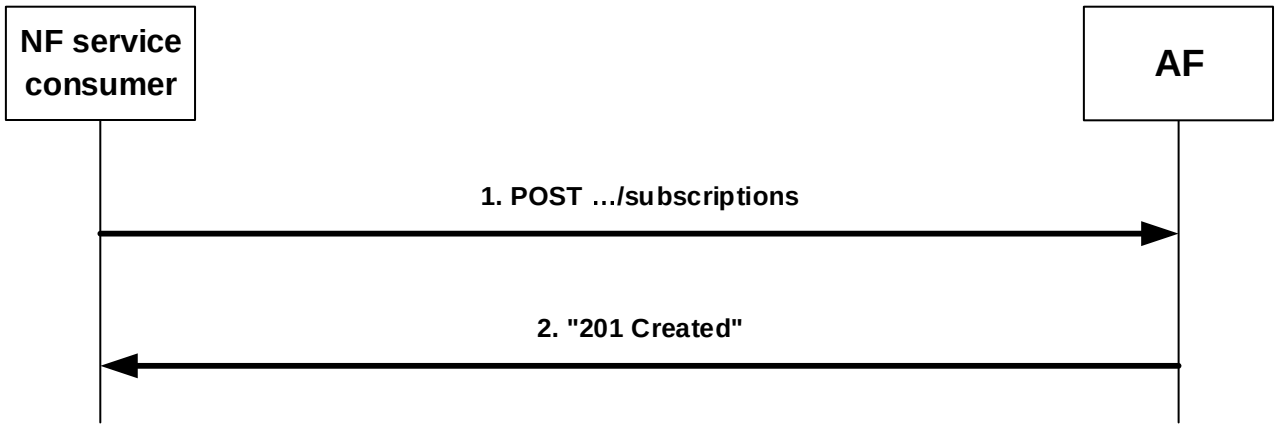

Figure 4.2.2.2-1: Creation of a subscription

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 "DataAccProfileId" feature 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;

and may include:

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

The "eventsRepInfo" attribute may include:

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

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

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 "ServiceExperience" feature 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; and

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

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

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

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

- If the "UeCommunication" feature 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; and

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

- If the "UeMobility" feature 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; and

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

- If the "UserDataCongestion" feature 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; and

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

- If the "PerformanceData" feature 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; and

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

- If the "CollectiveBehaviour" feature is supported and the event is "COLLECTIVE_BEHAVIOUR", the "eventFilter" attribute may provide:

  1) collective attributes information via the "collAttrs" attribute;

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

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

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

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

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

- If the "MSQoeMetrics" feature 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; and

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

- If the "MSConsumption" feature 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; and

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

- If the "MSNetAssInvocation" feature 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; and

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

- If the "MSDynPolicyInvocation" feature 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; and

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

- If the "MSAccessActivity" feature 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; and

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

- If the "GNSSAssistData" feature is supported and the subscribed event is "GNSS_ASSISTANCE_DATA", the "eventFilter" attribute may include:

  1) an area of interest within the "locArea" attribute.

- If the "DataVolTransferTime" feature is supported and the event is "DATA_VOLUME_TRANSFER_TIME", the "eventFilter" attribute may provide:

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

  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.

