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Stage 3

(Release 17)

** 

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# Foreword

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

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

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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.

# 1 Scope

The present specification provides the stage 3 definition of the Network Data Analytics Function Services of the 5G System.

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The stage 2 definition and related procedures for Network Data Analytics Function Services are specified in 3GPP TS 23.288 [17] and 3GPP TS 23.503 [4].

The 5G System stage 3 call flows are provided in 3GPP TS 29.552 [25] and 3GPP TS 29.513 [5].

The Technical Realization of the Service Based Architecture and the Principles and Guidelines for Services Definition are specified in 3GPP TS 29.500 [6] and 3GPP TS 29.501 [7].

The Network Data Analytics Function Services are provided by the Network Data Analytics Function (NWDAF).

# 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] Void.

[4] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System; Stage 2".

[5] 3GPP TS 29.513: "5G System; Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

[6] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[7] 3GPP TS 29.501: "5G System; Principles and Guidelines for Services Definition; Stage 3".

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

[9] IETF RFC 7540: "Hypertext Transfer Protocol Version 2 (HTTP/2)".

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

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

[12] 3GPP TS 29.510: "5G System; Network Function Repository Services; Stage 3".

[13] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

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

[15] IETF RFC 7807: "Problem Details for HTTP APIs".

[16] 3GPP TR 21.900: "Technical Specification Group working methods".

[17] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[18] 3GPP TS 29.554: "5G System; Background Data Transfer Policy Control Service; Stage 3".

[19] 3GPP TS 29.122: "T8 reference point for Northbound APIs".

[20] 3GPP TS 29.523: "5G System; Policy Control Event Exposure Service; Stage 3".

[21] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

[22] 3GPP TS 29.517: "5G System; Application Function (AF) event exposure service".

[23] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[24] 3GPP TS 29.531: "5G System; Network Slice Selection Services; Stage 3".

[25] 3GPP TS 29.552: "5G System; Network Data Analytics signalling flows; Stage 3".

[26] 3GPP TS 29.574: "5G System; Data Collection Coordination Services; Stage 3".

[27] 3GPP TS 29.575: "5G System; Analytics Data Repository Services; Stage 3".

[28] 3GPP TS 29.576: "5G System; Messaging Framework Adaptor Services; Stage 3".

[29] 3GPP TS 29.508: "5G System; Session Management Event Exposure Service; Stage 3".

# 3 Definitions and abbreviations

## 3.1 Definitions

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

## 3.2 Abbreviations

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

5QI 5G QoS Identifier

ADRF Analytics Data Repository Function

AF Application Function

AMF Access and Mobility Management Function

AOI Area of Interest

API Application Programming Interface

CEF Charging Enablement Function

DCCF Data Collection Coordination Function

DNN Data Network Name

GFBR Guaranteed Flow Bit Rate

HTTP Hypertext Transfer Protocol

JSON JavaScript Object Notation

LADN Local Area Data Network

MFAF Messaging Framework Adaptor Function

ML Machine Learning

MTLF Model Training Logical Function

NEF Network Exposure Function

NF Network Function

NRF Network Repository Function

NSSF Network Slice Selection Function

NWDAF Network Data Analytics Function

OAM Operation, Administration, and Maintenance

PCF Policy Control Function

SUPI Subscription Permanent Identifier

S-NSSAI Single Network Slice Selection Assistance Information

SMCC Session Management Congestion Control

SMCCE Session Management Congestion Control Experience

SMF Session Management Function

UDM Unified Data Management

UPF User Plane Function

URI Uniform Resource Identifier

UTC Universal Time Coordinated

# 4 Services offered by the NWDAF

## 4.1 Introduction

The Nnwdaf services are used by the NWDAF to provide specific analytics information and ML models.

Analytics information is either statistical information of past events, or predictive information.

The following services are specified for the NWDAF:

Table 4.1-1: Services provided by NWDAF

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Service Name | Description | Service Operations | Operation  Semantics | Example Consumer(s) |
| Nnwdaf\_EventsSubscription  (NOTE 1) | This service enables the NF service consumers to subscribe to/unsubscribe from notifications for different analytics information from the NWDAF. It also enables the transfer of subscriptions between NWDAFs | Subscribe | Subscribe / Notify | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF |
| Unsubscribe |
| Notify |
| Transfer | Request / Response | NWDAF |
| Nnwdaf\_AnalyticsInfo | This service enables the NF service consumers to request and get specific analytics or context information related to analytics subscriptions from the NWDAF. | Request | Request / Response | PCF, NSSF, AMF, SMF, NEF, AF, OAM, NWDAF, DCCF |
| ContextTransfer | Request / Response | NWDAF |
| Nnwdaf\_DataManagement | This service enables the NF service consumers to subscribe to/unsubscribe from notifications when subscribed event(s) are detected or retrieve the subscribed data from the NWDAF. | Subscribe | Subscribe / Notify | NWDAF, DCCF, MFAF |
| Unsubscribe |  |  |
| Notify |  |  |
| Fetch | Request / Response | NWDAF, DCCF, MFAF |
| Nnwdaf\_MLModelProvision  (NOTE 2) | This service enables the NF service consumers to subscribe to/unsubscribe from notifications when a ML model matching the subscription parameters becomes available. | Subscribe | Subscribe / Notify | NWDAF |
| Unsubscribe |
| Notify |
| NOTE 1: This service corresponds to the Nnwdaf\_AnalyticsSubscription service defined in 3GPP TS 23.288 [17].  NOTE 2: This service implements also the Nnwdaf\_MLModelInfo service as specified in 3GPP TS 23.288 [17] by using immediate and one-time reporting requirement. | | | | |

Table 4.1-2 summarizes the corresponding APIs defined in this specification.

Table 4.1-2: API Descriptions

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Service Name | Clause | Description | OpenAPI Specification File | apiName | Annex |
| Nnwdaf\_EventsSubscription | 5.1 | Nnwdaf Events Subscription Service. | TS29520\_Nnwdaf\_EventsSubscription.yaml | nnwdaf-eventssubscription | A.2 |
| Nnwdaf\_AnalyticsInfo | 5.2 | Nnwdaf Analytics Information Service | TS29520\_Nnwdaf\_AnalyticsInfo.yaml | nnwdaf-analyticsinfo | A.3 |
| Nnwdaf\_DataManagement | 5.3 | NWDAF Data Management Service | TS29520\_Nnwdaf\_DataManagement.yaml | nnwdaf-datamanagement | A.4 |
| Nnwdaf\_MLModelProvision | 5.4 | NWDAF ML Model Provision Service | TS29520\_Nnwdaf\_MLModelProvision.yaml | nnwdaf-mlmodelprovision | A.5 |

## 4.2 Nnwdaf\_EventsSubscription Service

### 4.2.1 Service Description

#### 4.2.1.1 Overview

The Nnwdaf\_EventsSubscription service corresponding to Nnwdaf\_AnalyticsSubscription service as defined in 3GPP TS 23.501 [2], 3GPP TS 23.288 [17] and 3GPP TS 23.503 [4], is provided by the Network Data Analytics Function (NWDAF).

This service:

- allows NF service consumers to subscribe to and unsubscribe from different analytics events;

- notifies NF service consumers with a corresponding subscription about observed events. and

- allows NF service consumers to request the transfer of subscriptions for analytics events.

The types of observed events include:

- Slice load level information;

- Network slice instance load level information;

- Service experience;

- NF load;

- Network performance;

- Abnormal behaviour;

- UE mobility;

- UE communication;

- User data congestion;

- QoS sustainability;

- Dispersion;

- Redundant transmission experience;

- SM congestion control experience;

- WLAN performance; and

- DN performence.

#### 4.2.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Network Data Analytics Exposure architecture is defined in 3GPP TS 23.288 [17]. The Network Data Analytics signalling flows are defined in 3GPP TS 29.552 [25], the Policy and Charging related 5G architecture is also described in 3GPP TS 23.503 [4] and 3GPP TS 29.513 [5].

The Nnwdaf\_EventsSubscription service is part of the Nnwdaf service-based interface exhibited by the Network Data Analytics Function (NWDAF).

Known consumers of the Nnwdaf\_EventsSubscription service are:

- Policy Control Function (PCF)

- Network Slice Selection Function (NSSF)

- Access and Mobility Management Function (AMF)

- Session Management Function (SMF)

- Network Exposure Function (NEF)

- Application Function (AF)

- Operation, Administration, and Maintenance (OAM)

- Charging Enablement Function (CEF)

- Network Data Analytics Function (NWDAF)

- Data Collection Coordination Function (DCCF)

The PCF accesses the Nnwdaf\_EventsSubscription service at the NWDAF via the N23 Reference point. The NSSF accesses the Nnwdaf\_EventsSubscription service at the NWDAF via the N34 Reference point.



Figure 4.2.1.2-1: Reference Architecture for the Nnwdaf\_EventsSubscription Service; SBI representation



Figure 4.2.1.2-2: Reference Architecture for the Nnwdaf\_EventsSubscription Service: reference point representation

#### 4.2.1.3 Network Functions

##### 4.2.1.3.1 Network Data Analytics Function (NWDAF)

The Network Data Analytics Function (NWDAF) provides analytics information for different analytics events to NF service consumers.

The Network Data Analytics Function (NWDAF) allows NF service consumers to subscribe to and unsubscribe from one-time, periodic notification or notification when an event is detected.

The Network Data Analytics Function (NWDAF) allows NF service consumers to request the transfer of subscriptions for analytics events.

##### 4.2.1.3.2 NF Service Consumers

The Policy Control Function (PCF):

- supports (un)subscription to the notification of analytics information for slice load level information from the NWDAF;

- supports (un)subscription to the notification of analytics information for service experience related network data from the NWDAF;

- supports (un)subscription to the notification of analytics information for network performance from the NWDAF;

- supports (un)subscription to the notification of analytics information for abnormal UE behaviour from the NWDAF;

- supports (un)subscription to the notification of analytics information for UE mobility from the NWDAF;

- supports (un)subscription to the notification of analytics information for UE communication from the NWDAF;

- supports (un)subscription to the notification of analytics information for user data congestion from the NWDAF;

- supports (un)subscription to the notification of analytics information for dispersion from the NWDAF;

- supports (un)subscription to the notification of analytics information for WLAN performance from the NWDAF; and

- supports taking one or more above input from the NWDAF into consideration for policies on assignment of network resources and/or for traffic steering policies.

NOTE: How this information is used by the PCF is not standardized in this specification.

The Network Slice Selection Function (NSSF):

- supports (un)subscription to the notification of analytics information for slice load level information or network slice instance load level information from the NWDAF to determine slice selection;

- supports (un)subscription to the notification of analytics information for service experience related network data from the NWDAF; and

- supports (un)subscription to the notification of analytics information for dispersion at the slice from the NWDAF.

The Access and Mobility Management Function (AMF):

- supports (un)subscription to the notification of analytics information for slice load level information from the NWDAF;

- supports (un)subscription to the notification of analytics information for service experience related network data from the NWDAF;

- supports (un)subscription to the notification of analytics information for SMF load information from the NWDAF to determine SMF selection;- supports (un)subscription to the notification of analytics information for expected UE behavioural information (UE mobility and/or UE communication) from the NWDAF to monitor UE behaviour;

- supports (un)subscription to the notification of analytics information for abnormal UE behaviour information from the NWDAF to determine adjustment of UE mobility related network parameters to solve the abnormal risk; and

- supports (un)subscription to the notification of analytics information for dispersion at the slice from the NWDAF.

The Session Management Function (SMF):

- supports (un)subscription to the notification of analytics information for UPF load information from the NWDAF to determine UPF selection;

- supports (un)subscription to the notification of analytics information for UE mobility information from the NWDAF to determine UPF selection;

- supports (un)subscription to the notification of analytics information for Session Management Congestion Control Experience from the NWDAF;- supports (un)subscription to the notification of analytics information for expected UE behavioural information (UE mobility and/or UE communication) from the NWDAF to monitor UE behaviour;

- supports (un)subscription to the notification of analytics information for abnormal UE behaviour information from the NWDAF to determine adjustment of UE communication related network parameters to solve the abnormal risk;

- supports (un)subscription to the notification of analytics information for slice load level information or network slice instance load level information from the NWDAF to determine slice selection.

- supports (un)subscription to the notification of analytics information for service experience related network data from the NWDAF;

- supports (un)subscription to the notification of analytics information for redundant transmission experience from the NWDAF to consider whether redundant transmission shall be performed, or (if it had been activated) shall be stopped; and

- supports (un)subscription to the notification of analytics information for DN performance from the NWDAF.

The Network Exposure Function (NEF):

- supports forwarding UE mobility information from the NWDAF to the AF when it is untrusted;

- supports forwarding UE communication information from the NWDAF to the AF when it is untrusted;

- supports forwarding expected UE behavioural information (UE mobility and/or UE communication) from the NWDAF to the AF when it is untrusted;

- supports forwarding abnormal behaviour information from the NWDAF to the AF when it is untrusted;

- supports forwarding user data congestion information from the NWDAF to the AF when it is untrusted;

- supports forwarding network performance information from the NWDAF to the AF when it is untrusted;

- supports forwarding QoS Sustainability information from the NWDAF to the AF when it is untrusted;

- supports forwarding Dispersion information from the NWDAF to the AF when it is untrusted;

- supports forwarding DN performance information from NWDAF to the AF when it is untrusted; and

- supports forwarding Observed Service Experience information from NWDAF to the AF when it is untrusted.

The Application Function (AF):

- supports receiving UE mobility information from NWDAF or via the NEF;

- supports receiving UE communication information from NWDAF or via the NEF;

- supports receiving expected UE behavioural information (UE mobility and/or UE communication) from NWDAF or via the NEF;

- supports receiving abnormal behaviour information from the NWDAF or via the NEF;

- supports receiving user data congestion information from the NWDAF or via the NEF;

- supports receiving network performance information from the NWDAF or via the NEF;

- supports receiving QoS Sustainability information from the NWDAF or via the NEF;

- supports receiving Dispersion information from the NWDAF or via the NEF;

- supports receiving DN performance information from NWDAF or via the NEF; and

- supports receiving Observed Service Experience information from NWDAF or via the NEF.

The Operation, Administration, and Maintenance (OAM):

- supports receiving slice load level information from the NWDAF;

- supports receiving observed service experience from the NWDAF;

- supports receiving NF load information from the NWDAF;

- supports receiving network performance information from the NWDAF;

- supports receiving UE mobility information from the NWDAF;

- supports receiving UE communication information from the NWDAF;

- supports receiving expected UE behaviour information (UE mobility and/or UE communication) from the NWDAF; and

- supports receiving abnormal UE behaviour information from the NWDAF.

The Charging Enablement Function (CEF):

- supports (un)subscription to the notification of analytics information for slice load level information from the NWDAF; and

- supports (un)subscription to the notification of analytics information for service experience statistics information from the NWDAF.

The Network Data Analytics Function (NWDAF):

- supports (un)subscription to the notification of analytics information for all types of network analytics from the NWDAF; and

- supports requesting the transfer of subscriptions to another NWDAF.

The Data Collection Coordination Function (DCCF):

- supports (un)subscription to the notification of analytics information for all types of network analytics from the NWDAF.

### 4.2.2 Service Operations

#### 4.2.2.1 Introduction

Table 4.2.2.1-1: Operations of the Nnwdaf\_EventsSubscription Service

| Service operation name | Description | Initiated by |
| --- | --- | --- |
| Nnwdaf\_EventsSubscription\_Subscribe | This service operation is used by an NF to subscribe or update subscription for event notifications of the analytics information.  One-time, periodic notification or notification upon event detected can be subscribed. | NF service consumer (PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF) |
| Nnwdaf\_EventsSubscription\_Unsubscribe | This service operation is used by an NF to unsubscribe from event notifications. | NF service consumer (PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF) |
| Nnwdaf\_EventsSubscription\_Notify | This service operation is used by an NWDAF to notify NF service consumers about subscribed events. | NWDAF |
| Nnwdaf\_EventsSubscription\_Transfer | This service operation is used by an NWDAF to request the transfer of subscription(s) for analytics events. | NWDAF |

#### 4.2.2.2 Nnwdaf\_EventsSubscription\_Subscribe service operation

##### 4.2.2.2.1 General

The Nnwdaf\_EventsSubscription\_Subscribe service operation is used by an NF service consumer to subscribe or update subscription for event notifications from the NWDAF.

##### 4.2.2.2.2 Subscription for event notifications

Figure 4.2.2.2.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to subscribe for event notification(s) (as shown in 3GPP TS 23.288 [17]).



Figure 4.2.2.2.2-1: NF service consumer subscribes to notifications

The NF service consumer shall invoke the Nnwdaf\_EventsSubscription\_Subscribe service operation to subscribe to event notification(s). The NF service consumer shall send an HTTP POST request with "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions" as Resource URI representing the "NWDAF Events Subscriptions", as shown in figure 4.2.2.2.2-1, step 1, to create a subscription for an "Individual NWDAF Event Subscription" according to the information in message body. The NnwdafEventsSubscription data structure provided in the request body shall include:

- an URI where to receive the requested notifications as "notificationURI" attribute; and

- a description of the subscribed events as "eventSubscriptions" attribute that, for each event, the EventSubscription data type shall include:

1) an event identifier as "event" attribute; and

2) if the event notification method "PERIODIC" is selected via the "notificationMethod" attribute, repetition period as "repetitionPeriod" attribute;

- and may include:

1) maximum number of objects in the "maxObjectNbr" attribute;

2) maximum number of SUPIs expected for an analytics report in the "maxSupiNbr" attribute;

3) identification of time window to which the subscription applies via identification of date-time(s) in the "startTs" and "endTs" attributes;

4) preferred level of accuracy of the analytics in the "accuracy" attribute;

5) identification of time when analytics information is needed in the "timeAnaNeeded" atribute if the feature "EneNA" is supported;

6) indication of which analytics metadata is requested to be delivered with the notification in the "anaMeta" attribute if the feature "Aggregation" is supported;

7) requested values for analytics metadata information to be used for the generation of the analytics in the "anaMetaInd" attribute if the feature "Aggregation" is supported;

8) offset period to the periodic reporting in the "offsetPeriod" attribute if the feature "EneNA" is supported. It may be present if the "repPeriod" attribute within the "evtReq" attribute is included;

9) preferred accuracy level per analytics subset in the "accPerSubset" attribute if the "listOfAnaSubsets" attribute is present and the "EneNA" feature is supported; and/or

10) the time period of historical analytics in the "histAnaTimePeriod" attribute if the "EneNA" feature is supported.

The NnwdafEventsSubscription data structure provided in the request body may include:

- event reporting information as the "evtReq" attribute, which applies for each event and may contain the following attributes:

1) event notification method (periodic, one time, on event detection) in the "notifMethod" attribute;

2) maximum Number of Reports in the "maxReportNbr" attribute;

3) monitoring duration in the "monDur" attribute;

4) repetition period for periodic reporting in the "repPeriod" attribute;

5) immediate reporting indication in the "immRep" attribute;

6) percentage of sampling among impacted UEs in the "sampRatio" attribute;

7) partitioning criteria for partitioning the impacted UEs before performing sampling as "partitionCriteria" attribute if the "EneNA" feature is supported;

8) group reporting guard time for aggregating the reports for a group of UEs in the "grpRepTime" attribute; and/or

9) a notification flag (used for muting and retrieving notifications) as "notifFlag" attribute if the "EneNA" feature is supported;

NOTE 1: The notification method indicated as the "notifMethod" attribute and the periodic reporting time indicated as the "repPeriod" attributes within the event reporting information as the "evtReq" attribute provided in NnwdafEventsSubscription data type, if present, supersedes the event notification method as the "notificationMethod" attribute and repetition period as the "repetitionPeriod" attribute respectively in the EventSubscription data type.

- information of previous analytics subscription in the "prevSub" attribute if the "AnaCtxTransfer" feature is supported;

- the notification correlation identifier in the "notifCorrId" attribute, if the "EneNA" feature is supported; and/or

- analytics consumer information as "consNfInfo" attribute, if the "AnaSubTransfer" feature is supported.

NOTE 2: The "consNfInfo" attribute enables the NWDAF to determine whether an analytics subscription transfer procedure is applicable. Otherwise, if the "consNfInfo" attribute is not provided in a subscription and the NWDAF cannot serve anymore or transfer this subscription, the NWDAF can notify the analytics consumer with a Termination Request so that the analytics consumer can select a new target NWDAF.

For different event types, the "eventSubscriptions" attribute:

- if the event is "SLICE\_LOAD\_LEVEL", shall provide:

1) network slice level load level threshold in the "loadLevelThreshold" attribute if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted; and

2) identification of network slice(s) to which the subscription applies via identification of network slice(s) in the "snssais" attribute or any slices indication in the "anySlice" attribute;

- if the feature "NsiLoad" is supported and the event is "NSI\_LOAD\_LEVEL", shall provide:

1) identification of network slice and the optionally associated network slice instance(s) if available, via the "nsiIdInfos" attribute or any slices indication in the "anySlice" attribute; and

NOTE 3: The network slice instance of a PDU session is not available in the PCF.

2) the network slice or network slice instance load level thresholds in the "nsiLevelThrds" attribute if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted;

and may include:

1) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "NSI\_LOAD\_LEVEL" event, if the "EneNA" feature is supported;

2) identification of network area to which the subscription applies via identification of network area(s) by "networkArea" attribute, if the "NsiLoadExt" feature is supported; and/or

3) a matching direction in the "matchingDir" attribute if the "nsiLevelThrds" attribute is provided and the "NsiLoadExt" feature is supported.

- if the feature "NfLoad" is supported and the event is "NF\_LOAD", shall provide:

1) identification of target UE(s) to which the subscription applies by "supis" or "anyUe" in the "tgtUe" attribute; and

NOTE 4: Only NF instances of type AMF and SMF which are serving the UE can be determined using a SUPI in "supis" attribute.

NOTE 5: If a list of the NF Instance IDs (or respectively of NF Set IDs) is provided, the NWDAF needs to provide the analytics for each designated NF instance (or respectively for each NF instance belonging to each designated NF Set). In such case the target UE(s) of the Analytics Reporting need be ignored.

2) NF load level thresholds in the "nfLoadLvlThds" attribute if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted;

- and may include:

1) either list of NF instance IDs in the "nfInstanceIds" attribute or list of NF set IDs in the "nfSetIds" attribute if the identification of target UE(s) applies to all UEs;

2) list of NF instance types in the "nfTypes" attribute;

3) identification of network slice(s) by "snssais" attribute;

4) a matching direction in the "matchingDir" attribute if the "nfLoadLvlThds" attribute is provided;

5) optional area of interest by "networkArea" attribute, if the "NfLoadExt" feature is supported; and/or

6) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to NF\_LOAD event, if the "EneNA" feature is supported;

- if the feature "NetworkPerformance" is supported and the event is "NETWORK\_PERFORMANCE", it shall provide:

1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute; and

2) the network performance requirements via "nwPerfRequs" attribute;

and may provide:

1) identification of network area to which the subscription applies via identification of network area(s) by "networkArea" attribute (mandatory if "anyUe" attribute is set to true);

2) a matching direction in the "matchingDir" attribute if the "nwPerfRequs" attribute is provided; and/or

3) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "NETWORK\_PERFORMANCE" event, if the "EneNA" feature is supported;

- if the feature "ServiceExperience" is supported and the event is "SERVICE\_EXPERIENCE", shall provide:

1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute; and

2) any slices indication in the "anySlice" attribute or identification of network slice(s) together with the optionally associated network slice instance(s) if available, via the "nsiIdInfos" attribute;

NOTE 6: The network slice instance of a PDU session is not available in the PCF.

- and may provide:

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

2) identification of network area to which the subscription applies via identification of network area(s) by "networkArea" attribute (mandatory if "anyUe" attribute is set to true);

3) identification of DNN to which the subscription applies via identification of application(s) by "dnns" attribute;

4) identification of user plane access to DN(s) which the subscription applies as the "dnais" attribute;

5) identification of a user plane access to one or more DN(s) where applications are deployed by "dnais" attribute;

6) if "appIds" attribute is provided, the bandwidth requirement of each application by "bwRequs" attribute;

7) indication of all the RAT types and/or all the frequencies that the NWDAF received for the application or specific RAT type(s) and/or frequency(ies) and the service experience threshold value(s) for the RAT Type(s) and/or Frequency value(s) where the UE camps on by "ratFreqs" attribute if the feature "ServiceExperienceExt" is also supported; and/or

8) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "SERVICE\_EXPERIENCE" event, if the "EneNA" feature is supported;

9) the identification of the UPF as the "upfInfo" attribute if the feature "ServiceExperienceExt" is also supported; and/or

10) IP address(s)/FQDN(s) of the Application Server(s) as the "appServerAddrs" attribute if the feature "ServiceExperienceExt" is also supported;

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

1) identification of target UE(s) to which the subscription applies by "supis" or "intGroupIds" attribute in the "tgtUe" attribute;

2) if the feature "UeMobilityExt" is supported,

i) identification of LADN DNN in the "ladnDnns" attribute;

ii) Visited Area(s) of Interest as the "visitedAreas" attirbute.

NOTE 7: For LADN service, the consumer (e.g. SMF) provides the LADN DNN to refer the LADN service area as the AOI.

- and may provide:

1) identification of network area to which the subscription applies via identification of network area(s) by "networkArea" attribute;

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

1) identification of target UE(s) to which the subscription applies by "supis" or "intGroupIds" attribute in the "tgtUe" attribute;

- and may provide:

1) identification of the application in the "appIds" attribute;

2) identification of network area to which the subscription applies via identification of network area(s) by "networkArea" attribute;

3) an identification of DNN in the "dnns" attribute;

4) identification of network slice in the "snssais" attribute; and/or

5) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "UE\_COMM" event, if the "EneNA" feature is supported;

- if the feature "QoSSustainability" is supported and the event is "QOS\_SUSTAINABILITY", shall provide:

1) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;

2) the QoS requirements via "qosRequ" attribute;

3) QoS flow retainability threshold(s) by the "qosFlowRetThds" attribute for the 5QI of GBR resource type or RAN UE throughout threshold(s) by the "ranUeThrouThds" attribute for the 5QI of non-GBR resource type, if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted; and

4) identification of target UE(s) to which the subscription applies by "anyUe" in the "tgtUe" attribute;

- and may include:

1) identification of network slice(s) by "snssais" attribute; and/or

2) a matching direction in the "matchingDir" attribute if the "qosFlowRetThds" attribute or the "ranUeThrouThds" attribute is provided;

- if the feature "AbnormalBehaviour" is supported and the event is "ABNORMAL\_BEHAVIOUR", shall provide:

1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute; and

2) either the expected analytics type via "exptAnaType" attribute or a list of exception Ids with the associated thresholds via "excepRequs" attribute. If the expected analytics type via "exptAnaType" attribute is provided, the NWDAF shall derive the corresponding Exception Ids from the received expected analytics type as follows:

a) if "exptAnaType" attribute sets to "MOBILITY", the corresponding list of Exception Ids are "UNEXPECTED\_UE\_LOCATION", "PING\_PONG\_ACROSS\_CELLS", "UNEXPECTED\_WAKEUP" and "UNEXPECTED\_RADIO\_LINK\_FAILURES";

b) if "exptAnaType" attribute sets to "COMMUN", the corresponding list of Exception Ids are "UNEXPECTED\_LONG\_LIVE\_FLOW", "UNEXPECTED\_LARGE\_RATE\_FLOW", "SUSPICION\_OF\_DDOS\_ATTACK", "WRONG\_DESTINATION\_ADDRESS" and "TOO\_FREQUENT\_SERVICE\_ACCESS"; and

c) if "exptAnaType" attribute sets to "MOBILITY\_AND\_COMMUN", the corresponding list of Exception Ids includes all above derived exception Ids.

The derived list of Exception Ids are used by the NWDAF to notify the NF service consumer when UE's behaviour is exceptional based on one or more Exception Ids within the list.

If the "anyUe" attribute in the "tgtUe" attribute sets to "true";

a) the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via "excepRequs" attribute shall not be requested for both mobility and communication related analytics at the same time;

b) if the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via "excepRequs" attribute is mobility related, at least one of identification of network area(s) by "networkArea" attribute and identification of network slice(s) by "snssais" attribute should be provided; and

c) if the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via "excepRequs" attribute is communication related, at least one of identification of network area(s) by "networkArea" attribute, identification of application(s) by "appIds" attribute, identification of DNN(s) in the "dnns" attribute and identification of network slice(s) by "snssais" attribute should be provided;

- and may provide:

1) expected UE behaviour via "exptUeBehav" attribute; and

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

1) identification of target UE(s) to which the subscription applies by "supis", "gpsis" (if feature "UserDataCongestionExt" is supported) or "anyUe" attribute;

- and may include:

1) congestion threshold by the "congThresholds" attribute if the "notifMethod" attribute in "evtReq" attribute is set to "ON\_EVENT\_DETECTION" or the "notificationMethod" attribute in "eventSubscriptions" attribute is set to "THRESHOLD" or omitted;

2) identification of network area to which the subscription applies via identification of network area(s) by "networkArea" attribute (mandatory if "anyUe" attribute is set to true);

3) identification of network slice(s) by "snssais" attribute;

4) a matching direction in the "matchingDir" attribute if the "congThresholds" attribute is provided;

5) if the feature "UserDataCongestionExt" is also supported, request a list of top applications with maximum number that contribute the most to the traffic in uplink and/or downlink directions by the "maxTopAppUlNbr" attribute and/or the "maxTopAppDlNbr" attribute; and/or

6) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "USER\_DATA\_CONGESTION" event, if the "EneNA" feature is supported.

- if the feature "Dispersion" is supported and the event is "DISPERSION", shall provide:

1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute, "anyUe" attribute is only supported in combination with "snssais" attribute, "networkArea" attribute and/or "disperClass" attribute;

and may include:

1) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute, if the "supis" attribute or "intGroupIds" attribute is included in the "tgtUe" attribute;

2) identification of network slice(s) by "snssais" attribute;

3) application identifier(s) in "appIds" attribute;

4) dispersion analytics requirements in "disperReqs" attribute, which for the requested dispersion type may include dispersion class, preferred ordering requirements; and/or

5) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to DISPERSION event, if the "EneNA" feature is supported.

- if the feature "RedundantTransmissionExp" is supported and the event is "RED\_TRANS\_EXP", shall provide:

1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute;

and may include:

1) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;

2) identification of network slice(s) by "snssais" attribute;

3) identification of DNN in the "dnns" attribute; and/or

4) other redundant transmission experience analysis requirements in "redTransReqs" attribute, which may include preferred order of results for the list of Redundant Transmission Experience.

5) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to RED\_TRANS\_EXP event, if the "EneNA" feature is supported.

- if the feature "WlanPerformance" is supported and the event is "WLAN\_PERFORMANCE", shall provide:

1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute. If "anyUe" attribute is included in the "tgtUe" attribute, then any of "networkArea" attribute, "ssIds" or "bssIds" attribute within "wlanReqs" attribute shall be present;

and may include:

1) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;

2) other WLAN performance analytics requirements in "wlanReqs" attribute, which may include SSID(s), BSSID(s), preferred order of results for the list of WLAN performance information and/or accuracy per analytics subset; and/or

3) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to WLAN\_PERFORMANCE event, if the "EneNA" feature is supported.

- if the feature "DnPerformance" is supported and the event is "DN\_PERFORMANCE", shall provide:

1) identification of target UE(s) to which the subscription applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgtUe" attribute;

and may include:

1) identification of network area to which the subscription applies via identification of network area by "networkArea" attribute;

2) identification of network slice(s) in the "snssais" attribute;

3) identification of network slice and the optionally associated network slice instance(s) if available, via the "nsiIdInfos" attribute or any slices indication in the "anySlice" attribute;

4) application identifier(s) in "appIds" attribute;

5) an identification of DNN in the "dnns" attribute;

6) identification of a user plane access to one or more DN(s) where applications are deployed by "dnais" attribute;

7) the identification of the UPF as the "upfInfo" attribute;

8) IP address(s)/FQDN(s) of the Application Server(s) as the "appServerAddrs" attribute;

9) other DN performance analytics requirements in "dnPerfReqs" attribute, which may include the preferred order of results for the list of DN performance information and/or the reporting threshold of each analytics subset; and/or

10) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to "DN\_PERFORMANCE" event, if the "EneNA" feature is supported.

- if the feature "SMCCE" is supported and the event is "SM\_CONGESTION", shall provide:

1) an identification of DNN in the "dnns" attribute; and/or

2) identification of network slice in the "snssais" attribute;

3) identification of target UE(s) via "supis" attribute in the "tgtUe" attribute where the target UE(s) are one have the PDU Session for the DNN and/or S-NSSAI;

and may include:

1) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to "SM\_CONGESTION" event, if the "EneNA" feature is supported.

NOTE 8: The predictions are not applicable for Session Management Congestion Control Experience analytics.

Upon the reception of an HTTP POST request with: "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions" as Resource URI and NnwdafEventsSubscription data structure as request body, the NWDAF shall:

- create a new subscription;

- assign an event subscriptionId; and

- store the subscription.

If the NWDAF created an "Individual NWDAF Event Subscription" resource, the NWDAF shall respond with "201 Created" status code with the message body containing a representation of the created subscription, as shown in figure 4.2.2.2.2-1, step 2. If not all the requested analytics events in the subscription are accepted, then the NWDAF may include the "failEventReports" attribute indicating the event(s) for which the subscription failed and the associated reason(s). The NWDAF shall include a Location HTTP header field. The Location header field shall contain the URI of the created subscription i.e. "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions/{subscriptionId}". If the immediate reporting indication in the "immRep" attribute within the "evtReq" attribute sets to true in the event subscription, the NWDAF shall include the reports of the events subscribed, if available, in the HTTP POST response.

When the "notifFlag" attribute is included and set to "DEACTIVATE" in the request, the NWDAF shall mute the event notification and store the available events.

If the analytics target period provided in the body of the HTTP POST request includes the start time in the past and the end time in the future, the NWDAF shall reject the request with an HTTP "400 Bad Request" response including the "cause" attribute set to "BOTH\_STAT\_PRED\_NOT\_ALLOWED".

If the statistics in the past is requested but the necessary data to perform the service is unavailable, the NWDAF shall reject the request with an HTTP "500 Internal Server Error" response including the "cause" attribute set to "UNAVAILABLE\_DATA".

##### 4.2.2.2.3 Update subscription for event notifications

Figure 4.2.2.2.3-1 shows a scenario where the NF service consumer sends a request to the NWDAF to update the subscription for event notifications (see also 3GPP TS 23.288 [17]).



Figure 4.2.2.2.3-1: NF service consumer updates subscription to notifications

The NF service consumer shall invoke the Nnwdaf\_EventsSubscription\_Subscribe service operation to update subscription to event notifications. The NF service consumer shall send an HTTP PUT request with "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI representing the "Individual NWDAF Event Subscription", as shown in figure 4.2.2.2.3-1, step 1, to update the subscription for an "Individual NWDAF Event Subscription" resource identified by the {subscriptionId}. The NnwdafEventsSubscription data structure provided in the request body shall include the same contents as described in clause 4.2.2.2.2:

Upon the reception of an HTTP PUT request with: "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI and NnwdafEventsSubscription data structure as request body, the NWDAF shall:

- update the subscription of corresponding subscriptionId; and

- store the subscription.

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

If the NWDAF successfully processed and accepted the received HTTP PUT request, the NWDAF shall update an "Individual NWDAF Event Subscription" resource, and shall respond with:

a) HTTP "200 OK" status code with the message body containing a representation of the updated subscription, as shown in figure 4.2.2.2.3-1, step 2a. If not all the requested analytics events in the subscription are modified successfully, then the NWDAF may include the "failEventReports" attribute indicating the event(s) for which the modification failed and the associated reason(s); or

b) HTTP "204 No Content" status code, as shown in figure 4.2.2.2.3-1, step 2b.

If errors occur when processing the HTTP PUT request, the NWDAF shall send an HTTP error response as specified in clause 5.1.7.

If the analytics target period provided in the body of the HTTP POST request includes the start time in the past and the end time in the future, the NWDAF shall reject the request with an HTTP "400 Bad Request" response including the "cause" attribute set to "BOTH\_STAT\_PRED\_NOT\_ALLOWED".

If the statistics in the past is requested but the necessary data to perform the service is unavailable, the NWDAF shall reject the request with an HTTP "500 Internal Server Error" response including the "cause" attribute set to "UNAVAILABLE\_DATA".

If the feature "ES3XX" is supported, and the NWDAF determines the received HTTP PUT request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

When the "notifFlag" attribute is included in the request with the value "DEACTIVATE", the NWDAF shall mute the event notification and store the available events; if it is set to the value "RETRIEVAL", the NWDAF shall send the stored events to the NF service consumer, mute the event notification again and store available events; if it is set to the value "ACTIVATE" and the event notifications are muted (due to a previously received "DECATIVATE" value), the NWDAF shall unmute the event notification, i.e. start sending again notifications for available events.

#### 4.2.2.3 Nnwdaf\_EventsSubscription\_Unsubscribe service operation

##### 4.2.2.3.1 General

The Nnwdaf\_EventsSubscription\_Unsubscribe service operation is used by an NF service consumer to unsubscribe from event notifications.

##### 4.2.2.3.2 Unsubscribe from event notifications

Figure 4.2.2.3.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to unsubscribe from event notifications (see also 3GPP TS 23.288 [17]).



Figure 4.2.2.3.2-1: NF service consumer unsubscribes from notifications

The NF service consumer shall invoke the Nnwdaf\_EventsSubscription\_UnSubscribe service operation to unsubscribe to event notifications. The NF service consumer shall send an HTTP DELETE request with: "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI, where "{subscriptionId}" is the event subscriptionId of the existing subscription that is to be deleted.

Upon the reception of an HTTP DELETE request with: "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI, if the NWDAF successfully processed and accepted the received HTTP DELETE request, the NWDAF shall:

- remove the corresponding subscription; and

- respond with HTTP "204 No Content" status code.

If errors occur when processing the HTTP DELETE request, the NWDAF shall send an HTTP error response as specified in clause 5.1.7.

If the feature "ES3XX" is supported, and the NWDAF determines the received HTTP DELETE request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

#### 4.2.2.4 Nnwdaf\_EventsSubscription\_Notify service operation

##### 4.2.2.4.1 General

The Nnwdaf\_EventsSubscription\_Notify service operation is used by an NWDAF to notify NF consumers about subscribed events or by the target NWDAF to notify the consumer of the successful analytics subscription transfer.

##### 4.2.2.4.2 Notification about subscribed event

Figure 4.2.2.4.2-1 shows a scenario where the NWDAF sends a request to the NF service consumer to notify for event notifications or notify for the successful analytics subscription transfer (see also 3GPP TS 23.288 [17]).



Figure 4.2.2.4.2-1: NWDAF notifies the subscribed event

The NWDAF shall invoke the Nnwdaf\_EventsSubscription\_Notify service operation to notify the subscribed event or the successful analytics subscription transfer. The NWDAF shall send an HTTP POST request with "{notificationURI}" received in the Nnwdaf\_EventsSubscription\_Subscribe service operation as Resource URI, as shown in figure 4.2.2.4.2-1, step 1.

If both the "repPeriod" attribute and the "offsetPeriod" attribute are present in the subscription request for periodical notification, the NWDAF shall produce a notification every repPeriod seconds, including the statistics in the past offset period if the "offsetPeriod" attribute value is negative, or including the prediction for the future offset period if the "offsetPeriod" attribute value is positive.

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

- If the notification is for notifying about subscribed events, a description of the notified event as "eventNotifications" attribute that for each event shall include:

a) an event identifier as "event" attribute;

b) network slice load level information in the "sliceLoadLevelInfo" attribute when subscribed event is "SLICE\_LOAD\_LEVEL";

c) service experience information as "svcExps" attribute when subscribed event is "SERVICE\_EXPERIENCE";

d) UE mobility information in the "ueMobs" attribute when subscribed event is "UE\_MOBILITY";

e) UE communication information in the "ueComms" attribute when subscribed event is "UE\_COMM";

f) abnormal behaviour information in the "abnorBehavrs" attribute when subscribed event is "ABNORMAL\_BEHAVIOUR";

g) user data congestion information in the "userDataCongInfos" attribute when subscribed event is "USER\_DATA\_CONGESTION";

h) QoS sustainability information in the "qosSustainInfos" attribute when subscribed event is "QOS\_SUSTAINABILITY";

i) NF load information in "nfLoadLevelInfos" attribute when subscribed event is "NF\_LOAD";

j) network performance information in the "nwPerfs" attribute when subscribed event is "NETWORK\_PERFORMANCE";

k) Load level information for the network slice(s) and the optionally associated network slice instance(s) in "nsiLoadLevelInfos" attribute when subscribed event is "NSI\_LOAD\_LEVEL";

l) Dispersion information in the "disperInfos" attribute when subscribed event is "DISPERSION";

m) Redundant transmission experience information in the "redTransInfos" attribute when subscribed event is "RED\_TRANS\_EXP";

n) WLAN performance information in the "wlanInfos" attribute when subscribed event is "WLAN\_PERFORMANCE";

o) DN performance information in the "dnPerfInfos" attribute when subscribed event is "DN\_PERFORMANCE"; and

p) SMCCE performance information in the "smccExps" attribute when subscribed event is "SM\_CONGESTION".

and may include:

a) information about analytics metadata required for aggregation of the analytics in the "anaMetaInfo" attribute if the feature "Aggregation" is supported;

b) the start time of which the analytics information is valid in the "start" attribute;

c) the expiration time after which the analytics information will become invalid in the "expiry" attribute.