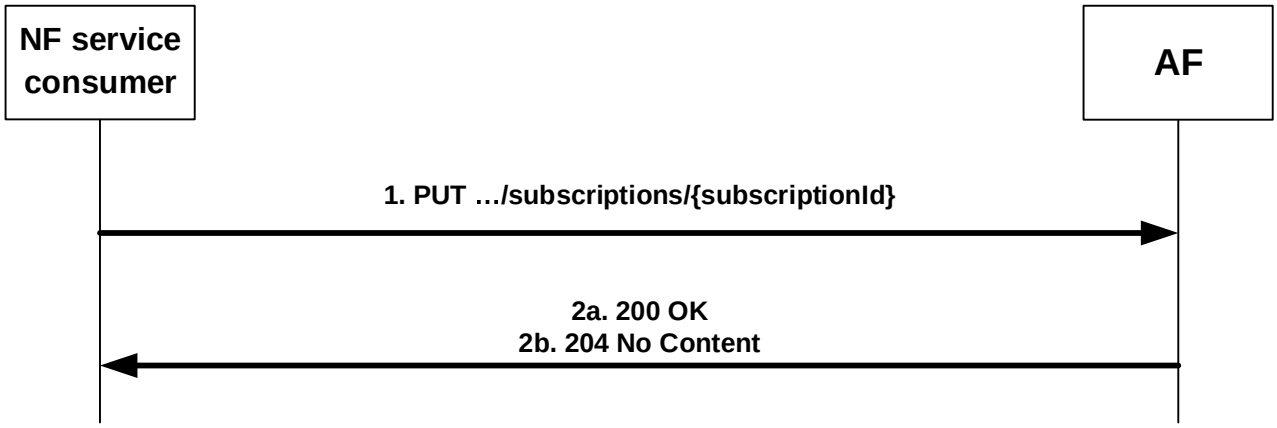

Figure 4.2.2.3-1: Modification of an existing subscription

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.

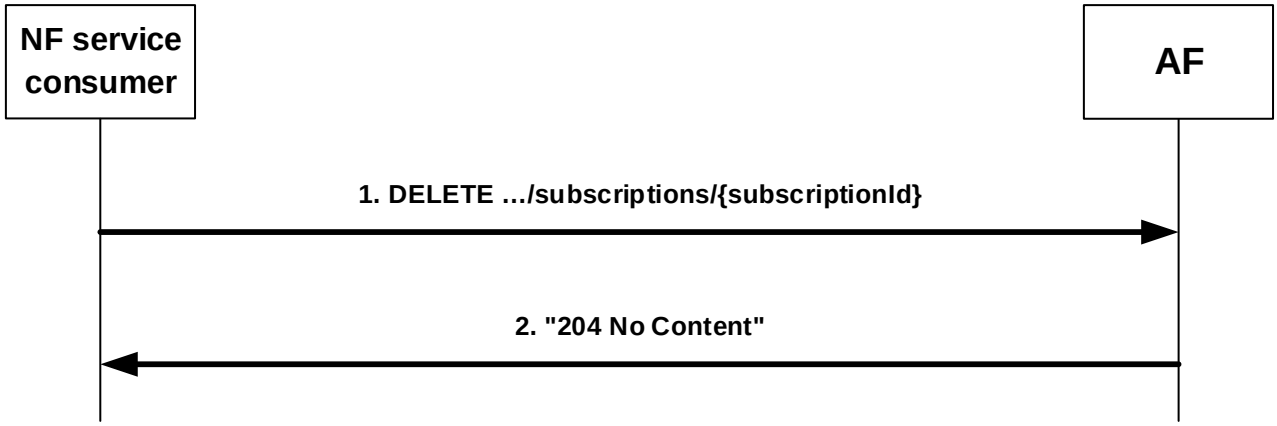

Figure 4.2.3.2-1: Unsubscription from event notifications

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.