- If the "EneNA" feature is supported and the target NWDAF notifies a successful analytics subscription transfer, the old subscription ID which had been allocated by the source NWDAF within the "oldSubscriptionId" attribute and the resource URI of the Individual NWDAF Event Subscription resource created by the target NWDAF within "resourceUri" attribute; and

- an event subscription Id as "subscriptionId" attribute.

and may include:

- the notification correlation identifier in the "notifCorrId" attribute, if the "EneNA" feature is supported.

If the feature "EneNA" is supported and the time when analytics information is needed has been provided (via the "timeAnaNeeded" attribute within the "extraReportReq" attribute) during the subscription for an event (via the "event" attribute within the EventSubscription data type), if the time when analytics information is needed is reached but the subscribed analytics information is not ready, the consumer does not need to wait for the analytics information any longer. In this case, the NWDAF may send an HTTP POST request as shown in step 1 of figure 4.2.2.4.2-1, which shall only provide (within the EventNotification data type in the NnwdafEventsSubscriptionNotification data type) an indication of the failure event via the "event" attribute and the corresponding failure reason via a "failNotifyCode" attribute, and may also provide a minimum time interval recommended by the NWDAF for the event via a "rvWaitTime" attribute which will be used by the NF service consumer to determine the time when analytics information is needed in similar future analytics subscriptions.

Upon the reception of an HTTP POST request with: "{notificationURI}" as Resource URI and NnwdafEventsSubscriptionNotification data structure as request body, if the NF service consumer successfully processed and accepted the received HTTP POST request, the NF service consumer shall:

- store the notification; and

- respond with HTTP "204 No Content" status code.

If errors occur when processing the HTTP POST request, the NF service consumer shall send an HTTP error response as specified in clause 5.1.7.

If the feature "ES3XX" is supported, and the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

#### 4.2.2.5 Nnwdaf\_EventsSubscription\_Transfer service operation

##### 4.2.2.5.1 General

The Nnwdaf\_EventsSubscription\_Transfer service operation is used by an NWDAF instance to request the transfer of analytics subscription(s) to another NWDAF instance. If the source NWDAF discovers that the analytics consumer may change concurrently to this procedure, the source NWDAF should not perform the procedure. In such a case, the source NWDAF may send a message to indicate to the analytics consumer that it will not serve this subscription anymore.

NOTE 1: To discover the possible change of analytics consumer, if the Analytics ID is UE related, the source NWDAF takes actions responding to external trigger (such as UE mobility), for example, checking if the Target of Analytics Reporting is still within the serving area of the analytics consumer, if the serving area information of the consumer is available.

NOTE 2: Handling of overload situation or preparation for a graceful shutdown are preferably executed inside an NWDAF Set, when available, therefore, not requiring an analytics subscription transfer as described in this clause.

##### 4.2.2.5.2 Creation of request for analytics subscription transfer

Figure 4.2.2.5.2-1 shows a scenario where the NF Service Consumer (e.g. NWDAF) sends a request to the NWDAF to request the transfer of analytics subscription(s) from the NF Service Consumer to the NF Service Producer (see also 3GPP TS 23.288 [17]).



Figure 4.2.2.5.2-1: NF service consumer requests an analytics subscription transfer

The NF service consumer shall invoke the Nnwdaf\_EventsSubscription\_Transfer service operation to request the transfer of analytics subscription(s). The NF service consumer shall send an HTTP POST request with "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers" as Resource URI representing the "NWDAF Event Subscription Transfers", as shown in figure 4.2.2.5.2-1, step 1, to create a request for an "Individual NWDAF Event Subscription Transfer" according to the information in the message body. The AnalyticsSubscriptionsTransfer data structure provided in the request body shall include:

- information about the subscription(s) transfer request as "subsTransInfos" attribute, which, for each subscription that is requested to be transferred, shall include:

a) the type of the transfer request (i.e. if it is a request for transfer preparation or transfer execution) in the "transReqType" attribute;

b) information about the analytics subscription in the "nwdafEvSub" attribute, its contents being as defined for the NnwdafEventsSubscription data structure in clause 4.2.2.2.2;

c) the NF instance identifer of the consumer of the analytics subscription in the "consumerId" attribute;

and may include:

a) analytics context identifier information about the context that is available at the NF service consumer in the "contextId" attribute;

b) NF instance identifer(s) of active data source(s) the NF service consumer is currently using for the analytics of this analytics subscription in the "sourceNfIds" attribute;

c) NF set identifer(s) of active data source(s) the NF service consumer is currently using for the analytics of this analytics subscription in the "sourceSetIds" attribute;

d) information identifying the ML model(s) that the NF service consumer is currently using for the analytics in the "modelInfos" attribute;

Upon the reception of an HTTP POST request with: "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers" as Resource URI and AnalyticsSubscriptionsTransfer data structure as request body, in the successful case the NWDAF shall:

- if the "transReqType" attribute has the value PREPARE, perform the steps required for the preparation of an analytics subscription transfer as described in clause 5.4.3 of TS 29.552 [25], create a new Individual NWDAF Event Subscription Transfer resource and send an HTTP "201 Created" response with the URI for the created resource in the "Location" header field, as shown in figure 4.2.2.5.2-1, step 2a;

- if the "transReqType" attribute has the value TRANSFER, perform the steps required for the execution of an analytics subscription transfer as described in clause 5.4.2 of TS 29.552 [25], and send an HTTP "204 No Content" response, as shown in figure 4.2.2.5.2-1, step 2b.

'If errors occur when processing the HTTP POST request, the NF service consumer shall send an HTTP error response as specified in clause 5.1.7.

##### 4.2.2.5.3 Update a request for analytics subscription transfer

Figure 4.2.2.5.3-1 shows a scenario where the NF Service Consumer (e.g. NWDAF) sends a request to the NWDAF to update a request for the transfer of analytics subscription(s) from the NF Service Consumer to the NF Service Producer (see also 3GPP TS 23.288 [17]).



Figure 4.2.2.5.3-1: NF service consumer updates a request for an analytics subscription transfer

The NF service consumer shall invoke the Nnwdaf\_EventsSubscription\_Transfer service operation to update a request for the transfer of analytics subscription(s). The NF service consumer shall send an HTTP PUT request with "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers/{transferId}" as Resource URI representing the "Individual NWDAF Event Subscription Transfer", as shown in figure 4.2.2.5.3-1, step 1, to update the "Individual NWDAF Event Subscription Transfer" resource identified by the {transferId}. The AnalyticsSubscriptionsTransfer data structure provided in the request body shall include the same contents as described in clause 4.2.2.5.2.

Upon the reception of an HTTP PUT request with: "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers/{transferId}" as Resource URI and AnalyticsSubscriptionsTransfer data structure as request body, the NWDAF shall:

- if the "transReqType" attribute has the value PREPARE, perform the steps required for the preparation of an analytics subscription transfer as described in clause 5.4.3 of TS 29.552 [25], update the Individual NWDAF Event Subscription Transfer resource identified by "transferId", and send an HTTP "204 No Content" response, as shown in figure 4.2.2.5.3-1, step 2;

- if the "transReqType" attribute has the value TRANSFER, perform the steps required for the execution of an analytics subscription transfer as described in clause 5.4.3 of TS 29.552 [25], remove the Individual NWDAF Event Subscription Transfer resource identified by "transferId", and send an HTTP "204 No Content" response, as shown in figure 4.2.2.5.3-1, step 2.

'If errors occur when processing the HTTP PUT request, the NWDAF shall send an HTTP error response as specified in clause 5.1.7.

If the NWDAF determines the received HTTP PUT request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

##### 4.2.2.5.4 Cancel a request for analytics subscription transfer

Figure 4.2.2.5.4-1 shows a scenario where the NF service consumer (e.g. NWDAF) sends a request to the NWDAF to cancel a request for the transfer of analytics subscription(s) from the NF service consumer to the NF Service Producer (see also 3GPP TS 23.288 [17]).



Figure 4.2.2.5.4-1: NF service consumer cancels a request for an analytics subscription transfer

The NF service consumer shall invoke the Nnwdaf\_EventsSubscription\_Transfer service operation to cancel a request for the transfer of analytics subscription(s). The NF service consumer shall send an HTTP DELETE request with "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers/{transferId}" as Resource URI representing the "Individual NWDAF Event Subscription Transfer", as shown in figure 4.2.2.5.4-1, step 1, to cancel the "Individual NWDAF Event Subscription Transfer" resource identified by the {transferId}.

Upon the reception of an HTTP DELETE request with: "{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers/{transferId}" as Resource URI, if the NWDAF successfully processed and accepted the received HTTP DELETE request, the NWDAF shall:

- if applicable, delete any analytics data that is no longer needed and unsubscribe to entities for data collection or ML model acquisition, if the subscriptions are not needed for other active analytics subscriptions;

- remove the corresponding Individual NWDAF Event Subscription Transfer resource; and

- respond with HTTP "204 No Content" status code, as shown in figure 4.2.2.5.4-1, step 2.

'If errors occur when processing the HTTP DELETE request, the NWDAF shall send an HTTP error response as specified in clause 5.1.7.

If the NWDAF determines the received HTTP DELETE request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

## 4.3 Nnwdaf\_AnalyticsInfo Service

### 4.3.1 Service Description

#### 4.3.1.1 Overview

The Nnwdaf\_AnalyticsInfo service as defined in 3GPP TS 23.501 [2], 3GPP TS 23.288 [17] and 3GPP TS 23.503 [4], is provided by the Network Data Analytics Function (NWDAF).

This service:

- allows NF service consumers to request and get different type of analytic event information; and

- allows NF service consumers to request and get context information related to analytics subscriptions.

The types of observed events include:

- Slice load level information;

- Network slice instance load level information;

- Service experience;

- NF load;

- Network performance;

- Abnormal behaviour;

- UE mobility;

- UE communication;

- User data congestion;

- QoS sustainability;

- SM congestion control experience;

- Dispersion;

- Redundant transmission experience;

- WLAN performance; and

- DN performence.

#### 4.3.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Network Data Analytics Exposure architecture is defined in 3GPP TS 23.288 [17]. The Network Data Analytics signalling flows are defined in 3GPP TS 29.552 [25], the Policy and Charging related 5G architecture is also described in 3GPP TS 23.503 [4] and 3GPP TS 29.513 [5].

The Nnwdaf\_AnalyticsInfo service is part of the Nnwdaf service-based interface exhibited by the Network Data Analytics Function (NWDAF).

Known consumers of the Nnwdaf\_AnalyticsInfo service are:

- Policy Control Function (PCF)

- Network Slice Selection Function (NSSF)

- Access and Mobility Management Function (AMF)

- Session Management Function (SMF)

- Network Exposure Function (NEF)

- Application Function (AF)

- Operation, Administration, and Maintenance (OAM)

- Network Data Analytics Function (NWDAF)

- Data Collection Coordination Function (DCCF)

The PCF accesses the Nnwdaf\_AnalyticsInfo service at the NWDAF via the N23 Reference point. The NSSF accesses the Nnwdaf\_AnalyticsInfo service at the NWDAF via the N34 Reference point.

Figure 4.3.1.2-1: Reference Architecture for the Nnwdaf\_AnalyticsInfo Service; SBI representation



Figure 4.3.1.2-2: Reference Architecture for the Nnwdaf\_AnalyticsInfo Service: reference point representation

#### 4.3.1.3 Network Functions

##### 4.3.1.3.1 Network Data Analytics Function (NWDAF)

The Network Data Analytics Function (NWDAF) provides specific analytics information for different analytic events and, if the "AnaCtxTransfer" feature is supported, context information related to analytics subscriptions to NF service consumers.

##### 4.3.1.3.2 NF Service Consumers

The Policy Control Function (PCF):

- supports taking analytics information for slice load level information from the NWDAF;

- supports taking analytics information for service experience related network data from the NWDAF;

- supports taking analytics information for network performance from the NWDAF;

- supports taking analytics information for abnormal UE behaviour from the NWDAF;

- supports taking analytics information for user data congestion from the NWDAF.

- supports taking analytics information for dispersion from the NWDAF;

- supports taking analytics information for WLAN performance from the NWDAF; and

- supports taking one or more above input from NWDAF into consideration for policies on assignment of network resources and/or for traffic steering policies.

NOTE: How this information is used by the PCF is not standardized in this specification.

The Network Slice Selection Function (NSSF):

- supports taking slice load level information or network slice instance load level information from the NWDAF into consideration for slice selection;

- supports taking analytics information for service experience related network data from the NWDAF; and

- supports taking analytics information for dispersion at the slice from the NWDAF.

The Access and Mobility Management Function (AMF):

- supports taking SMF load information from the NWDAF into consideration for SMF selection;

- supports taking expected UE behaviour information (UE mobility and/or UE communication) from the NWDAF into consideration for monitoring UE behaviour;

- supports taking abnormal UE behaviour information from the NWDAF into consideration for adjustment of UE mobility related network parameters to solve the abnormal risk;

- supports taking slice load level information or network slice instance load level information from NWDAF into consideration for slice selection;

- supports taking analytics information for service experience related network data from the NWDAF; and

- supports taking analytics information for dispersion at the slice from the NWDAF.

The Session Management Function (SMF):

- supports taking UPF load information from the NWDAF into consideration for UPF selection;

- supports taking expected UE behaviour information (UE mobility and/or UE communication) from the NWDAF into consideration for monitoring UE behaviour;

- supports taking UE mobility information from the NWDAF into consideration for UPF selection;

- supports taking abnormal UE behaviour information from the NWDAF into consideration for adjustment of UE mobility related network parameters to solve the abnormal risk;

- supports taking analytics information for SM congestion control experience from the NWDAF into consideration for determining back-off timer provided to UE;

- supports taking analytics information for redundant transmission experience from the NWDAF to consider whether redundant transmission shall be performed, or (if it had been activated) shall be stopped; and

- supports taking analytics information for DN performance from the NWDAF into consideration for user plane performance.

The Network Exposure Function (NEF):

- supports forwarding UE mobility information from the NWDAF to the AF when it is untrusted;

- supports forwarding UE communication information from the NWDAF to the AF when it is untrusted;

- supports forwarding expected UE behavioural information (UE mobility and/or UE communication) from the NWDAF to the AF when it is untrusted;

- supports forwarding abnormal behaviour information from the NWDAF to the AF when it is untrusted;

- supports forwarding user data congestion information from the NWDAF to the AF when it is untrusted;

- supports forwarding network performance information from the NWDAF to the AF when it is untrusted;

- supports forwarding QoS Sustainability information from the NWDAF to the AF when it is untrusted;

- supports forwarding Dispersion information from the NWDAF to the AF when it is untrusted;

- supports forwarding DN performance information from the NWDAF to the AF when it is untrusted; and

- supports forwarding Observed Service Experience information from NWDAF to the AF when it is untrusted.

The Application Function (AF):

- supports receiving UE mobility information from the NWDAF or via the NEF;

- supports receiving UE communication information from the NWDAF or via the NEF;

- supports receiving expected UE behavioural information (UE mobility and/or UE communication) from the NWDAF or via the NEF;

- supports receiving abnormal behaviour information from the NWDAF or via the NEF;

- supports receiving user data congestion information from the NWDAF or via the NEF;

- supports receiving network performance information from the NWDAF or via the NEF;

- supports receiving QoS Sustainability information from the NWDAF or via the NEF;

- supports receiving Dispersion information from the NWDAF or via the NEF;

- supports receiving DN performance information from NWDAF or via the NEF; and

- supports receiving Observed Service Experience information from NWDAF or via the NEF.

The Operation, Administration, and Maintenance (OAM):

- supports receiving slice load level information from the NWDAF;

- supports receiving observed service experience from the NWDAF;

- supports receiving NF load information from the NWDAF;

- supports receiving network performance information from the NWDAF;

- supports receiving UE mobility information from the NWDAF;

- supports receiving UE communication information from the NWDAF;

- supports receiving expected UE behaviour information (UE mobility and/or UE communication) from the NWDAF; and

- supports receiving abnormal UE behaviour information from the NWDAF.

The Network Data Analytics Function (NWDAF):

- supports receiving information for all types of network data analytics from the NWDAF; and

- supports receiving context information related to analytics subscriptions from the NWDAF.

The Data Collection Coordination Function (DCCF):

- supports receiving information for all types of network data analytics from the NWDAF.

### 4.3.2 Service Operations

#### 4.3.2.1 Introduction

Table 4.3.2.1-1: Operations of the Nnwdaf\_AnalyticsInfo Service

| Service operation name | Description | Initiated by |
| --- | --- | --- |
| Nnwdaf\_AnalyticsInfo\_Request | This service operation is used by an NF to request and get specific analytics from NWDAF. | NF consumer (PCF, NSSF, AMF, SMF, NEF, AF, OAM, NWDAF, DCCF) |
| Nnwdaf\_AnalyticsInfo\_ContextTransfer | This service operation is used by an NF to request and get context information related to analytics subscriptions from NWDAF. | NF consumer (NWDAF) |

#### 4.3.2.2 Nnwdaf\_AnalyticsInfo\_Request service operation

##### 4.3.2.2.1 General

The Nnwdaf\_AnalyticsInfo\_Request service operation is used by an NF service consumer to request and get specific analytics information from the NWDAF.

##### 4.3.2.2.2 Request and get from NWDAF Analytics information

Figure 4.3.2.2.2-1 shows a scenario where the NF service consumer (e.g. PCF) sends a request to the NWDAF to request and get from the NWDAF analytics information (as shown in 3GPP TS 23.288 [17]).



Figure 4.3.2.2.2-1: Requesting a NWDAF Analytics information

The NF service consumer (e.g. PCF) shall invoke the Nnwdaf\_AnalyticsInfo\_Request service operation when requesting the NWDAF analytics information. The NF service consumer shall send an HTTP GET request on the resource URI "{apiRoot}/nnwdaf-analyticsinfo/<apiVersion>/analytics" representing the "NWDAF Analytics" (as shown in figure 4.3.2.2.2-1, step 1), to request analytics data according to the query parameter value of the "event-id" attribute. In addition, the following information may be provided:

- common reporting requirement in the "ana-req" attribute as follows:

1) identification of time window for the requested analytics data applies via identification of date-time(s) in the "startTs" and "endTs" attributes;

2) preferred level of accuracy of the analytics in "accuracy" attribute;

3) percentage of sampling among impacted UEs in the "sampRatio" attribute;

4) maximum number of objects in the "maxObjectNbr" attribute;

5) maximum number of SUPIs expected for an analytics report in the "maxSupiNbr" attribute;

6) identification of time when analytics information is needed in the "timeAnaNeeded" attribute if the feature "EneNA" is supported;

7) indication of which analytics metadata is requested to be delivered with the response in the "anaMeta" attribute if the feature "Aggregation" is supported;

8) requested values for the analytics metadata information to be used for the generation of the analytics in the "anaMetaInd" attribute if the feature "Aggregation" is supported;

9) preferred accuracy level per analytics subset in the "accPerSubset" attribute if the "listOfAnaSubsets" attribute is present and the EneNA feature is supported; and/or

10) the time period of historical analytics in the "histAnaTimePeriod" attribute if the "EneNA" feature is supported.

For different event types:

- if the event is "LOAD\_LEVEL\_INFORMATION", it shall provide the event specific filter information within "event-filter" attribute including identification(s) of the network slice via:

1) identification of network slice(s) in the "snssais" attribute; or

2) any slices indication in the "anySlice" attribute.;

- if the feature "NsiLoad" is supported and the event is "NSI\_LOAD\_LEVEL", it shall provide the event specific filter information within "event-filter" attribute including identification(s) of the network slice via:

1) identification of network slice(s) and the optionally associated instance(s) if available, in the "nsiIdInfos" attribute; or

NOTE 1: The network slice instance of a PDU session is not available in the PCF.