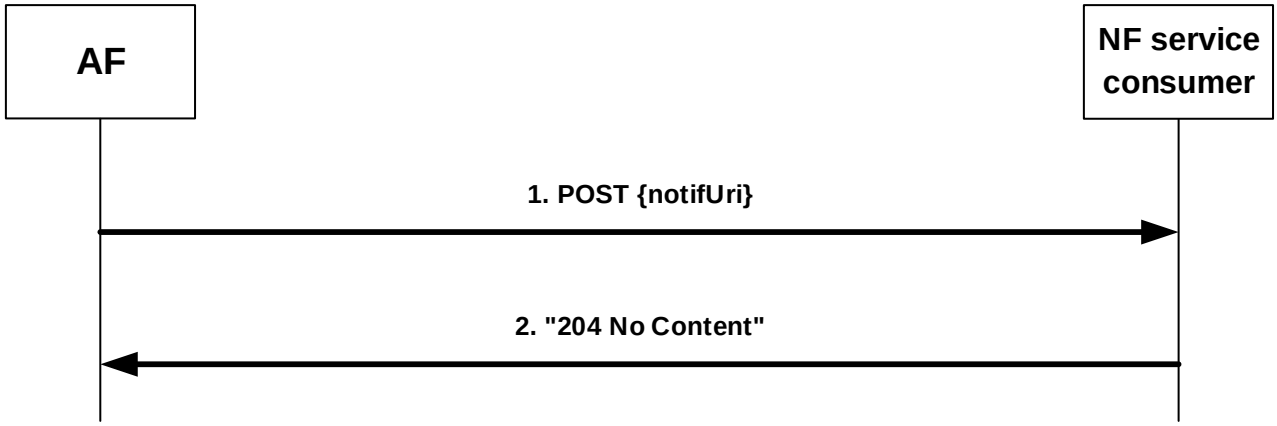

Figure 4.2.4.2-1: Notification about subscribed events

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 "DATA_VOLUME_TRANSFER_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.

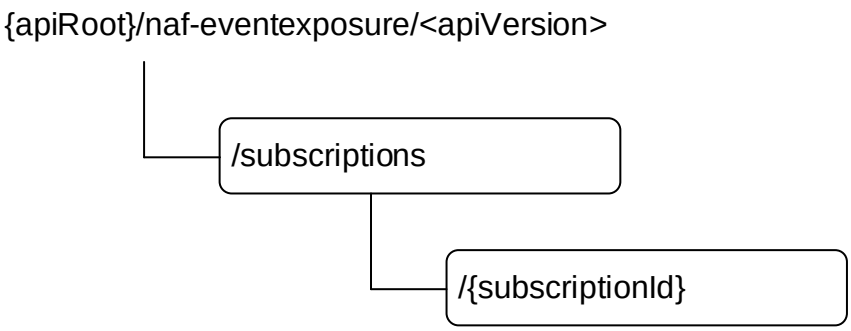

Figure 5.3.1-1: Resource URI structure of the Naf_EventExposure API

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
AfEventExposure Subsc	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
AfEventExposure Subsc	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
RelativeDirection	5.6.3.6	Contains the heading of the UE movement with respect to another UE.	RelativeProximity
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.	
Direction	3GPP TS 29.520 [19]	Heading directions of the UE flow in the target area.	RelativeProximity
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 RelativeProximity
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.	
eventRepInfo	ReportingInformation	O	0..1	Represents the reporting requirements to be applied for the event provided within the "event" attribute. (NOTE 1, NOTE 2)	PerEventRepReq
NOTE 1: When the "PerEventRepReq" feature is supported and this attribute is present, the "eventRepInfo" attribute may include muting instructions within the "notifFlagInstruct" attribute and/or muting notifications settings within the "mutingSetting" attribute only when the "EnhDataMgmt" feature is supported. NOTE 2: When the "PerEventRepReq" feature is supported and this attribute is present, the event reporting requirements provided within this attribute shall take precedence over the common events reporting requirements provided within the "eventsRepInfo" attribute of the parent AfEventExposureSubsc data structure.					

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, NOTE 7)	
supis	array(Supi)	O	1..N	Each element represents a SUPI identifying a UE (NOTE 1, NOTE 2, NOTE 7)	
exterGroupIds	array(ExtGroupId)	O	1..N	Each element represents a group of UEs identified by an External Group Identifier. (NOTE 1, NOTE 2, NOTE 7)	
interGroupIds	array(GroupId)	O	1..N	Each element represents a group of UEs identified by an Internal Group Identifier. (NOTE 1, NOTE 2, NOTE 7)	
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", "GNSS_ASSISTANCE_DATA", or "USER_DATA_CONGESTION". (NOTE 2, NOTE 7)	ServiceExperience Exceptions UserDataCongestion GNSSAssistData
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 GNSSAssistData
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 "nwAreaInfo" attribute within the LocationArea5G data type is only applicable for a trusted AF. In addition, for the "SVC_EXPERIENCE" or "GNSS_ASSISTANCE_DATA" event, only the "tais" attribute within the NetworkAreaInfo data type encoding the "nwAreaInfo" attribute is applicable for the trusted AF.
NOTE 6: Only "excepId" and "excepLevel" attributes within the Exception data type are applicable to this attribute.
NOTE 7: When the "GNSSAssistData" feature is supported, only the "anyUeInd" attribute is applicable (and shall be present and set to "true") for the "GNSS_ASSISTANCE_DATA" event in this release of the specification.

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 "MS_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 "MS_NET_ASSIST_INVOCATION". This attribute deprecates "msNetAssInvInfos" attribute.	MSEventExposure
msDynPlyInvInfos	array(MsDynPolicyInvocationCollection)	C	1..N	Each element represents the Media Streaming Dynamic Policy invocation information collected for an UE application via the Data Collection AF. Shall be present if the "event" attribute sets to "MS_DYN_POLICY_INVOCATION". This attribute is deprecated; the attribute "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 event record. 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	C	0..1	Identifies IP packet filter.(NOTE)	
ethTrafficFilter	EthFlowDescription	C	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 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(UeTrajectory Collection)	M	1..N	Identifies a list of UE moving trajectories.	
areas	array(LocationArea 5G)	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	M	1	Identifies the uplink traffic volume. (NOTE)	
dlVol	Volume	M	1	Identifies the downlink traffic volume. (NOTE)	

NOTE: If there is no traffic volume in the uplink or downlink, then the corresponding "ulVol" attribute or "dlVol" attribute shall be set to zero value.

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.	PerformanceData Ext_AIML
maxPdbUl	PacketDelBudget	O	0..1	Indicates Maximum uplink Packet Delay.	PerformanceData Ext_AIML
maxPdbDl	PacketDelBudget	O	0..1	Indicates Maximum downlink Packet Delay.	PerformanceData Ext_AIML
plr	PacketLossRate	O	0..1	Indicates average Loss Rate.	
plrDl	PacketLossRate	O	0..1	Indicates average downlink Loss Rate.	PerformanceData Ext_AIML
maxPlrUl	PacketLossRate	O	0..1	Indicates Maximum uplink Loss Rate.	PerformanceData Ext_AIML
maxPlrDl	PacketLossRate	O	0..1	Indicates Maximum downlink Loss Rate.	PerformanceData Ext_AIML
thrputUl	BitRate	O	0..1	Indicates the average uplink throughput.	
maxThrputUl	BitRate	O	0..1	Indicates the Maximum uplink throughput.	PerformanceData Ext_AIML
minThrputUl	BitRate	O	0..1	Indicates the Minimum uplink throughput.	PerformanceData Ext_AIML
thrputDl	BitRate	O	0..1	Indicates the average downlink throughput.	
maxThrputDl	BitRate	O	0..1	Indicates the Maximum downlink throughput.	PerformanceData Ext_AIML
minThrputDl	BitRate	O	0..1	Indicates the Minimum downlink throughput.	PerformanceData Ext_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)	C	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. This attribute shall be provided if the "RelativeProximity" feature is not supported.	
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)	
collisionDist	Uinteger	O	0..1	Indicates the collision risk distance in units of centimeters.	RelativeProximity
absDirs	array(Direction)	O	1..N	Indicates the heading of the UE movement with respect to the true north.	RelativeProximity
relDirs	array(RelativeDirection)	O	1..N	Indicates the heading of the UE movement with respect to another UE.	RelativeProximity
ueTrajectory	UeTrajectoryCollection	O	0..1	Timestamped UE positions.	RelativeProximity
confidence	Uinteger	O	0..1	Indicates the confidence on the relative proximity data. Minimum = 0. Maximum = 100.	RelativeProximity
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. If the "RelativeProximity" feature is supported, this event is also applicable for relative proximity data collection.	CollectiveBehaviour RelativeProximity
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.	

5.6.3.6 Enumeration: RelativeDirection

The enumeration RelativeDirection represents the relative heading of the UE movement with respect to another UE. It shall comply with the provisions defined in table 5.6.3.6-1.

Table 5.6.3.6-1: Enumeration RelativeDirection

Enumeration value	Description	Applicability
ABOVE	Indicates that UE movement with respect to another UE is above.	
BELOW	Indicates that UE movement with respect to another UE is below.	
LEFT	Indicates that UE movement with respect to another UE is left.	
RIGHT	Indicates that UE movement with respect to another UE is right.	
BEFORE	Indicates that UE movement with respect to another UE is before.	
AFTER	Indicates that UE movement with respect to another UE is after.	