2) any slices indication in the "anySlice" attribute;

and may include:

1) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "NSI\_LOAD\_LEVEL" event, if the "EneNA" feature is supported.

- if the feature "NfLoad" is supported and the event is "NF\_LOAD", it shall provide:

1) identification of target UE(s) to which the request applies by "supis" or "anyUe" in the "tgt-ue" attribute; and

NOTE 2: Only NF instances of type AMF and SMF which are serving the UE can be determined using a SUPI in "supis" attribute.

NOTE 3: If a list of the NF Instance IDs (or respectively of NF Set IDs) is provided, the NWDAF needs to provide the analytics for each designated NF instance (or respectively for each NF instance belonging to each designated NF Set). In such case the target UE(s) of the Analytics Reporting need be ignored.

- the "event-filter" attribute may provide:

a) either list of NF instance IDs in the "nfInstanceIds" attribute or list of NF set IDs in the "nfSetIds" attribute if the identification of target UE(s) applies to all UEs;

b) list of NF instance types in the "nfTypes" attribute;

c) identification of network slice(s) in the "snssais" attribute;

d) optional area of interest by "networkArea" attribute; and/or

e) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to NF\_LOAD event, if the "EneNA" feature is supported.

- if the feature "UeMobility" is supported and the event is "UE\_MOBILITY", it shall provide:

1) identification of target UE(s) to which the request applies by "supis" or "intGroupIds" attribute in the "tgt-ue" attribute;

- and may provide:

1) event specific filter information in the "event-filter" attribute:

a) identification of network area to which the request applies via identification of network area by "networkArea" attribute; and/or

b) if the feature "UeMobilityExt" is supported,

i) identification of LADN DNN in the "ladnDnns" attribute;

ii) visited Area(s) of Interest as the "visitedAreas" attirbute.

NOTE 1: For LADN service, the consumer (e.g. SMF) provides the LADN DNN to refer the LADN service area as the AOI.

- if the feature "UeCommunication" is supported and the event is "UE\_COMM", it shall provide:

1) identification of target UE(s) to which the request applies by "supis" or "intGroupIds" attribute in the "tgt-ue" attribute;

- and may provide:

1) event specific filter information in the "event-filter" attribute:

a) identification of the application as "appIds" attribute;

b) identification of network area to which the request applies via identification of network area by "networkArea" attribute;

c) identification of DNN in the "dnns" attribute;

d) identification of network slice(s) in the "snssais" attribute; and/or

e) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "UE\_COMM" event, if the "EneNA" feature is supported.

- if the feature "NetworkPerformance" is supported and the event is "NETWORK\_PERFORMANCE", it shall provide:

1) identification of target UE(s) to which the request applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgt-ue" attribute;

2) event specific filter information in the "event-filter" attribute which shall provide:

a) the network performance types via "nwPerfTypes" attribute;

the "event-filter" attribute may provide:

a) identification of network area to which the request applies via identification of network area(s) by "networkArea" attribute (mandatory if "anyUe" attribute is set to true); and/or

b) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "NETWORK\_PERFORMANCE" event, if the "EneNA" feature is supported.

- if the feature "ServiceExperience" is supported and the event is "SERVICE\_EXPERIENCE", it shall provide:

1) identification of target UE(s) to which the request applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgt-ue" attribute;

2) event specific filter information in the "event-filter" attribute which shall provide:

a) any slices indication in the "anySlice" attribute or identification of network slice(s) together with the optionally associated network slice instance(s) if available, via the "nsiIdInfos" attribute; and

NOTE 4: The network slice instance of a PDU session is not available in the PCF.

the "event-filter" attribute may provide:

a) identification of application(s) to which the request applies via "appIds" attribute;

b) identification of DNN via identification of Dnn(s) by "dnns" attribute;

c) identification of user plane accesses to one or more DN(s) where applications are deployed via "dnais" attribute;

d) identification of network area to which the request applies via identification of network area(s) by "networkArea" attribute (mandatory if "anyUe" attribute is set to true);

e) if "appIds" attribute is provided, the bandwidth requirement of each application by "bwRequs" attribute;

f) identication of all the RAT types and/or all the frequencies that the NWDAF received for the application or specific RAT type(s) and/or frequency(ies) by "ratFreqs" attribute if the feature "ServiceExperienceExt" is also supported;

g) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "SERVICE\_EXPERIENCE" event, if the "EneNA" feature is supported;

h) the identification of the UPF as the "upfInfo" attribute if the feature "ServiceExperienceExt" is also supported; and/or

i) IP address(s)/FQDN(s) of the Application Server(s) as the "appServerAddrs" attribute if the feature "ServiceExperienceExt" is also supported.

- if the feature "QoSSustainability" is supported and the event is "QOS\_SUSTAINABILITY", it shall provide:

1) event specific filter information in the "event-filter" attribute which shall provide:

a) identification of network area to which the request applies via identification of network area by "networkArea" attribute; and

b) QoS requirements via "qosRequ" attribute;

2) identification of target UE(s) to which the request applies by "anyUe" in the "tgt-ue" attribute;

the "event-filter" attribute may provide:

a) identification of network slice(s) by "snssais" attribute;

- if the feature "AbnormalBehaviour" is supported and the event is "ABNORMAL\_BEHAVIOUR", it shall provide:

1) identification of target UE(s) to which the request applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgt-ue" attribute; and

2) event specific filter information in the "event-filter" attribute which shall provide

a) either the expected analytics type via "exptAnaType" attribute or a list of exception Ids via "excepIds" attribute. If the expected analytics type via "exptAnaType" attribute is provided, the NWDAF shall derive the corresponding Exception Ids from the received expected analytics type as follows:

- if "exptAnaType" attribute sets to "MOBILITY", the corresponding list of Exception Ids are "UNEXPECTED\_UE\_LOCATION", "PING\_PONG\_ACROSS\_CELLS", "UNEXPECTED\_WAKEUP" and "UNEXPECTED\_RADIO\_LINK\_FAILURES";

- if "exptAnaType" attribute sets to "COMMUN", the corresponding list of Exception Ids are "UNEXPECTED\_LONG\_LIVE\_FLOW", "UNEXPECTED\_LARGE\_RATE\_FLOW", "SUSPICION\_OF\_DDOS\_ATTACK", "WRONG\_DESTINATION\_ADDRESS" and "TOO\_FREQUENT\_SERVICE\_ACCESS";

- if "exptAnaType" attribute sets to "MOBILITY\_AND\_COMMUN", the corresponding list of Exception Ids includes all above derived exception Ids.

The derived list of Exception Ids are used by the NWDAF to notify the NF service consumer when UE's behaviour is exceptional based on one or more Exception Ids within the list.

If the "anyUe" attribute in the "tgt-ue" attribute sets to "true";

a) the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via "excepIds" attribute shall not be requested for both mobility and communication related analytics at the same time;

b) if the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via "excepIds" attribute is mobility related, at least one of identification of network area by "networkArea" attribute and identification of network slice(s) by "snssais" attribute should be provided; and

c) if the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via "excepIds" attribute is communication related, at least one of identification of network area by "networkArea" attribute, identification of application(s) by "appIds" attribute, identification of DNN(s) in the "dnns" attribute and identification of network slice(s) by "snssais" attribute should be provided;

the "event-filter" attribute may provide:

a) expected UE behaviour via "exptUeBehav" attribute;

- if the feature "UserDataCongestion" is supported and the event is "USER\_DATA\_CONGESTION", it shall provide one of the following attributes:

1) identification of target UE(s) via "supis" "gpsis" (if feature "UserDataCongestionExt" is supported) or "anyUe" attribute within "tgt-ue" attribute;

and may provide:

1) event specific filter information in the "event-filter" attribute which may provide:

a) identification of network slice(s) by "snssais" attribute;

b) identification of network area to which the request applies via identification of network area by "networkArea" attribute (mandatory if "anyUe" attribute is set to true); and/or

c) if the feature "UserDataCongestionExt" is also supported, request a list of top applications with maximum number that contribute the most to the traffic in uplink and/or downlink directions bythe "maxTopAppUlNbr" attribute and/or the "maxTopAppDlNbr" attribute; and/or

d) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "USER\_DATA\_CONGESTION" event, if the "EneNA" feature is supported.

- if the feature "SMCCE" is supported and the event is "SM\_CONGESTION", it shall provide:

1) event specific filter information in the "event-filter" attribute which shall provide:

a) identification of DNN in the "dnns" attribute; and/or

b) identification of network slice(s) in the "snssais" attribute; and

2) identification of target UE(s) via "supis" attribute in the "tgt-ue" attribute where the target UE(s) are one have the PDU Session for the DNN and/or S-NSSAI indicated by the event specific filter information.

and may include:

1) a list of analytics subsets carried by "listOfAnaSubsets" attribute with value(s) only applicable to "SM\_CONGESTION" event, if the "EneNA" feature is supported.

NOTE 5: The predictions are not applicable for Session Management Congestion Control Experience analytics.

- if the feature "Dispersion" is supported and the event is "DISPERSION", shall provide:

1) identification of target UE(s) applies by "supis", "intGroupIds" or "anyUe" attribute within "tgt-ue" attribute, "anyUe" attribute is only supported in combination with "snssais" attribute, "networkArea" attribute and/or "disperClass" attribute;

and may include:

1) identification of network area applies via identification of network area by "networkArea" attribute;

2) identification of network slice(s) by "snssais" attribute;

3) application identifier(s) in "appIds" attribute;

4) dispersion analytics requirements in "disperReqs" attribute, which for the requested dispersion type may include dispersion class, ranking, ordering and/or accuracy requirments; and/or

5) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to DISPERSION event.

- if the feature "RedundantTransmissionExp" is supported and the event is "RED\_TRANS\_EXP", shall provide:

1) identification of target UE(s) applies by "supis", "intGroupIds" or "anyUe" attribute within "tgt-ue" attribute;

and may include:

1) identification of network area applies via identification of network area by "networkArea" attribute, if the "supis" attribute or "intGroupIds" attribute is included in the "tgt-ue" attribute;

2) identification of network slice(s) by "snssais" attribute;

3) identification of DNN in the "dnns" attribute; and/or

4) other redundant transmission experience analysis requirements in "redTransReqs" attribute, which may include preferred order of results for the list of Redundant Transmission Experience.

5) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to RED\_TRANS\_EXP event, if the "EneNA" feature is supported.

- if the feature "WlanPerformance" is supported and the event is "WLAN\_PERFORMANCE", shall provide:

1) identification of target UE(s) by "supis", "intGroupIds" or "anyUe" attribute in the "tgt-ue" attribute. If "anyUe" attribute is included in the "tgt-ue" attribute, then any of "networkArea" attribute, "ssIds" or "bssIds" attribute shall be present in the "wlanReqs" attribute;

and may include:

1) identification of network area to which the request applies via identification of network area by "networkArea" attribute;

2) other WLAN performance analytics requirements in "wlanReqs" attribute, which may include SSID(s), BSSID(s), preferred order of results for the list of WLAN performance information and/or accuracy per analytics subset; and/or

3) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to WLAN\_PERFORMANCE event, if the "EneNA" feature is supported.

- if the feature "DnPerformance" is supported and the event is "DN\_PERFORMANCE", shall provide:

1) identification of target UE(s) to which the request applies by "supis", "intGroupIds" or "anyUe" attribute in the "tgt-ue" attribute;

and may include:

1) identification of network area to which the request applies via identification of network area by "networkArea" attribute;

2) identification of network slice(s) in the "snssais" attribute;

3) identification of network slice and the optionally associated network slice instance(s) if available, via the "nsiIdInfos" attribute or any slices indication in the "anySlice" attribute;

4) application identifier(s) in "appIds" attribute;

5) an identification of DNN in the "dnns" attribute;

6) identification of a user plane access to one or more DN(s) where applications are deployed by "dnais" attribute;

7) the identification of the UPF as the "upfInfo" attribute;

8) IP address(s)/FQDN(s) of the Application Server(s) as the "appServerAddrs" attribute;

9) DN performance analytics requirements in "dnPerfReqs" attribute, which may include the preferred order of results for the list of DN performance information; and/or

10) an optional list of analytics subsets by "listOfAnaSubsets" attribute with value(s) only applicable to "DN\_PERFORMANCE" event, if the "EneNA" feature is supported.

Upon the reception of the HTTP GET request, the NWDAF shall:

- analyse the requested analytic data according to the requested event.

If the HTTP request message from the NF service consumer is accepted, the NWDAF shall respond with "200 OK" status code with the message body containing the analytics with parameters as relevant for the requesting NF service consumer. The AnalyticsData data structure in the response body shall include:

- analytics with the corresponding information as described in clause 4.2.2.4.2.

If the request NWDAF Analytics data does not exist, the NWDAF shall respond with "204 No Content" status code.

If the "timeAnaNeeded" attribute within EventReportingRequirement is provided during the request, if the time is reached but the requested analytics information is not ready, the consumer does not need to wait for the analytics information any longer, the NWDAF may send a "500 Internal Server Error" status code to the NF service consumer. In addition, if the EneNA feature is supported, the NWDAF may provide, within the ProblemDetailsAnalyticsInfoRequestdata in the response, the corresponding failure reason via a "problemDetails" attribute with the "cause" attribute set to "UNSATISFIED\_REQUESTED\_ANALYTICS\_TIME" and a minimum time interval recommended by the NWDAF via a "rvWaitTime" attribute which is used by the NF service consumer to determine the time when analytics information is needed in similar future analytics requests.

If the analytics target period provided in the body of the HTTP POST request includes the start time in the past and the end time in the future, the NWDAF shall reject the request with an HTTP "400 Bad Request" response including the "cause" attribute set to "BOTH\_STAT\_PRED\_NOT\_ALLOWED".

If the statistics in the past is requested but the necessary data to perform the service is unavailable, the NWDAF shall reject the request with an HTTP "500 Internal Server Error" response including the "cause" attribute set to "UNAVAILABLE\_DATA".

#### 4.3.2.3 Nnwdaf\_AnalyticsInfo\_ContextTransfer service operation

##### 4.3.2.3.1 General

The Nnwdaf\_AnalyticsInfo\_ContextTransfer service operation is used by an NF service consumer to request and get context information related to analytics subscriptions from the NWDAF.

##### 4.3.2.3.2 Request and get from NWDAF context of a subscription

Figure 4.3.2.3.2-1 shows a scenario where the NF service consumer (e.g. NWDAF) sends a request to the NWDAF to request and get from NWDAF context information related to analytics subscriptions (see also 3GPP TS 23.288 [17]).



Figure 4.3.2.3.2-1: Requesting NWDAF context information related to analytics subscriptions

The NF service consumer (e.g. NWDAF) shall invoke the Nnwdaf\_AnalyticsInfo\_ContextTransfer service operation when requesting context information related to analytics subscriptions. The NF service consumer shall send an HTTP GET request on the resource URI "{apiRoot}/nnwdaf-analyticsinfo/<apiVersion>/context" representing the "NWDAF Context" (as shown in figure 4.3.2.3.2-1, step 1), to request context information related to analytics subscriptions according to the query parameter values of the attributes "context-ids" and "req-context".

Upon the reception of the HTTP GET request, the NWDAF shall retrieve the context information for the requested context identifiers.

If the HTTP request message from the NF service consumer is accepted, the NWDAF shall respond with "200 OK" status code with the message body containing the retrieved context information. The ContextData data structure in the response body shall include for each of the context elements contained in the "contextElems" attribute:

- the context identifier that this context element refers to in the "contextId" attribute, which indicates among others the analytics subscription that this context element is associated with.

- the pending output analytics for the indicated analytics subscription in the "pendAnalytics" attribute if such analytics are available and the NF service consumer has indicated the "PENDING\_ANALYTICS" context type in the "req-context" attribute of the request.

- the historical output analytics for the indicated analytics subscription in the "histAnalytics" attribute if such analytics are available and the NF service consumer has indicated the "HISTORICAL\_ANALYTICS" context type in the "req-context" attribute of the request.

- a timestamp of the last provided output analytics in the "lastOutputTime" if the NF service consumer has indicated the "PENDING\_ANALYTICS" and/or "HISTORICAL\_ANALYTICS" context type in the "req-context" attribute of the request and output analytics had been provided to the analytics consumer.

- information about aggregation related analytics subscriptions that the NWDAF has with other NWDAFs in the "aggrSubs" attribute if such subscriptions exist and the NF service consumer has indicated the "AGGR\_SUBS" context type in the "req-context" attribute of the request.

- historical data related to the indicated analytics subscription in the "histData" attribute if such data exists and the NF service consumer has indicated the "DATA" context type in the "req-context" attribute of the request.

- identifier of ADRF instance in the "adrfId" attribute if the NWDAF stores data in the ADRF.

- the types of data stored in the ADRF in the "adrfDataTypes" attribute if the "adrfId" attribute is provided.

- identifiers of NWDAF instances used when aggregating multiple analytics subscriptions in the "aggrNwdafIds" if such information is available and the NF service consumer has indicated the "AGGR\_INFO" context type in the "req-context" attribute of the request.

- information about used ML models in the "modelInfos" attribute if such information is available and the NF service consumer has indicated the "ML\_MODELS" context type in the "req-context" attribute of the request.

If the requested context information does not exist, the NWDAF shall respond with "204 No Content" status code.

## 4.4 Nnwdaf\_DataManagement Service

### 4.4.1 Service Description

#### 4.4.1.1 Overview

The Nnwdaf\_DataManagement Service as defined in 3GPP TS 23.288 [17] is provided by the Network Data Analytics Function (NWDAF).

This service:

- allows the NF service consumers to subscribe to and unsubscribe from data management related events;

- notifies the NF service consumers with the subscribed events which are detected by the NWDAF; and

- allows the NF service consumers to retrieve the subscribed data from the NWDAF.

#### 4.4.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Network Data Analytics Exposure architecture is defined in 3GPP TS 23.288 [17]. The Network Data Analytics signalling flows are defined in 3GPP TS 29.552 [25].

The Nnwdaf\_DataManagement service is part of the Nnwdaf service-based interface exhibited by the Network Data Analytics Function (NWDAF).

Known consumers of the Nnwdaf\_DataManagement service are:

- Network Data Analytics Function (NWDAF)

- Data Collection Coordination Function (DCCF)

- Messaging Framework Adaptor Function (MFAF)

- Analytics Data Repository Function (ADRF)



Figure 4.4.1.2-1: Reference Architecture for the Nnwdaf\_DataManagement Service; SBI representation



Figure 4.4.1.2-2: Reference Architecture for the Nnwdaf\_DataManagement Service: reference point representation

#### 4.4.1.3 Network Functions

##### 4.4.1.3.1 Network Data Analytics Function (NWDAF)

The Network Data Analytics Function (NWDAF) provides requested data to NF consumers.

The Network Data Analytics Function (NWDAF) allows NF consumers to subcribe to and unsubscribe from the notification of detected event(s).

The Network Data Analytics Function (NWDAF) allows NF consumers to retrieve data that was collected based on their subscriptions.

##### 4.4.1.3.2 NF Service Consumers

The Network Data Analytics Function (NWDAF):

- supports (un)subscription to the notification of data exposed by the NWDAF;

- supports retrieving data from the NWDAF.

The Data Collection Coordination Function (DCCF):

- supports (un)subscription to the notification of data exposed by the NWDAF;

- supports retrieving data from the NWDAF.

The Messaging Framework Adaptor Function (MFAF):

- supports receiving notifications of data provided by the NWDAF;

- supports retrieving data from the NWDAF.

The Analytics Data Repository Function (ADRF):

- supports receiving notifications of data provided by the NWDAF.

- supports retrieving data from the NWDAF.

### 4.4.2 Service Operations

#### 4.4.2.1 Introduction

Table 4.4.2.1-1: Operations of the Nnwdaf\_DataManagement Service

| Service operation name | Description | Initiated by |
| --- | --- | --- |
| Nnwdaf\_DataManagement\_Subscribe | This service operation is used by an NF service consumer to subscribe to data management related event(s) from NWDAF. | NF service consumer (NWDAF, DCCF, MFAF, ADRF) |
| Nnwdaf\_DataManagement\_Unsubscribe | This service operation is used by an NF service consumer to unsubscribe to data management related event(s). | NF service consumer (NWDAF, DCCF, MFAF, ADRF) |
| Nnwdaf\_DataManagement\_Notify | This service operation is used by the NWDAF to notify the detected event(s) to the NF service consumer instance which has subscribed to. | NWDAF |
| Nnwdaf\_DataManagement\_Fetch | This service operation is used by an NF service consumer to retrieve the subscribed data. | NF service consumer (NWDAF, DCCF, MFAF) |

#### 4.4.2.2 Nnwdaf\_DataManagement\_Subscribe service operation

##### 4.4.2.2.1 General

The Nnwdaf\_DataManagement\_Subscribe service operation is used by an NF service consumer to create or update a subscription for data notifications from the NWDAF.

##### 4.4.2.2.2 Subscription for data notifications

Figure 4.4.2.2.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to subscribe for data notification(s).



Figure 4.4.2.2.2-1: NF service consumer subscribes to data notifications

The NF service consumer shall invoke the Nnwdaf\_DataManagement\_Subscribe service operation to subscribe to data notification(s). The NF service consumer shall send an HTTP POST request with "{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions" as Resource URI representing the "NWDAF Data Management Subscriptions", as shown in figure 4.4.2.2.2-1, step 1, to create a subscription for an "Individual NWDAF Data Management Subscription" according to the information in message body.

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

- an URI where to receive the requested notifications as "notificURI" attribute;

- notification correlation identfier within the "notifCorrId" attribute; and

- one of the following:

- analytics subscription information to be used to determine which data shall be collected and reported within the "anaSub" attribute;

- data subscription information within the "dataSub" attribute;

The NnwdafDataManagementSubsc data structure provided in the request body may include:

- formatting instructions within the "formatInstruct" attribute;

- processing instructions within the "procInstruct" attribute;

- one of the following identifiers related to the ADRF:

- ADRF instance identifier within the "adrfId" attribute;

- ADRF set identifier within the "adrfSetId" attribute;

- one of the following target identifiers:

- NF instance identifier within the "targetNfId" attribute;

- NF set identifier within the "targetNfSetId" attribute;

- time window of the occurrence of the requested data collection within the "timePeriod” attribute;

- the purpose of data collection within the "dataCollectPurposes" attribute.

Upon the reception of an HTTP POST request with: "{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions" as Resource URI and NnwdafDataManagementSubsc data structure as request body, the NWDAF shall use the contents of the request to determine whether the subscription can already be served or interactions with the ADRF and/or data sources are required. If the NWDAF cannot use the contents of the request to determine this, the NWDAF shall send an HTTP "400 Bad Request" error response including the "cause" attribute set to "SUBSCRIPTION\_CANNOT\_BE\_SERVED".

NOTE: The "SUBSCRIPTION\_CANNOT\_BE\_SERVED" error can occur, for example, in the case where the "dataSub" or "anaSub" attributes are provided, when the request is syntactically valid and there is no NWDAF internal error, but the NWDAF can neither find an existing subscription to a data source nor construct one based on the received subscription contents.

If the NWDAF determines that the subscription can already be served (without requiring further interactions with ADRF and/or data sources) or a successful response from the ADRF and/or data sources is received for the creation or modification of subscription(s) to serve this subscription, the NWDAF shall:

- create a new subscription;

- assign a subscriptionId;

- store the subscription.

If the NWDAF created an "Individual NWDAF Data Management Subscription" resource, the NWDAF shall respond with "201 Created" with the message body containing a representation of the created subscription, as shown in figure 4.4.2.2.2-1, step 2. The NWDAF shall include a Location HTTP header field. The Location header field shall contain the URI of the created subscription i.e. "{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions/{subscriptionId}". If an immediate reporting indication is provided in the subscription, the NWDAF shall include the reports of the events subscribed, if available, in the HTTP POST response.

If an error occurs when processing the HTTP POST request, the NWDAF shall send an HTTP error response as specified in clause 5.3.7.

##### 4.4.2.2.3 Update subscription for data notifications

Figure 4.4.2.2.3-1 shows a scenario where the NF service consumer sends a request to the NWDAF to update the subscription for data notifications.



Figure 4.4.2.2.3-1: NF service consumer updates subscription to data notifications

The NF service consumer shall invoke the Nnwdaf\_DataManagement\_Subscribe service operation to update subscription to data notifications. The NF service consumer shall send an HTTP PUT request with "{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI representing the "Individual NWDAF Data Management Subscription", as shown in figure 4.4.2.2.3-1, step 1, to update the subscription for an "Individual NWDAF Data Management Subscription" resource identified by the {subscriptionId}. The NnwdafDataManagementSubsc data structure provided in the request body shall include the same contents as described in clause 4.4.2.2.2.

Upon the reception of an HTTP PUT request with: "{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI and NnwdafDataManagementSubsc data structure as request body, the NWDAF shall use the contents of the request to determine whether the updated subscription can already be served or interactions with the ADRF and/or data sources are required. If the NWDAF cannot use the contents of the request to determine this, the NWDAF shall send an HTTP "400 Bad Request" error response including the "cause" attribute set to "SUBSCRIPTION\_CANNOT\_BE\_SERVED".

NOTE: The "SUBSCRIPTION\_CANNOT\_BE\_SERVED" error can occur, for example, in the case when the "dataSub" or "anaSub" attributes are provided, when the request is syntactically valid and there is no NWDAF internal error, but the NWDAF can neither find an existing subscription to a data source nor construct one based on the received subscription contents.

If the NWDAF determines that the updated subscription can already be served (without requiring further interactions with the ADRF and/or data sources) or a successful response from the ADRF and/or data sources is received for the creation or modification of subscription(s) to serve this subscription, the NWDAF shall:

- update the subscription of corresponding subscriptionId; and

- store the subscription.

If the NWDAF successfully processed and accepted the received HTTP PUT request, the NWDAF shall update an "Individual NWDAF Data Management Subscription" resource, and shall respond with:

a) HTTP "200 OK" status code with the message body containing a representation of the updated subscription, as shown in figure 4.4.2.2.3-1, step 2a; or

b) HTTP "204 No Content" status code, as shown in figure 4.4.2.2.3-1, step 2b.

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

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

#### 4.4.2.3 Nnwdaf\_DataManagement\_Unsubscribe service operation

##### 4.4.2.3.1 General

The Nnwdaf\_DataManagement\_Unsubscribe service operation is used by an NF service consumer to remove a subscription for data notifications from the NWDAF.

##### 4.4.2.3.2 Unsubscribe from data notifications

Figure 4.4.2.3.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to unsubscribe from data notifications.



Figure 4.4.2.3.2-1: NF service consumer unsubscribes from data notifications

The NF service consumer shall invoke the Nnwdaf\_DataManagement\_Unsubscribe service operation to unsubscribe from data notifications. The NF service consumer shall send an HTTP DELETE request with: "{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI, where "{subscriptionId}" is the identifier of the existing subscription that is to be deleted.

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

- remove the corresponding subscription;

- respond with HTTP "204 No Content" status.

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

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

#### 4.4.2.4 Nnwdaf\_DataManagement\_Notify service operation

##### 4.4.2.4.1 General

The Nnwdaf\_DataManagement\_Notify service operation is used by the NWDAF to notify NF service consumers about subscribed events related to data.

##### 4.4.2.4.2 Notification about subscribed data

Figure 4.2.2.4.2-1 shows a scenario where the NWDAF sends a request to the NF service consumer to notify for event notifications (see also 3GPP TS 23.288 [17]).



Figure 4.4.2.4.2-1: NWDAF notifies the subscribed event

The NWDAF shall invoke the Nnwdaf\_DataManagement\_Notify service operation to notify the subscribed event. The NWDAF shall send an HTTP POST request with "{notificURI}" received in the Nnwdaf\_DataManagement\_Subscribe service operation as Resource URI, as shown in figure 4.4.2.4.2-1, step 1.

The NnwdafDataManagementNotif data structure provided in the request body that shall include:

- the notification correlation identifier within the "notifCorrId" attribute;

- the timestamp of the notification within the "notifTimestamp" attribute;

- one of the following:

- data collected from data sources (e.g. SMF, NEF) in the "dataNotification" attribute;

- summarized data derived from events that occurred based on processing and formatting instructions in the "dataReports" attribute;

- information for fetching the contents of the notification in the "fetchInstruct" attribute.

The NnwdafDataManagementNotif data structure provided in the request body may include:

- an indication that the NWDAF has requested a termination of the subscription within the "terminationReq" attribute.

Upon the reception of an HTTP POST request, if the NF service consumer successfully processed and accepted the received HTTP POST request, the NF Service Consumer shall store the notification and respond with HTTP "204 No Content" status code.

If errors occur when processing the HTTP POST request, the NF service consumer shall send an HTTP error response as specified in clause 5.3.7.

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

#### 4.4.2.5 Nnwdaf\_DataManagement\_Fetch service operation

##### 4.4.2.5.1 General

The Nnwdaf\_DataManagement\_Fetch service operation is used by an NF service consumer to retrieve data notifications indicated by fetch instructions from the NWDAF.

##### 4.4.2.5.2 Retrieve data from the NWDAF

Figure 4.4.2.5.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to retrieve notified data.



Figure 4.4.2.5.2-1: Requesting to retrieve notified data

The NF service consumer shall invoke the Nnwdaf\_DataManagement\_Fetch service operation to retrieve notified data. The NF service consumer shall send an HTTP POST request with "{fetchUri}" URI previously provided by the NWDAF in "fetchInstruct" attribute within NnwdafDataManagementNotif data type, as shown in figure 4.4.2.5.2-1, step 1, to fetch NWDAF data.The request body shall include fetch correlation identifiers, which was previously provided by the NWDAF in the "fetchCorrIds" attribute within fetchInstruction in the NWDAF notification.

Upon the reception of the HTTP POST request, the NWDAF shall:

- find the data according to the requested parameters.

If the requested data is found, the NWDAF shall respond with "200 OK" status code with the message body containing the NnwdafDataManagementNotif data structure. The NnwdafDataManagementNotif data structure in the response body shall include the data collected from data sources (e.g. SMF, NEF) in the "dataNotification" attribute.

If an error occurs when processing the HTTP POST request, the NWDAF shall send an HTTP error response as specified in clause 5.3.7.

If the NWDAF determines that the received HTTP POST request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

## 4.5 Nnwdaf\_MLModelProvision Service

### 4.5.1 Service Description

#### 4.5.1.1 Overview

The Nnwdaf\_MLModelProvision service as defined in 3GPP TS 23.501 [2] and 3GPP TS 23.288 [17], is provided by the Network Data Analytics Function (NWDAF) containing Model Training Logical Function (MTLF).

This service:

- allows the NF service consumers to subscribe to and unsubscribe from different ML model analytics events; and

- notifies the NF service consumers with a corresponding subscription about ML model information.

The types of analytics events include:

- Slice load level information;

- Network slice instance load level information;

- Service experience;

- NF load;

- Network performance;

- Abnormal behaviour;

- UE mobility;

- UE communication;

- Abnormal behaviour;

- User data congestion;

- QoS sustainability;

- Dispersion;

- SM congestion control experience;

- Redundant transmission experience; and

- WLAN performance.

NOTE: ML model provisioning is limited to a single vendor environment in this release of current specification.

#### 4.5.1.2 Service Architecture

The 5G System Architecture is defined in 3GPP TS 23.501 [2]. The Network Data Analytics Exposure architecture is defined in 3GPP TS 23.288 [17]. The ML Model provisioning signalling flows are defined in 3GPP TS 29.552 [25].

The Nnwdaf\_MLModelProvision service is part of the Nnwdaf service-based interface exhibited by the Network Data Analytics Function (NWDAF) containing Model Training Logical Function (MTLF).

Known consumers of the Nnwdaf\_MLModelProvision service are:

- Network Data Analytics Function (NWDAF) containing Analytics logical function (AnLF)



Figure 4.5.1.2-1: Reference Architecture for the Nnwdaf\_MLModelProvision Service; SBI representation



Figure 4.5.1.2-2: Reference Architecture for the Nnwdaf\_MLModelProvision Service: reference point representation

#### 4.5.1.3 Network Functions

##### 4.5.1.3.1 Network Data Analytics Function (NWDAF)

The Network Data Analytics Function (NWDAF), containing Model Training Logical Function (MTLF), provides ML model information for different analytic events to NF service consumers.

The Network Data Analytics Function (NWDAF) allows NF service consumers to subscribe to and unsubscribe from one-time, periodic notification or notification when an event is detected.

##### 4.5.1.3.2 NF Service Consumers

The Network Data Analytics Function (NWDAF) supports (un)subscription to the notification of different ML model information from the NWDAF which contains Model Training Logical Function (MTLF).

### 4.5.2 Service Operations

#### 4.5.2.1 Introduction

Table 4.5.2.1-1: Operations of the Nnwdaf\_MLModelProvision Service

| Service operation name | Description | Initiated by |
| --- | --- | --- |
| Nnwdaf\_MLModelProvision\_Subscribe | This service operation is used by an NF service consumer to subscribe to ML model provision from NWDAF. | NF service consumer (NWDAF) |
| Nnwdaf\_MLModelProvision\_Unsubscribe | This service operation is used by an NF service consumer to unsubscribe to ML model provision. | NF service consumer (NWDAF) |
| Nnwdaf\_MLModelProvision\_Notify | This service operation is used by the NWDAF to notify the ML model information to the NF service consumer instance which has subscribed to. | NWDAF |

#### 4.5.2.2 Nnwdaf\_MLModelProvision\_Subscribe service operation

##### 4.5.2.2.1 General

The Nnwdaf\_MLModelProvision\_Subscribe service operation is used by an NF service consumer to subscribe or update subscription for event notifications from the NWDAF which contains Model Training Logical Function (MTLF).

##### 4.5.2.2.2 Subscription for event notifications

Figure 4.5.2.2.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to subscribe for event notification(s) (as shown in 3GPP TS 23.288 [17]).



Figure 4.5.2.2.2-1: NF service consumer subscribes to notifications

The NF service consumer shall invoke the Nnwdaf\_MLModelProvision\_Subscribe service operation to subscribe to event notification(s). The NF service consumer shall send an HTTP POST request with "{apiRoot}/nnwdaf-mlmodelprovision/<apiVersion>/subscriptions" as Resource URI representing the "NWDAF ML Model Provision Subscriptions", as shown in figure 4.5.2.2.2-1, step 1, to create a subscription for an "Individual NWDAF ML Model Provision Subscription" according to the information in message body.

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

- an URI where to receive the requested notifications as the "notifUri" attribute; and

- a description of the subscribed events as the "mLEventSubscs" attribute that, for each event, the MLEventSubscription data type shall include:

1) an event identifier as the "mLEvent" attribute;

2) event filter information as the "mLEventFilter" attirbute; and

and may include:

1) an identification of target UE information as the "tgtUe" attribute;

2) a time interval during which the ML model shall be reported as the "mLTargetPeriod" attirbute; and

3) the time when the subscription expired as the "expiryTime" attirbute.The NwdafMLModelProvSubsc data structure provided in the request body may include:

- a notification correlation identifier assigned by the NF service consumer for the requested notifications as "notifCorreId" attribute; and

- the reporting requirement information of the subscription as the "eventReq" attribute.

For different event types, the "mLEventFilter" attribute within the MLEventSubscription data type:

- if the event is "SLICE\_LOAD\_LEVEL", shall provide:

1) the S-NSSAI as the "snssais" attribute; and/or

2) the identification(s) of Network Slice instance as the "nsiIdInfos" attribute;

and may provide:

1) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

- if the event is "SERVICE\_EXPERIENCE", may provide:

1) the identification of the application as the "appIds" attribute;

2) the S-NSSAI as the "snssais" attribute;

3) the identification(s) of Network Slice instance as the "nsiIdInfos" attribute;

4) the Area of Interest (AOI) as the "networkArea" attribute;

5) the identification of DNN as the "dnns" attribute;

6) identification of user plane access to DN(s) which the subscription applies as the "dnais" attribute; and

7) identification(s) of RAT type(s) and/or frequency(ies) of UE's serving cell(s) which the subscription applies by "ratFreqs" attribute;

- if the event is "UE\_MOBILITY", may provide

1) Area of Interest (AOI) as the "networkArea" attribute; and

- if the feature "UeMobilityExt" is supported and the event is "UE\_MOBILITY", may provide

1) Visited Area(s) of Interest as the "visitedAreas" attirbute.

- if the event is "UE\_COMM", may provide

1) the S-NSSAI as the "snssais" attribute;

2) the identification of DNN as the "dnns" attribute;

3) the identification of the application as the "appIds" attribute;

4) the Area of Interest (AOI) as the "networkArea" attribute; and

5) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

- if he event is "QOS\_SUSTAINABILITY", shall provide:

1) The QoS requirements via "qosRequ" attribute; and

2) Location information as "networkArea" attribute;

and may provide:

1) identification of network slice(s) by "snssais" attribute.

- if the event is "ABNORMAL\_BEHAVIOUR", may provide:

1) the S-NSSAI as the "snssais" attribute;

2) the identification of DNN as the "dnns" attribute;

3) the identification of the application as the "appIds" attribute;

4) the Area of Interest (AOI) as the "networkArea" attribute;

5) expected UE behaviour via "exptUeBehav" attribute; and

6) either the expected analytics type via "exptAnaType" attribute or a list of exception Ids with the associated thresholds via "excepRequs" attribute.

- if the event is "USER\_DATA\_CONGESTION", shall provide:

1) the Area of Interest (AOI) as the "networkArea" attribute;

2) an optional list of analytics subsets as the "listOfAnaSubsets" attribute; and

3) the S-NSSAI as the "snssais" attribute.

- if the event is "NF\_LOAD", may provide:

1) the S-NSSAI as the "snssais" attribute;

2) either list of NF instance IDs in the "nfInstanceIds" attribute or list of NF set IDs in the "nfSetIds" attribute;

3) list of NF instance types in the "nfTypes" attribute;

4) the Area of Interest (AOI) as the "networkArea" attribute; and

5) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

- if the event is "NETWORK\_PERFORMANCE", may provide:

1) Area of Interest (AOI) as the "networkArea" attribute; and

2) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

- if the event is "NSI\_LOAD\_LEVEL", shall provide:

1) the S-NSSAI as the "snssais" attribute; and/or

2) the identification(s) of Network Slice instance as the "nsiIdInfos" attribute;

and may provide:

1) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

- if the event is "SM\_CONGESTION", shall provide:

1) the S-NSSAI as the "snssais" attribute; and/or

2) the identification of DNN as the "dnns" attribute;

and may provide:

1) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

- if the event is "REDUNDANT\_TRANSMISSION", may provide:

1) the Area of Interest (AOI) as the "networkArea" attribute;

2) the S-NSSAI as the "snssais" attribute; and

3) the identification of DNN as the "dnns" attribute.

- if the event is "WLAN\_PERFORMANCE", may provide:

1) the Area of Interest (AOI) as the "networkArea" attribute;

2) the SSID(s) and BSSID(s) as "wlanReqs" attribute; and

3) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

- if the event is "DN\_PERFORMANCE", may provide

1) the identification of the application as the "appIds" attribute;

2) the S-NSSAI as the "snssais" attribute;

3) the identification(s) of Network Slice instance as the "nsiIdInfos" attribute;

4) the Area of Interest (AOI) as the "networkArea" attribute;

5) the identification of the UPF as the "upfInfo" attribute;

6) the identification of DNN as the "dnns" attribute;

7) identification of user plane access to DN(s) which the subscription applies as the "dnais" attribute;

8) IP address(s)/FQDN(s) of the Application Server(s) as the "appServerAddrs" attribute;

9) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

- if the event is "DISPERSION", may provide:

1) the Area of Interest (AOI) as the "networkArea" attribute;

2) the S-NSSAI as the "snssais" attribute;

3) the identification of the application as the "appIds" attribute;

4) dispersion analytics requirements in "disperReqs" attribute;

5) an optional list of analytics subsets as the "listOfAnaSubsets" attribute.

Upon the reception of an HTTP POST request with: "{apiRoot}/nnwdaf-mlmodelprovision/<apiVersion>/subscriptions" as Resource URI and NwdafMLModelProvSubsc data structure as request body, the NWDAF shall create a new subscription and store the subscription.

If the NWDAF created an "Individual NWDAF ML Model Provision Subscription" resource, the NWDAF shall respond with "201 Created" with the message body containing a representation of the created subscription, as shown in figure 4.5.2.2.2-1, step 2. The NWDAF shall include a Location HTTP header field. The Location header field shall contain the URI of the created subscription i.e. "{apiRoot}/nnwdaf-mlmodelprovision/<apiVersion>/subscriptions/{subscriptionId}".

If the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute sets to true during the event subscription, the NWDAF shall include the reports of the subscribed events, if available, as the "mLEventNotifs" attribute in the HTTP POST response.