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.
29	PerEventRepReq	This feature indicates the support of the per-event reporting requirements management functionality. The following functionalities are supported: - Provisioning/updating the reporting requirements on a per subscribed event granularity.
30	RelativeProximity	This feature indicates the support of providing confidence information of the relative proximity data. Supporting this feature requires the support of the CollectiveBehaviour feature.

5.9 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: 1.3.3
  title: Naf_EventExposure
  description: |
    AF Event Exposure Service.
    © 2025, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).
    All rights reserved.

externalDocs:
  description: >
    3GPP TS 29.517 V18.11.0; 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'
      eventRepInfo:
        $ref: 'TS29523_Npcf_EventExposure.yaml#/components/schemas/ReportingInformation'
    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
      collisionDist:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
      absDirs:
        type: array
        items:
          $ref: 'TS29520_Nnwdaf_EventsSubscription.yaml#/components/schemas/Direction'
        minItems: 1
      relDirs:
        type: array
        items:
          $ref: '#/components/schemas/RelativeDirection'
        minItems: 1
      ueTrajectory:
        $ref: '#/components/schemas/UeTrajectoryCollection'
      confidence:
        $ref: 'TS29571_CommonData.yaml#/components/schemas/Uinteger'
    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.

    RelativeDirection:
      anyOf:
      - type: string
        enum:
          - ABOVE
          - BELOW
          - LEFT
          - RIGHT
          - BEFORE
          - AFTER
      - 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:
        - ABOVE: Indicates that UE movement with respect to another UE is above.
        - BELOW: Indicates that UE movement with respect to another UE is below.
        - LEFT: Indicates that UE movement with respect to another UE is left.
        - RIGHT: Indicates that UE movement with respect to another UE is right.
        - BEFORE: Indicates that UE movement with respect to another UE is before.
        - AFTER: Indicates that UE movement with respect to another UE is after.
```

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	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
2024-03	CT#103	CP-240180	0127	1	B	Support per event reporting requirements management	18.5.0
2024-03	CT#103	CP-240166	0128	-	F	Update of info and externalDocs fields	18.5.0
2024-06	CT#104	CP-241091	0129	-	F	EventFilter editor note removal	18.6.0
2024-06	CT#104	CP-241093	0130	1	F	ServiceExperienceInfoPerFlow data model update	18.6.0
2024-06	CT#104	CP-241253	0132	1	B	Support of providing relative proximity data collected from the AF	18.6.0
2024-06	CT#104	CP-241085	0133	-	F	Update of info and externalDocs fields	18.6.0
2024-09	CT#105	CP-242143	0139	1	A	Corrections on the presence of the attributes in Naf_EventExposure API	18.7.0
2024-09	CT#105	CP-242158	0134	1	F	Clarify regarding event filters for GNSSAssistData feature	18.7.0
2024-09	CT#105	CP-242119	0135	-	F	Relative Proximity data applicability	18.7.0
2024-12	CT#106	CP-243118	0142	1	F	Corrections on the event name of data volume transfer time	18.8.0
2024-12	CT#106	CP-243116	0145	1	F	Corrections to the GNSS Assistance Data information collection	18.8.0
2025-03	CT#107	CP-250108	0154	-	A	Corrections on the event name	18.9.0
2025-03	CT#107	CP-250128	0156	-	F	Update of info and externalDocs fields	18.9.0
2025-06	CT#108	CP-251230	0159	-	F	Update of info and externalDocs fields	18.10.0
2025-09	CT#109	CP-252112	0161	-	F	Update of info and externalDocs fields	18.11.0

History

Document history		
V18.5.0	May 2024	Publication
V18.6.0	July 2024	Publication
V18.7.0	September 2024	Publication
V18.8.0	January 2025	Publication
V18.9.0	March 2025	Publication
V18.10.0	June 2025	Publication
V18.11.0	September 2025	Publication