If there is no associated ML model available for all the listed "mLEvent" attribute, the NWDAF which contains MTLF shall send a "500 Internal Server Error" status code to the NF service consumer. Also, the corresponding failure reason via a "problemDetails" attribute with the "cause" attribute set to "UNAVAILABLE\_ML\_MODEL\_FOR\_ALLEVENTS". If errors occur when processing the HTTP POST request, the NWDAF shall send an HTTP error response as specified in clause 5.4.7.

##### 4.5.2.2.3 Update subscription for event notifications

Figure 4.5.2.2.3-1 shows a scenario that the NF service consumer sends an HTTP PUT request to the NWDAF to modify an existing subscription (as shown in 3GPP TS 23.288 [17]).



Figure 4.5.2.2.3-1: Modification of events subscription information using HTTP PUT

The NF service consumer shall invoke the Nnwdaf\_MLModelProvision\_Subscribe service operation to modify an existing ML Model subscription. The NF service consumer shall send an HTTP PUT request with: "{apiRoot}/nnwdaf-mlmodelprovision/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI, where "{subscriptionId}" is the event subscriptionId of the existing subscription to be modified, to update an "Individual NWDAF ML Model Provision Subscription" according to the information in the message body. The NwdafMLModelProvSubsc data structure provided in the request body shall include the same contents as described in clause 4.5.2.2.2.

Upon receipt of an HTTP PUT request with: "{apiRoot}/nnwdaf-mlmodelprovision/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI and NwdafMLModelProvSubsc data type as request body, if the request is successfully processed and accepted, the NWDAF shall:

- modify the concerned subscription; and

- store the subscription.

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

If the NWDAF successfully processed and accepted the received HTTP PUT request, the NWDAF shall update an "Individual NWDAF ML Model Provision Subscription" resource, and shall respond with:

- HTTP "204 No Content" response (as shown in figure 4.5.2.2.3-1, step 2a); or

- HTTP "200 OK" response (as shown in figure 4.5.2.2.3-1, step 2b) with a response body containing a representation of the updated subscription in the NwdafMLModelProvSubsc data type.

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

If the NWDAF determines that the received HTTP PUT request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

#### 4.5.2.3 Nnwdaf\_MLModelProvision\_Unsubscribe service operation

##### 4.5.2.3.1 General

The Nnwdaf\_MLModelProvision\_Unsubscribe service operation is used by an NF service consumer to unsubscribe from event notifications.

##### 4.5.2.3.2 Unsubscribe from event notifications

Figure 4.5.2.3.2-1 shows a scenario where the NF service consumer sends a request to the NWDAF to unsubscribe from event notifications (see also 3GPP TS 23.288 [17]).



Figure 4.5.2.3.2-1: NF service consumer unsubscribes from notifications

The NF service consumer shall invoke the Nnwdaf\_MLModelProvision\_UnSubscribe service operation to unsubscribe to event notifications. The NF service consumer shall send an HTTP DELETE request with: "{apiRoot}/nnwdaf-mlmodelprovision/<apiVersion>/subscriptions/{subscriptionId}" as Resource URI, where "{subscriptionId}" is the event subscriptionId of the existing subscription that is to be deleted.

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

- remove the corresponding subscription; and

- respond with HTTP "204 No Content" status code.

If the NWDAF determines the received HTTP DELETE request needs to be redirected, the NWDAF shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

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

#### 4.5.2.4 Nnwdaf\_MLModelProvision\_Notify service operation

##### 4.5.2.4.1 General

The Nnwdaf\_MLModelProvision\_Notify service operation is used by an NWDAF to notify NF consumers about subscribed events.

##### 4.5.2.4.2 Notification about subscribed event

Figure 4.5.2.4.2-1 shows a scenario where the NWDAF sends a request to the NF Service Consumer to notify for event notifications (see also 3GPP TS 23.288 [17]).



Figure 4.5.2.4.2-1: NWDAF notifies the subscribed event

The NWDAF shall invoke the Nnwdaf\_MLModelProvision\_Notify service operation to notify the subscribed event. The NWDAF shall send an HTTP POST request with "{notifUri}" received in the Nnwdaf\_MLModelProvision\_Subscribe service operation as Resource URI, as shown in figure 4.2.2.4.2-1, step 1. The NwdafMLModelProvNotif data structure provided in the request body that shall include:

- an event subscriptionId as "subscriptionId" attribute;

- and description of the notified event as "eventNotifs" attribute, that for each event, the MLEventNotif data type shall include an event identifier as the "event" attribute, an address (e.g. a URL or an FQDN) of the ML model file as the "mLFileAddr" attribute, and may include a notification correlation identifier as "notifCorreId" attribute and a time period when the provided ML model applies as the "validityPeriod" attribute and an area where the provided ML model applies as the "spatialValidity" attribute.

Upon the reception of an HTTP POST request, if the NF service consumer successfully processed and accepted the received HTTP POST request, the NF Service Consumer shall store the notification and respond with HTTP "204 No Content" status code.

If the NF service consumer determines the received HTTP POST request needs to be redirected, the NF service consumer shall send an HTTP redirect response as specified in clause 6.10.9 of 3GPP TS 29.500 [6].

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

# 5 API Definitions

## 5.1 Nnwdaf\_EventsSubscription Service API

### 5.1.1 Introduction

The Nnwdaf\_EventsSubscription service shall use the Nnwdaf\_EventsSubscription API.

The API URI of the Nnwdaf\_EventsSubscription API shall be:

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

The request URIs used in each HTTP requests from the NF service consumer towards the NWDAF shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [7], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [7].

- The <apiName>shall be "nnwdaf-eventssubscription".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 5.1.3.

### 5.1.2 Usage of HTTP

#### 5.1.2.1 General

HTTP/2, IETF RFC 7540 [9], shall be used as specified in clause 5 of 3GPP TS 29.500 [6].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [6].

The OpenAPI [11] specification of HTTP messages and content bodies for the Nnwdaf\_EventsSubscription is contained in Annex A.

#### 5.1.2.2 HTTP standard headers

##### 5.1.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [6] for the usage of HTTP standard headers.

##### 5.1.2.2.2 Content type

JSON, IETF RFC 8259 [10], 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 [6]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [15].

#### 5.1.2.3 HTTP custom headers

The Nnwdaf\_EventsSubscription service API shall support the mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [6] and may support the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [6].

In this release of the specification, no specific custom headers are defined for the Nnwdaf\_EventsSubscription service API.

### 5.1.3 Resources

#### 5.1.3.1 Resource Structure

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

Figure 5.1.3.1-1 depicts the resource URIs structure for the Nnwdaf\_EventsSubscription API.



Figure 5.1.3.1-1: Resource URI structure of the Nnwdaf\_EventsSubscription API

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

Table 5.1.3.1-1: Resources and methods overview

|  |  |  |  |
| --- | --- | --- | --- |
| Resource name | Resource URI | HTTP method or custom operation | Description |
| NWDAF Events Subscriptions | /subscriptions | POST | Creates a new Individual NWDAF Event Subscription resource. |
| Individual NWDAF Event Subscription | /subscriptions/{subscriptionId} | DELETE | Deletes an Individual NWDAF Event Subscription identified by subresource {subscriptionId}. |
| PUT | Modifies an existing Individual Event Subscription subresource. |
| NWDAF Event Subscription Transfers | /transfers | POST | Provides information about the requested analytics subscription transfer(s), potentially creating a new Individual NWDAF Event Subscription Transfer resource. |
| Individual NWDAF Event Subscription Transfer | /transfers/{transferId} | DELETE | Deletes an Individual NWDAF Event Subscription Transfer resource identified by subresource {transferId}. |
| PUT | Modifies an existing Individual NWDAF Event Subscription Transfer resource. |

#### 5.1.3.2 Resource: NWDAF Events Subscriptions

##### 5.1.3.2.1 Description

The NWDAF Events Subscriptions resource represents all subscriptions to the Nnwdaf\_EventsSubscription service at a given NWDAF. The resource allows an NF service consumer to create a new Individual NWDAF Event Subscription resource.

##### 5.1.3.2.2 Resource definition

Resource URI: **{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions**

The <apiVersion> shall be set as described in clause 5.1.1.

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

Table 5.1.3.2.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.1.1 |

##### 5.1.3.2.3 Resource Standard Methods

###### 5.1.3.2.3.1 POST

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

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

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

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

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

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NnwdafEventsSubscription | M | 1 | Creates a new Individual NWDAF Event Subscription resource. |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| NnwdafEventsSubscription | M | 1 | 201 Created | The creation of an Individual NWDAF Event Subscription resource is confirmed and a representation of that resource is returned. |
| ProblemDetails | O | 0..1 | 400 Bad Request | (NOTE 2) |
| ProblemDetails | O | 0..1 | 500 Internal Server Error | (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 [6] also apply.  NOTE 2: Failure cases are described in clause 5.1.7. | | | | |

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

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

##### 5.1.3.2.4 Resource Custom Operations

None in this release of the specification.

#### 5.1.3.3 Resource: Individual NWDAF Event Subscription

##### 5.1.3.3.1 Description

The Individual NWDAF Event Subscription resource represents a single subscription to the Nnwdaf\_EventsSubscription service at a given NWDAF.

##### 5.1.3.3.2 Resource definition

Resource URI: {apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions/{subscriptionId}

The <apiVersion> shall be set as described in clause 5.1.1.

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

Table 5.1.3.3.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.1.1. |
| subscriptionId | string | Identifies a subscription to the Nnwdaf\_EventsSubscription service. |

##### 5.1.3.3.3 Resource Standard Methods

###### 5.1.3.3.3.1 DELETE

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

Table 5.1.3.3.3.1-1: URI query parameters supported by the DELETE method on this resource

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

This method shall support the request data structures specified in table 5.1.3.3.3.1-2 and the response data structures and response codes specified in table 5.1.3.3.3.1-3.

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

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | Successful case: The Individual NWDAF Event Subscription resource matching the subscriptionId was deleted. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF Event Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance.  Applicable if the feature "ES3XX" is supported. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF Event Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance.  Applicable if the feature "ES3XX" is supported. |
| NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | |

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

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

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

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

###### 5.1.3.3.3.2 PUT

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

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

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

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

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

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NnwdafEventsSubscription | M | 1 | Parameters to replace a subscription to NWDAF Event Subscription resource. |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| NnwdafEventsSubscription | M | 1 | 200 OK | The Individual NWDAF Event Subscription resource was modified successfully and a representation of that resource is returned. |
| n/a |  |  | 204 No Content | The Individual NWDAF Event Subscription resource was modified successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF Event Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance.  Applicable if the feature "ES3XX" is supported. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF Event Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance.  Applicable if the feature "ES3XX" is supported. |
| ProblemDetails | O | 0..1 | 400 Bad Request | (NOTE 2) |
| ProblemDetails | O | 0..1 | 500 Internal Server Error | (NOTE 2) |
| NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.  NOTE 2: Failure cases are described in clause 5.1.7. | | | | |

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

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

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

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

##### 5.1.3.3.4 Resource Custom Operations

None in this release of the specification.

#### 5.1.3.4 Resource: NWDAF Event Subscription Transfers

##### 5.1.3.4.1 Description

The NWDAF Event Subscription Transfers resource represents all requests to transfer subscription(s) of the Nnwdaf\_EventsSubscription service at a given NWDAF. The resource allows an NF service consumer to provide information about analytics subscriptions that are requested to be:

- prepared for transfer, leading to the creation of a new Individual NWDAF Event Subscription Transfer resource, which can be later modified, removed, or requested to be transferred; and

- transferred, leading to the execution of the necessary steps for transferring the analytics subscription.

##### 5.1.3.4.2 Resource definition

Resource URI: **{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers**

The <apiVersion> shall be set as described in clause 5.1.1.

This resource shall support the resource URI variables defined in table 5.1.3.4.2-1.

Table 5.1.3.4.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.1.1 |

##### 5.1.3.4.3 Resource Standard Methods

###### 5.1.3.4.3.1 POST

This method shall support the URI query parameters specified in table 5.1.3.4.3.1-1.

Table 5.1.3.4.3.1-1: 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 5.1.3.4.3.1-2 and the response data structures and response codes specified in table 5.1.3.4.3.1-3.

Table 5.1.3.4.3.1-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| AnalyticsSubscriptionsTransfer | M | 1 | Information about analytics subscription(s) that are requested to be transferred or prepared for transfer. |

Table 5.1.3.4.3.1-3: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| AnalyticsSubscriptionsTransfer | M | 1 | 201 Created | The creation of an Individual NWDAF Event Subscription Transfer resource is confirmed and a representation of that resource is returned. |
| n/a |  |  | 204 No Content | The receipt of the information about analytics subscription(s) that are requested to be transferred and the ability to handle this information (e.g. execute the steps required to transfer an analytics subscription directly) is confirmed. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | |

Table 5.1.3.4.3.1-4: Headers supported by the 201 Response Code on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| Location | string | M | 1 | Contains the URI of the newly created resource, according to the structure: {apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers/{transferId}. |

##### 5.1.3.4.4 Resource Custom Operations

None in this release of the specification.

#### 5.1.3.5 Resource: Individual NWDAF Event Subscription Transfer

##### 5.1.3.5.1 Description

The Individual NWDAF Event Subscription Transfer resource represents a single request to transfer subscription(s) of the Nnwdaf\_EventsSubscription service at a given NWDAF.

##### 5.1.3.5.2 Resource definition

Resource URI: {apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers/{transferId}

The <apiVersion> shall be set as described in clause 5.1.1.

This resource shall support the resource URI variables defined in table 5.1.3.5.2-1.

Table 5.1.3.5.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.1.1. |
| transferId | string | Identifies a request to transfer subscription(s) of the Nnwdaf\_EventsSubscription service. |

##### 5.1.3.5.3 Resource Standard Methods

###### 5.1.3.5.3.1 DELETE

This method shall support the URI query parameters specified in table 5.1.3.5.3.1-1.

Table 5.1.3.5.3.1-1: URI query parameters supported by the DELETE method on this resource

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

This method shall support the request data structures specified in table 5.1.3.5.3.1-2 and the response data structures and response codes specified in table 5.1.3.5.3.1-3.

Table 5.1.3.5.3.1-2: Data structures supported by the DELETE Request Body on this resource

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

Table 5.1.3.5.3.1-3: 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 NWDAF Event Subscription Transfer resource matching the transferId was deleted. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF Event Subscription Transfer deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF Event Subscription Transfer deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | |

Table 5.1.3.5.3.1-4: Headers supported by the 307 Response Code on this resource

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

Table 5.1.3.5.3.1-5: Headers supported by the 308 Response Code on this resource

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

###### 5.1.3.5.3.2 PUT

This method shall support the URI query parameters specified in table 5.1.3.5.3.2-1.

Table 5.1.3.5.3.2-1: URI query parameters supported by the PUT method on this resource

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

This method shall support the request data structures specified in table 5.1.3.5.3.2-2 and the response data structures and response codes specified in table 5.1.3.5.3.2-3.

Table 5.1.3.5.3.2-2: Data structures supported by the PUT Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| AnalyticsSubscriptionsTransfer | M | 1 | Parameters to replace in an Individual NWDAF Event Subscription Transfer resource. |

Table 5.1.3.5.3.2-3: Data structures supported by the PUT Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| n/a |  |  | 204 No Content | The Individual NWDAF Event Subscription Transfer resource was modified successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF Event Subscription Transfer modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF Event Subscription Transfer modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| NOTE: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | |

Table 5.1.3.5.3.2-4: Headers supported by the 307 Response Code on this resource

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

Table 5.1.3.5.3.2-5: Headers supported by the 308 Response Code on this resource

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

##### 5.1.3.5.4 Resource Custom Operations

None in this release of the specification.

### 5.1.4 Custom Operations without associated resources

None in this release of the specification.

### 5.1.5 Notifications

#### 5.1.5.1 General

Notifications shall comply with clause 6.2 of 3GPP TS 29.500 [6] and clause 4.6.2.3 of 3GPP TS 29.501 [7].

Table 5.3.3.4.1-1: Notifications overview

|  |  |  |  |
| --- | --- | --- | --- |
| Notification | Callback URI | HTTP method or custom operation | Description (service operation) |
| Event Notification | {notificationURI} | POST | Reports one or several observed Events. |

#### 5.1.5.2 Event Notification

##### 5.1.5.2.1 Description

The Event Notification is used by the NWDAF to report one or several observed Events to an NF service consumer that has subscribed to such Notifications or used by the target NWDAF to report the successful analytics subscription transfer via the Individual NWDAF Event Subscription Resource.

##### 5.1.5.2.2 Operation Definition

Callback URI: **{notificationURI}**

The operation shall support the callback URI variables defined in table 5.1.5.2.2-1, the request data structures specified in table 5.1.5.2.2-2 and the response data structure and response codes specified in table 5.1.5.2.2-3.

Table 5.1.5.2.2-1: Callback URI variables

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| notificationURI | Uri | The Notification Uri as assigned within the Individual NWDAF Event Subscription and described within the NnwdafEventsSubscription type (see table 5.1.6.2.2-1). |

Table 5.1.5.2.2-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| array(NnwdafEventsSubscriptionNotification) | M | 1..N | Provides Information about observed Events or the successful analytics subscription transfer. |

Table 5.1.5.2.2-3: 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 the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.  Applicable if the feature "ES3XX" is supported. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent.  Applicable if the feature "ES3XX" is supported. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | |

Table 5.1.5.2.2-4: Headers supported by the 307 Response Code on this resource

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

Table 5.1.5.2.2-5: Headers supported by the 308 Response Code on this resource

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

### 5.1.6 Data Model

#### 5.1.6.1 General

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

Table 5.1.6.1-1 specifies the data types defined for the Nnwdaf\_EventsSubscription service based interface protocol.

Table 5.1.6.1-1: Nnwdaf\_EventsSubscription specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Section defined | Description | Applicability |
| AbnormalBehaviour | 5.1.6.2.15 | Represents the abnormal behaviour information. | AbnormalBehaviour |
| Accuracy | 5.1.6.3.5 | Represents the preferred level of accuracy of the analytics. |  |
| AdditionalMeasurement | 5.1.6.2.26 | Represents additional measurement information. | AbnormalBehaviour |
| AddressList | 5.1.6.2.28 | Represents a list of IPv4 and/or IPv6 addresses. | AbnormalBehaviour |
| AnalyticsContextIdentifier | 5.1.6.2.43 | Contains information about available analytics contexts. | AnaSubTransfer |
| AnalyticsMetadata | 5.1.6.3.14 | Represents the types of analytics metadata information that can be requested. | Aggregation |
| AnalyticsMetadataIndication | 5.1.6.2.36 | Contains analytics metadata values indicated to be used during analytics generation. | Aggregation |
| AnalyticsMetadataInfo | 5.1.6.2.37 | Contains analytics metadata information required for analytics aggregation. | Aggregation |
| AnalyticsSubscriptionsTransfer | 5.1.6.2.40 | Contains information about a request to transfer analytics subscriptions. | AnaSubTransfer |
| AnalyticsSubset | 5.1.6.3.18 | Analytics subset used to indicate the content of the analytics. | EneNA |
| AnySlice | 5.1.6.3.2 | Represents the any slices. |  |
| ApplicationVolume | 5.1.6.2.55 | Application data volume per application Id. | Dispersion |
| AppListForUeComm | 5.1.6.2.64 | Represents the analytics of the application list used by UE. | UeCommunicationExt |
| BwRequirement | 5.1.6.2.25 | Represents bandwidth requirement. | ServiceExperience |
| ClassCriterion | 5.1.6.2.51 | Disperion class criterion. | Dispersion |
| CircumstanceDescription | 5.1.6.2.29 | Contains the description of a circumstance. | AbnormalBehaviour |
| CongestionInfo | 5.1.6.2.18 | Represents the congestion information | UserDataCongestion |
| CongestionType | 5.1.6.3.8 | Identification congestion analytics type. | UserDataCongestion |
| ConsumerNfInformation | 5.1.6.2.49 | Represents the analytics consumer NF Information. | AnaSubTransfer |
| DatasetStatisticalProperty | 5.1.6.3.15 | Dataset statistical properties of the data used to generate the analytics. | Aggregation |
| DnPerf | 5.1.6.2.46 | Represents DN performance information. | DnPerformance |
| DnPerfInfo | 5.1.6.2.45 | Represents DN performances for the application. | DnPerformance |
| DnPerfOrderingCriterion | 5.1.6.3.25 | Ordering criterion for the list of DN performance analytics. | DnPerformance |
| DnPerformanceReq | 5.1.6.2.66 | Represents DN performance analytics requirement. | DnPerformance |
| DispersionClass | 5.1.6.3.20 | Dispersion class. | Dispersion |
| DispersionCollection | 5.1.6.2.54 | Dispersion collections per UE location or or per slice. | Dispersion |
| DispersionInfo | 5.1.6.2.53 | Dispersion analytics information. | Dispersion |
| DispersionRequirement | 5.1.6.2.50 | Dispersion analytics requirement. | Dispersion |
| DispersionType | 5.1.6.3.19 | Dispersion type. | Dispersion |
| DispersionOrderingCriterion | 5.1.6.3.21 | Ordering criterion for the list of Dispersion. | Dispersion |
| EventNotification | 5.1.6.2.5 | Describes Notifications about events that occurred. |  |
| EventReportingRequirement | 5.1.6.2.7 | Represents the type of reporting the subscription requires. |  |
| EventSubscription | 5.1.6.2.3 | Represents the subscription to a single event. |  |
| Exception | 5.1.6.2.16 | Describes the Exception information. | AbnormalBehaviour |
| ExceptionId | 5.1.6.3.6 | Describes the Exception Id. | AbnormalBehaviour |
| ExceptionTrend | 5.1.6.3.7 | Describes the Exception Trend. | AbnormalBehaviour |
| ExpectedAnalyticsType | 5.1.6.3.11 | Represents expected UE analytics type. | AbnormalBehaviour |
| FailureEventInfo | 5.1.6.2.35 | Contains information on the event for which the subscription is not successful. |  |
| IpEthFlowDescription | 5.1.6.2.27 | Contains the description of an Uplink and/or Downlink Ethernet flow. | AbnormalBehaviour |
| LoadLevelInformation | 5.1.6.3.2 | Represents load level information of the network slice and the optionally associated network slice instance. |  |
| LocationInfo | 5.1.6.2.11 | Represents UE location information. | UeMobility |
| MatchingDirection | 5.1.6.3.12 | Defines the matching direction when crossing a threshold. | NfLoad, QoSSustainability, UserDataCongestion, NetworkPerformance  Dispersion  RedundantTransmissionExp  WlanPerformance  ServiceExperienceExt |
| MLModelInfo | 5.1.6.2.69 | The information of the ML model. | AnaSubTransfer |
| ModelInfo | 5.1.6.2.42 | Contains information about an ML model. | AnaSubTransfer |
| NetworkPerfInfo | 5.1.6.2.23 | Represents the network performance information. | NetworkPerformance |
| NetworkPerfRequirement | 5.1.6.2.22 | Represents a network performance requirement. | NetworkPerformance |
| NetworkPerfType | 5.1.6.3.10 | Represents the network performance types. | NetworkPerformance |
| NfLoadLevelInformation | 5.1.6.2.31 | Represents load level information of a given NF instance. | NfLoad |
| NfStatus | 5.1.6.2.32 | Provides the percentage of time spent on various NF states. | NfLoad |
| NnwdafEventsSubscription | 5.1.6.2.2 | Represents an Individual NWDAF Event Subscription resource. |  |
| NnwdafEventsSubscriptionNotification | 5.1.6.2.4 | Represents an Individual NWDAF Event Subscription Notification resource. |  |
| NumberAverage | 5.1.6.2.38 | Represents average and variance information. | NsiLoadExt |
| NwdafEvent | 5.1.6.3.4 | Describes the NWDAF Events. |  |
| NwdafFailureCode | 5.1.6.3.13 | Identifies the failure reason. |  |
| NotificationMethod | 5.1.6.3.3 | Represents the notification methods that can be subscribed. |  |
| NsiIdInfo | 5.1.6.2.33 | Represents the S-NSSAI and the optionally associated Network Slice Instance Identifier(s). | ServiceExperience  NsiLoad  DnPerformance |
| NsiLoadLevelInfo | 5.1.6.2.34 | Represents the load level information for an S-NSSAI and the optionally associated network slice instance. | NsiLoad |
| ObservedRedundantTransExp | 5.1.6.2.70 | Represents the observed Redundant Transmission Experience. | RedundantTransmissionExp |
| OutputStrategy | 5.1.6.3.16 | Represents the output strategy used for the reporting of the analytics. | Aggregation |
| PerfData | 5.1.6.2.47 | Represents DN performance information. | DnPerformance |
| PrevSubInfo | 5.1.6.2.68 | Information of the previous subscription. | AnaCtxTransfer |
| QosRequirement | 5.1.6.2.20 | Represents the QoS requirements. | QoSSustainability |
| QosSustainabilityInfo | 5.1.6.2.19 | Represents the QoS Sustainability information. | QoSSustainability |
| RankingCriterion | 5.1.6.2.52 | Ranking criterion. | Dispersion |
| RatFreqInformation | 5.1.6.2.67 | Represents the RAT type and/or Frequency information. | ServiceExperienceExt |
| RedTransExpOrderingCriterion | 5.1.6.3.22 | Ordering criterion for the list of Redundant Transmission Experience. | RedundantTransmissionExp |
| RedundantTransmissionExpInfo | 5.1.6.2.57 | Redundant transmission experience analytics information. | RedundantTransmissionExp |
| RedundantTransmissionExpPerTS | 5.1.6.2.58 | Redundant Transmission Experience per Time Slot. | RedundantTransmissionExp |
| RedundantTransmissionExpReq | 5.1.6.2.56 | Redundant transmission experience analytics requirement. | RedundantTransmissionExp |
| ResourceUsage | 5.1.6.2.48 | The current usage of the virtual resources assigned to the NF instances belonging to a particular network slice instance. | NsiLoadExt |
| RetainabilityThreshold | 5.1.6.2.21 | Represents a QoS flow retainability threshold. | QoSSustainability |
| ServiceExperienceInfo | 5.1.6.2.24 | Represents the service experience information. | ServiceExperience |
| ServiceExperienceType | 5.1.6.3.24 | Represents the type of Service Experience Analytics. | ServiceExperienceExt |
| SessInactTimerForUeComm | 5.1.6.2.65 | Represents the N4 Session inactivity timer. | UeCommunicationExt |
| SliceLoadLevelInformation | 5.1.6.2.6 | Represents the slices and their load level information. |  |
| SubscriptionTransferInfo | 5.1.6.2.41 | Contains information about subscriptions that are requested to be transferred. | AnaSubTransfer |
| TargetUeInformation | 5.1.6.2.8 | Identifies the target UE information. | ServiceExperience  NfLoad  NetworkPerformance  UserDataCongestion  UeMobility  UeCommunication  AbnormalBehaviour  QoSSustainability  Dispersion  RedundantTransmissionExp  WlanPerformance  DnPerformance |
| ThresholdLevel | 5.1.6.2.30 | Describe a threshold level. | UserDataCongestion  NfLoad  DnPerformance  ServiceExperienceExt |
| TimeUnit | 5.1.6.3.9 | Represents the unit for the session active time. | QoSSustainability |
| TopApplication | 5.1.6.2.39 | Top application that contributes the most to the traffic. | UserDataCongestionExt |
| TrafficCharacterization | 5.1.6.2.14 | Identifies the detailed traffic characterization. | UeCommunication |
| TrafficInformation | 5.1.6.2.63 | Traffic information including UL/DL data rate and/or Traffic volume. | WlanPerformance |
| TransferRequestType | 5.1.6.3.17 | Represents the type of a request for analytics subscription transfer. | AnaSubTransfer |
| UeAnalyticsContextDescriptor | 5.1.6.2.44 | Contains information about available UE related analytics contexts. | AnaSubTransfer |
| UeCommunication | 5.1.6.2.13 | Represents UE communication information. | UeCommunication |
| UeMobility | 5.1.6.2.10 | Represents UE mobility information. | UeMobility |
| UserDataCongestionInfo | 5.1.6.2.17 | Represents the user data congestion information. | UserDataCongestion |
| WlanOrderingCriterion | 5.1.6.3.23 | Ordering criterion for the list of WLAN performance information. | WlanPerformance |
| WlanPerformanceReq | 5.1.6.2.59 | WLAN performance analytics requirement. | WlanPerformance |
| WlanPerformanceInfo | 5.1.6.2.60 | WLAN performance analytics information. | WlanPerformance |
| WlanPerSsIdPerformanceInfo | 5.1.6.2.61 | WLAN performance information per SSID of WLAN access points deployed in the Area of Interest. | WlanPerformance |
| WlanPerTsPerformanceInfo | 5.1.6.2.62 | WLAN performance information per Time Slot during the analytics target period. | WlanPerformance |

Table 5.1.6.1-2 specifies data types re-used by the Nnwdaf\_EventsSubscription 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 Nnwdaf service based interface.

Table 5.1.6.1-2: Nnwdaf\_EventsSubscription re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| 5Qi | 3GPP TS 29.571 [8] | Identifies the 5G QoS identifier | QoSSustainability |
| AddrFqdn | 3GPP TS 29.517 [22] | Represents the IP address or FQDN of the Application Server. | DnPerformance  ServiceExperienceExt |
| ApplicationId | 3GPP TS 29.571 [8] | Identifies the application identifier. | ServiceExperience  UeCommunication  AbnormalBehaviour  Dispersion  DnPerformance |
| ArfcnValueNR | 3GPP TS 29.571 [8] | Integer value indicating the ARFCN applicable for a downlink, uplink or bi-directional (TDD) NR global frequency raster.  Minimum = 0. Maximum = 3279165. | ServiceExperienceExt |
| BitRate | 3GPP TS 29.571 [8] | 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". | ServiceExperience  QoSSustainability  WlanPerformance  DnPerformance |
| DateTime | 3GPP TS 29.571 [8] | Identifies the time. |  |
| Dnai | 3GPP TS 29.571 [8] | Identifies a user plane access to one or more DN(s). | ServiceExperience  DnPerformance |
| Dnn | 3GPP TS 29.571 [8] | Identifies the DNN. | ServiceExperience  AbnormalBehaviour  UeCommunication  DnPerformance  SMCCE |
| DurationSec | 3GPP TS 29.571 [8] |  |  |
| EthFlowDescription | 3GPP TS 29.514 [21] |  | UeCommunication  AbnormalBehaviour |
| ExpectedUeBehaviourData | 3GPP TS 29.503 [23] |  | AbnormalBehaviour |
| Float | 3GPP TS 29.571 [8] |  |  |
| FlowDescription | 3GPP TS 29.514 [21] |  | UeCommunication  AbnormalBehaviour |
| FlowInfo | 3GPP TS 29.122 [19] |  | UserDataCongestionExt |
| Gpsi | 3GPP TS 29.571 [8] | The GPSI for an UE. | UserDataCongestionExt |
| GroupId | 3GPP TS 29.571 [8] | Identifies a group of UEs. | UeMobility  UeCommunication NetworkPerformance  AbnormalBehaviour  ServiceExperience  Dispersion  RedundantTransmissionExp  WlanPerformance |
| Ipv4Addr | 3GPP TS 29.571 [8] |  |  |
| Ipv6Addr | 3GPP TS 29.571 [8] |  |  |
| NetworkAreaInfo | 3GPP TS 29.554 [18] | Identifies the network area. | ServiceExperience  QoSSustainability  AbnormalBehaviour  UeMobility  UserDataCongestion  NetworkPerformance  NsiLoadExt  NfLoadExt  Dispersion  RedundantTransmissionExp  WlanPerformance  EneNA  DnPerformance |
| NfInstanceId | 3GPP TS 29.571 [8] | Identifies an NF instance. | NfLoad |
| NfSetId | 3GPP TS 29.571 [8] | Identifies an NF Set instance. | NfLoad |
| NFType | 3GPP TS 29.510 [12] | Indentifies a type of NF. | NfLoad |
| NsiId | 3GPP TS 29.531 [24] | Identifies a Network Slice Instance. | ServiceExperience  NsiLoad  DnPerformance |
| PacketDelBudget | 3GPP TS 29.571 [8] |  | QoSSustainability  DnPerformance |
| PacketErrRate | 3GPP TS 29.571 [8] |  | QoSSustainability |
| PacketLossRate | 3GPP TS 29.517 [22] | Indicates Packet Loss Rate. | DnPerformance |
| PduSessionId | 3GPP TS 29.571 [8] | Indentifies PDU Session |  |
| ProblemDetails | 3GPP TS 29.571 [8] | Used in error responses to provide more detailed information about an error. |  |
| QosResourceType | 3GPP TS 29.571 [8] | Identifies the resource type in QoS characteristics. | QoSSustainability |
| RatType | 3GPP TS 29.571 [8] | Identifies the RAT type. | ServiceExperienceExt |
| RedirectResponse | 3GPP TS 29.571 [8] | Contains redirection related information. | ES3XX |
| ReportingInformation | 3GPP TS 29.523 [20] | Represents the type of reporting the subscription requires. |  |
| SamplingRatio | 3GPP TS 29.571 [8] |  |  |
| ScheduledCommunicationTime | 3GPP TS 29.122 [19] |  | UeMobility UeCommunication |
| SmcceInfo | 5.2.6.2.12 | Represents the analytics of Session Management Congestion Control Experience information. | SMCCE |
| Snssai | 3GPP TS 29.571 [8] | Identifies the S-NSSAI (Single Network Slice Selection Assistance Information). |  |
| Supi | 3GPP TS 29.571 [8] | The SUPI for an UE. | ServiceExperience,  NfLoad  NetworkPerformance,  UserDataCongestion  UeMobility  UeCommunication  AbnormalBehaviour  Dispersion  RedundantTransmissionExp  WlanPerformance |
| SupportedFeatures | 3GPP TS 29.571 [8] | Used to negotiate the applicability of the optional features defined in table 5.1.8-1. |  |
| SvcExperience | 3GPP TS 29.517 [22] |  | ServiceExperience |
| Tai | 3GPP TS 29.571 [8] | Tracking Area Information. | AnaSubTransfer |
| TimeWindow | 3GPP TS 29.122 [19] |  |  |
| Uinteger | 3GPP TS 29.571 [8] | Unsigned Integer, i.e. only value 0 and integers above 0 are permissible. |  |
| UpfInformation | 3GPP TS 29.508 [29] | The information of the UPF serving the UE. | ServiceExperienceExt  DnPerformance |
| Uri | 3GPP TS 29.571 [8] |  |  |
| UserLocation | 3GPP TS 29.571 [8] |  | UeMobility  Dispersion |
| Volume | 3GPP TS 29.122 [19] |  | UeCommunication  AbnormalBehaviour  Dispersion  WlanPerformance |

#### 5.1.6.2 Structured data types

##### 5.1.6.2.1 Introduction

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

##### 5.1.6.2.2 Type NnwdafEventsSubscription

Table 5.1.6.2.2-1: Definition of type NnwdafEventsSubscription

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | P | | Cardinality | | Description | | Applicability | |
| eventSubscriptions | | array(EventSubscription) | | M | | 1..N | | Subscribed events. | |  | |
| evtReq | | ReportingInformation | | O | | 0..1 | | Represents the reporting requirements of the event subscription. (NOTE 1, NOTE 2)  If omitted, the default values within the ReportingInformation data type apply. | |  | |
| notificationURI | | Uri | | C | | 0..1 | | Identifies the recipient of Notifications sent by the NWDAF.  This parameter shall be supplied by the NF service consumer in the HTTP POST requests that create the subscriptions for event notifications and in the HTTP PUT requests that update the subscriptions for event notifications. | |  | |
| notifCorrId | | string | | O | | 0..1 | | Notification correlation identifier. | | EneNA | |
| eventNotifications | | array(EventNotification) | | C | | 1..N | | Notifications about Individual Events.  Shall only be present if the immediate reporting indication in the "immRep" attribute within the "evtReq" attribute sets to true in the event subscription, and the reports are available. | |  | |
| failEventReports | | array(FailureEventInfo) | | O | | 1..N | | Supplied by the NWDAF. When available, shall contain the event(s) for which the subscription is not successful including the failure reason(s). | |  | |
| consNfInfo | | ConsumerNfInformation | | O | | 0..1 | | Represents the analytics consumer NF Information. | | AnaSubTransfer | |
| prevSub | | PrevSubInfo | | O | | 0..1 | | Contains information about the previous analytics subscription that the NF service consumer had with the source NWDAF.  (NOTE 3) | | AnaCtxTransfer | |
| supportedFeatures | | SupportedFeatures | | C | | 0..1 | | List of Supported features used as described in clause 5.1.8.  This parameter shall be supplied by NF service consumer in the POST request that request the creation of an NWDAF Event Subscriptions resource, and shall be supplied by the NWDAF in the reply of corresponding request. | |  | |
| NOTE 1: If the "evtReq" attribute (of data type ReportingInformation) is provided and contains the "notifMethod" attribute, the notification method indicated by the "notifMethod" attribute within the ReportingInformation data type takes preference over the notification method indicated by the "notificationMethod" attribute within the EventSubscription data type.  NOTE 2: If the "evtReq" attribute (of data type ReportingInformation) is provided and contains the "repPeriod" attribute, the periodic reporting time indicated by the "repPeriod" attribute in the ReportingInformation data type takes preference over the periodic reporting time indicated by the "repetitionPeriod" attribute in the EventSubscription data type.  NOTE 3: The "prevSub" attribute may be used by the NWDAF to derive analytics context identifier(s), which may be used in the Nnwdaf\_AnalyticsInfo\_ContextTransfer service operation invoked by the NWDAF. | | | | | | | | | | | |

##### 5.1.6.2.3 Type EventSubscription

Table 5.1.6.2.3-1: Definition of type EventSubscription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| anySlice | AnySlice | C | 0..1 | Default is "false". (NOTE 1) |  |
| appIds | array(ApplicationId) | C | 1..N | Represents the Application Identifier(s) to which the subscription applies.  The absence of appIds means subscription to all applications. (NOTE 8) | ServiceExperience  UeCommunication  AbnormalBehaviour  Dispersion  DnPerformance |
| dnns | array(Dnn) | C | 1..N | Represents the DNN(s) to which the subscription applies. Each DNN is a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only.  The absence of dnns means subscription to all DNNs. (NOTE 8) | ServiceExperience, AbnormalBehaviour  UeCommunication  RedundantTransmissionExp  DnPerformance  SMCCE |
| dnais | array(Dnai) | C | 1..N | Represents the Data Network Access Identifier(s) of user plane access to DN(s) which the subscription applies. | ServiceExperience  DnPerformance |
| event | NwdafEvent | M | 1 | Event that is subscribed. |  |
| extraReportReq | EventReportingRequirement | O | 0..1 | The extra event reporting requirement information. |  |
| ladnDnns | array(Dnn) | O | 1..N | LADN DNN(s) to indicate the LADN service area(s) as the AoI(s). | UeMobilityExt |
| loadLevelThreshold | integer | C | 0..1 | Indicates that the NWDAF shall report the corresponding network slice load level to the NF service consumer where the load level of the network slice identified by snssais is reached. (NOTE 4)  May be included when subscribed event is "SLICE\_LOAD\_LEVEL".  Minimum = 0. Maximum = 100. |  |
| matchingDir | MatchingDirection | O | 0..1 | A matching direction may be provided alongside a threshold. If omitted, the default value is CROSSED. | NfLoad, QoSSustainability, UserDataCongestion, NetworkPerformance, NsiLoadExt |
| nfLoadLvlThds | array(ThresholdLevel) | C | 1..N | Shall be supplied in order to start reporting when an average load level is reached. (NOTE 4) | NfLoad |
| networkArea | NetworkAreaInfo | C | 0..1 | Identification of network area to which the subscription applies.  The absence of networkArea means subscription to all network areas. (NOTE 7, NOTE 8) | ServiceExperience  UeMobility  UeCommunication  QoSSustainability  AbnormalBehaviour  UserDataCongestion  NetworkPerformance  NsiLoadExt  NfLoadExt  Dispersion  RedundantTransmissionExp  WlanPerformance  DnPerformance |
| visitedAreas | array(NetworkAreaInfo) | O | 1..N | Indicates the visited network area(s) which the UEs had previously been in at least one of the Visited Area(s) of Interest.  (NOTE 10) | UeMobilityExt |
| maxTopAppUlNbr | Uinteger | O | 0..1 | Indicates the requested maximum number of top applications that contribute the most to the traffic in Uplink direction. Minimum = 1.  May be included when one of the elements in the "listOfAnaSubsets" attribute is set to LIST\_OF\_TOP\_APP\_UL. | UserDataCongestionExt |
| maxTopAppDlNbr | Uinteger | O | 0..1 | Indicates the requested maximum number of top applications that contribute the most to the traffic in Downlink direction. Minimum = 1.  May be included when one of the elements in the "listOfAnaSubsets" attribute is set to LIST\_OF\_TOP\_APP\_DL. | UserDataCongestionExt |
| nfInstanceIds | array(NfInstanceId) | O | 1..N | Identification(s) of NF instance(s). | NfLoad |
| nfSetIds | array(NfSetId) | O | 1..N | Identification(s) of NF instance set(s). | NfLoad |
| nfTypes | array(NFType) | O | 1..N | Identification(s) of NF type(s). (NOTE 13) | NfLoad  NsiLoadExt |
| notificationMethod | NotificationMethod | O | 0..1 | Indicate the notification method. (NOTE 2) |  |
| nsiIdInfos | array(NsiIdInfo) | O | 1..N | Each element identifies the S-NSSAI and the optionally associated network slice instance(s).  May be included when subscribed event is "NSI\_LOAD\_LEVEL",  "SERVICE\_EXPERIENCE" or "DN\_PERFORMANCE".  (NOTE 1) | ServiceExperience  NsiLoad  DnPerformance |
| nsiLevelThrds | array(Uinteger) | O | 1..N | Identifies the load threshold for each S-NSSAI or S-NSSAI and the optionally associated network slice instance identified by the "nsiIds" attribute within the "nsiIdInfos" attribute.  (NOTE 4)  Minimum = 0. Maximum = 100. | NsiLoad |
| qosRequ | QosRequirement | C | 0..1 | Indicates the QoS requirements. It shall be included when subscribed event is "QOS\_SUSTAINABILITY". | QoSSustainability |
| qosFlowRetThds | array(RetainabilityThreshold) | C | 1..N | Represents the QoS flow retainability thresholds. Shall be supplied for the 5QI ("5qi" in "qosRequ") or resource type ("resType" in "qosRequ") of GBR resource type. (NOTE 4) | QoSSustainability |
| ranUeThrouThds | array(BitRate) | C | 1..N | Represents the RAN UE throughput thresholds.  Shall be supplied for the 5QI ("5qi" in "qosRequ") or resource type ("resType" in "qosRequ") of non-GBR resource type. (NOTE 4) | QoSSustainability |
| repetitionPeriod | DurationSec | C | 0..1 | Shall be supplied for notification method "PERIODIC" by the "notificationMethod" attribute. |  |
| snssais | array(Snssai) | C | 1..N | Identification(s) of network slice(s) to which the subscription applies. (NOTE 1, NOTE 8) |  |
| tgtUe | TargetUeInformation | O | 0..1 | Identifies target UE information.  (NOTE 3) |  |
| congThresholds | array(ThresholdLevel) | C | 1..N | Represents the congestion threshold levels. (NOTE 4) | UserDataCongestion |
| nwPerfRequs | array(NetworkPerfRequirement) | C | 1..N | Represents the network performance requirements. This attribute shall be included when subscribed event is "NETWORK\_PERFORMANCE". | NetworkPerformance |
| bwRequs | array(BwRequirement) | O | 1..N | Represents the bandwidth requirement for each application.  It may only be present if "appIds" attribute is provided. | ServiceExperience |
| excepRequs | array(Exception) | C | 1..N | Represents a list of Exception Ids with associated thresholds. May only be present when subscribed event is "ABNORMAL\_BEHAVIOUR".  (NOTE 5, NOTE 6, NOTE 8) | AbnormalBehaviour |
| exptAnaType | ExpectedAnalyticsType | C | 0..1 | Represents expected UE analytics type.  It shall not be present if the "excepRequs" attribute is provided. (NOTE 6, NOTE 8) | AbnormalBehaviour |
| exptUeBehav | ExpectedUeBehaviourData | O | 0..1 | Represents expected UE behaviour. | AbnormalBehaviour |
| ratFreqs | array(RatFreqInformation) | O | 1..N | Identification(s) of the RAT type(s) and/or frequency(ies) of UE's serving cell(s) which the subscription applies. (NOTE 9) | ServiceExperienceExt |
| listOfAnaSubsets | array(AnalyticsSubset) | O | 1..N | The list of analytics subsets can be used to indicate the content of the analytics. | EneNA |
| disperReqs | array(DispersionRequirement) | O | 1..N | Represents the dispersion analytics requirements. | Dispersion |
| redTransReqs | array(RedundantTransmissionExpReq) | O | 1..N | Represents the redundant transmission experience analytics requirements. | RedundantTransmissionExp |
| wlanReqs | array(WlanPerformanceReq) | O | 1..N | Represents other WLAN performance analytics requirements. If the attribute contains no content, may take default handling action. | WlanPerformance |
| upfInfo | UpfInformation | O | 0..1 | Identifies the UPF. (NOTE 12) | ServiceExperienceExt  DnPerformance |
| appServerAddrs | array(AddrFqdn) | C | 1..N | Each element represents the Application Server Instance (IP address/FQDN of the Application Server). (NOTE 11) | ServiceExperienceExt  DnPerformance |
| dnPerfReqs | array(DnPerformanceReq) | O | 1..N | Represents the DN performance analytics requirements. | DnPerformance |
| NOTE 1: The "anySlice" attribute is not applicable to features "UeMobility" and "NetworkPerformance". The "snssais" attribute is not applicable to features "ServiceExperience", "NsiLoad", "UeMobility" and "NetworkPerformance". When subscribed event is "SLICE\_LOAD\_LEVEL", the identifications of network slices, either information about slice(s) identified by "snssais", or "anySlice" set to "true" shall be included. When subscribed event is "QOS\_SUSTAINABILITY", "NF\_LOAD", "UE\_COMM", "ABNORMAL\_BEHAVIOUR", "USER\_DATA\_CONGESTION", "DISPERSION" or "RED\_TRANS\_EXP", the identifications of network slices identified by "snssais" is optional. When subscribed event is "NSI\_LOAD\_LEVEL", "SERVICE\_EXPERIENCE" or "DN\_PERFORMANCE", either the "nsiIdInfos" attribute or "anySlice" set to "true" shall be included.  NOTE 2: When notificationMethod is not supplied, the default value is "THRESHOLD".  NOTE 3: Applicability is further described in the corresponding data type.  NOTE 4: This property shall be provided if the "notifMethod" in "evtReq" is set to "ON\_EVENT\_DETECTION" or "notificationMethod" in "eventSubscriptions" is set to "THRESHOLD" or omitted.  NOTE 5: Only "excepId" and "excepLevel" within the Exception data type apply to the "excepRequs" attribute within EventSubscription data type.  NOTE 6: Either "excepRequs" or "exptAnaType" shall be provided if subscribed event is "ABNORMAL\_BEHAVIOUR".  NOTE 7: For "NETWORK\_PERFORMANCE", "SERVICE\_EXPERIENCE", "USER\_DATA\_CONGESTION" or "DN\_PERFORMANCE" event, this attribute shall be provided if the event applied for all UEs (i.e. "anyUe" attribute set to true within the "tgtUe" attribute). For "QOS\_SUSTAINABILITY", this attribute shall be provided.  NOTE 8: For "ABNORMAL\_BEHAVIOUR" event with "anyUe" attribute in "tgtUe" attribute sets to true,  - at least one of the "networkArea" and the "snssais" attribute should be included, if the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via the "excepRequs" attribute is mobility related;  - at least one of the "networkArea", "appIds", "dnns" and "snssais" attribute should be included, if the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via the "excepRequs" attribute is communication related;  - the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via "excepRequs" attribute shall not be requested for both mobility and communication related analytics at the same time.  NOTE 9: If both the "allFreq" attribute and the "allRat" attribute are present within the RatFreqInformation data type, then only one instance of the RatFreqInformation data typeshall be present to indicate for all the RAT type and all the Frequency values the NWDAF has received for the application.  NOTE 10: If this attribute is provided, the analytics target period shall be a past time period (i.e. only statistics is supported).  NOTE 11: This parameter shall be provided when a consumer requires analytics for an edge application over a UP path.  NOTE 12: This parameter may be provided when a consumer requires analytics for an edge application over a UP path.  NOTE 13: When subscribed event is "NSI\_LOAD\_LEVEL" and the NsiLoadExt feature is supported, and the NF service consumer provides the "nfTypes" attribute, then the NWDAF accounts only for the resource usage of the NF types included in "nfTypes" to derive the output analytics. If the "nfTypes" attribute is not provided, then NWDAF accounts for the resource usage of all NF types. | | | | | |

NOTE: Care needs to be taken to avoid excessive signalling.

##### 5.1.6.2.4 Type NnwdafEventsSubscriptionNotification

Table 5.1.6.2.4-1: Definition of type NnwdafEventsSubscriptionNotification

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| eventNotifications | array(EventNotification) | C | 1..N | Notifications about Individual Events.  (NOTE 1) |  |
| subscriptionId | string | M | 1 | String identifying a subscription to the Nnwdaf\_EventsSubscription service. (NOTE 2) |  |
| notifCorrId | string | O | 0..1 | Notification correlation identifier. | EneNA |
| oldSubscriptionId | string | C | 0..1 | Subscription ID which was allocated by the source NWDAF.  This parameter shall be present if the notification is for informing the assignment of a new Subscription Id by the target NWDAF in the analytics transfer procedure.  (NOTE 1) | EneNA |
| resourceUri | Uri | C | 1 | The resource URI of the Individual NWDAF Event Subscription resource created by the target NWDAF.  Shall be present when the target NWDAF notifies a successful analytics subscription transfer.  (NOTE 1) (NOTE 2) | EneNA |
| NOTE 1: Either "eventNotifications" attribute, or "resourceUri" and "oldSubscriptionId" attributes shall be provided.  NOTE 2: It shall be the same as the last segment of the “resourceUri” attribute when the target NWDAF notifies the consumer of the successful analytics subscription transfer. | | | | | |

##### 5.1.6.2.5 Type EventNotification

Table 5.1.6.2.5-1: Definition of type EventNotification

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | | P | Cardinality | | Description | | Applicability | |
| event | | NwdafEvent | | | M | 1 | | Event that is notified. | |  | |
| start | | DateTime | | | O | 0..1 | | It defines the start time of which the statistics analytics information is applicable or predictions analytics information is valid. (NOTE 1) (NOTE 4) | |  | |
| expiry | | DateTime | | | O | 0..1 | | It defines the expiration time after which the statistics analytics information is not applicable or predictions analytics information is invalid. (NOTE 1) (NOTE 4) | |  | |
| timeStampGen | | DateTime | | | C | 0..1 | | It defines the timestamp of analytics generation. (NOTE 3) | |  | |
| failNotifyCode | | NwdafFailureCode | | C | 0..1 | | | Identifies the failure reason for the event notification.  It shall only be included if the event notification is failed or the analytics information is not ready. (NOTE 2) | | EneNA | |
| rvWaitTime | | DurationSec | | O | 0..1 | | | Indicate a recommended time interval (in seconds) which is used to determine the time when analytics information is needed in similar future event subscriptions. It may only be included if the "failNotifyCode" attribute sets to "UNSATISFIED\_REQUESTED\_ANALYTICS\_TIME". | | EneNA | |
| anaMetaInfo | | AnalyticsMetadataInfo | | C | 0..1 | | | Contains information about analytics metadata required to aggregate the analytics. It shall be present if the "anaMeta" attribute was included in the subscription, containing the information indicated by the "anaMeta" attribute. | | Aggregation | |
| nwPerfs | | array(NetworkPerfInfo) | | | C | 1..N | | The network performance information.  Shall be present when subscribed even is "NETWORK\_PERFORMANCE". | | NetworkPerformance | |
| nfLoadLevelInfos | | array(NfLoadLevelInformation) | | | C | 1..N | | The NF load level information. When subscribed event is "NF\_LOAD", the nfLoadLevelInfos shall be included. | | NfLoad | |
| nsiLoadLevelInfos | | array(NsiLoadLevelInfo) | | | C | 1..N | | Each element identifies the load level information for each S-NSSAI and the optionally associated network slice instance.  Shall be included when subscribed event is "NSI\_LOAD\_LEVEL". | | NsiLoad | |
| qosSustainInfos | | array(QosSustainabilityInfo) | | | C | 1..N | | The QoS sustainability information.  When subscribed event is "QOS\_SUSTAINABILITY", the qosSustainInfos shall be included. | | QoSSustainability | |
| sliceLoadLevelInfo | | SliceLoadLevelInformation | | | C | 0..1 | | The slices and the load level information.  When subscribed event is "SLICE\_LOAD\_LEVEL", the sliceLoadLevelInfo shall be included. | |  | |
| svcExps | | array(ServiceExperienceInfo) | | | C | 1..N | | The service experience information.  When subscribed event is "SERVICE\_EXPERIENCE", the svcExps shall be included. | | ServiceExperience | |
| ueComms | | array(UeCommunication) | | | C | 1..N | | The UE communication information.  When subscribed event is "UE\_COMM", the ueComms shall be included. | | UeCommunication | |
| ueMobs | | array(UeMobility) | | | C | 1..N | | The UE mobility information.  When subscribed event is "UE\_MOBILITY", the ueMobs shall be included. | | UeMobility | |
| abnorBehavrs | | array(AbnormalBehaviour) | | | C | 1..N | | The Abnormal Behaviour information.  When subscribed event is "ABNORMAL\_BEHAVIOUR", the abnorBehavrs shall be included. | | AbnormalBehaviour | |
| userDataCongInfos | | array(UserDataCongestionInfo) | | | C | 1..N | | The location and user data congestion information.  Shall be present if the subscribed event is "USER\_DATA\_CONGESTION". | | UserDataCongestion | |
| dnPerfInfos | | array(DnPerfInfo) | | | C | 1..N | | The DN performance information.  Shall be present if the subscribed event is "DN\_PERFORMANCE". | | DnPerformance | |
| disperInfos | | array(DispersionInfo) | | | C | 1..N | | The Dispersion information.  When subscribed event is "DISPERSION", the "disperInfos" attribute shall be included. | | Dispersion | |
| redTransInfos | | array(RedundantTransmissionExpInfo) | | | C | 1..N | | The redundant transmission experience related information.  When subscribed event is "RED\_TRANS\_EXP", the "redTransInfos" attribute shall be included. | | RedundantTransmissionExp | |
| wlanInfos | | array(WlanPerformanceInfo) | | | C | 1..N | | The WLAN performance related information.  When subscribed event is "WLAN\_PERFORMANCE", the "wlanInfos" attribute shall be included. | | WlanPerformance | |
| smccExps | | array(SmcceInfo) | | | C | 1..N | | The Session Management Congestion Control Experience information.  Shall be present when the requested event is "SM\_CONGESTION". | | SMCCE | |
| NOTE 1: If the "start" attribute and the "expiry" attribute are both provided, the DateTime of the "expiry" attribute shall not be earlier than the DateTime of the "start" attribute.  NOTE 2: The values of "UNAVAILABLE\_DATA" and "BOTH\_STAT\_PRED\_NOT\_ALLOWED" of the NwdafFailureCode data type are not applicable for the "failNotifyCode" attribute.  NOTE 3: This attribute shall be included when ADRF is deployed.  NOTE 4: The validity period specified by "start" and "expiry" attributes is determined by NWDAF internal logic, and is a subset of the analytics target period indicated by "startTs" and "endTs", or "offsetPeriod" attributes contained in "ana-req" attribute. If the analytics target period refers to the past, the period specified by these two attributes indicate the time period over which the statistics are applicable. If the analytics target period refers to the future, the period specified by these two attributes indicate the time period over which the predictions are valid. | | | | | | | | | | | |

##### 5.1.6.2.6 Type SliceLoadLevelInformation

Table 5.1.6.2.6-1: Definition of type SliceLoadLevelInformation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| loadLevelInformation | LoadLevelInformation | M | 1 | Load level information which applies for each network slice identified by snssais. |  |
| snssais | array(Snssai) | M | 1..N | Identification(s) of network slice to which the subscription applies. |  |

NOTE: The functionality of the Slice Load Level Information is a subset of the functionality of the NSI Load Level Information, does not need to be used if the NsiLoadExt feature is supported, and is maintained only for backwards compatibility purposes.

##### 5.1.6.2.7 Type EventReportingRequirement

Table 5.1.6.2.7-1: Definition of type EventReportingRequirement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| accuracy | Accuracy | O | 0..1 | Preferred level of accuracy of the analytics. (NOTE 5) |  |
| accPerSubset | array(Accuracy) | O | 1..N | Each element indicates the preferred accuracy level per analytics subset. It may be present if the "listOfAnaSubsets" attribute is present in the subscription request when the subscription event is NF\_LOAD, UE\_COMM, DISPERSION, NETWORK\_PERFORMANCE, WLAN\_PERFORMANCE, DN\_PERFORMANCE or SERVICE\_EXPERIENCE. (NOTE 4, NOTE 5) | EneNA |
| startTs | DateTime | O | 0..1 | UTC time indicating the start time of the observation period.  The absence of this attribute means subscription at the present time unless the "offsetPeriod" attribute is included. (NOTE 3) |  |
| endTs | DateTime | O | 0..1 | UTC time indicating the end time of the observation period.  If the start time is in the past, then the absence of this attribute means that the end time of the subscription is at the present time, unless the "offsetPeriod" attribute is included.  If provided, it shall not be less than the start time. (NOTE 3) |  |
| offsetPeriod | integer | O | 0..1 | Offset period in units of seconds to the reporting time, if the value is negative means statistics in the past offset period, otherwise a positive value means prediction in the future offset period. May be present if the "repPeriod" attribute is included within the "evtReq" attribute. (NOTE 3) | EneNA |
| sampRatio | SamplingRatio | O | 0..1 | Percentage of sampling (1%...100%) among impacted UEs.  Applicable to event targeting a group of UEs or any UE.  (NOTE 1) |  |
| maxSupiNbr | Uinteger | O | 0..1 | Represents the maximum number of SUPIs expected in an object.  Applicable for the event(s) providing a list of SUPIs during the analytics response. |  |
| maxObjectNbr | Uinteger | O | 0..1 | Maximum number of objects expected for an analytics report. It's only applicable for the event(s) which may provide more than one entries or objects during event notification. |  |
| timeAnaNeeded | DateTime | O | 0..1 | UTC time indicating the time when analytcs information is needed. | EneNA |
| anaMeta | array(AnalyticsMetadata) | O | 1..N | List of analytics metadata that are requested to be included. | Aggregation |
| anaMetaInd | AnalyticsMetadataIndication | O | 0..1 | Contains values for the analytics metadata that the NF service consumer wants to be used for generating the analytics. | Aggregation |
| histAnaTimePeriod | TimeWindow | O | 0..1 | The time period of historical analytics indicates the start time and end time during which the historical analytics was generated. If this attribute is included, the NWDAF only needs to provide the existing analytics, and does not need to generate new analytics. | EneNA |
| NOTE 1: The "sampRatio" attribute within EventReportingRequirement data type is not applicable for the Nnwdaf\_EventsSubscription API.  NOTE 2: Void.  NOTE 3: When the "offsetPeriod" attribute is included, the "startTs" and "endTs" attributes shall not be included. If the analytics target period is indicated either by providing a "startTs" attribute and an "endTs" attribute that are equal, or by providing an "offsetPeriod" attribute equal to zero (which means there is no offset to the periodic reporting time indicated by the "repPeriod" attribute), then this is a request for analytics for a specific time of the same "startTs" attribute and "endTs" attribute or each specific time periodically indicated by the "repPeriod" attribute , rather than for a time interval. If none of the attributes "startTs", "endTs" and "offsetPeriod" is provided, the analytics target period starts at the present time and there is no specified end time.  NOTE 4: If multiple accuracy entries are included, the order of the entries of the "accPerSubset" attribute corresponds with the order of the entries of the "listOfAnaSubsets" attribute, i.e. the first entry of the "accPerSubset" attribute holds the requested accuracy for the analytics subset that is indicated by the first entry of the "listOfAnaSubsets" attribute, and so on.  NOTE 5: If both the "accuracy" attribute and "accPerSubset" attribute were provided in the request, the "accPerSubset" attribute takes precedence over the "accuracy" attribute. | | | | | |

##### 5.1.6.2.8 Type TargetUeInformation

Table 5.1.6.2.8-1: Definition of type TargetUeInformation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Attribute name** | **Data type** | **P** | **Cardinality** | **Description** | **Applicability** |
| anyUe | boolean | O | 0..1 | Identifies any UE when setting to "true".  Default value is "false" if omitted. (NOTE 3) | ServiceExperience  NetworkPerformance  NfLoad  UserDataCongestion  AbnormalBehaviour  QoSSustainability  Dispersion  RedundantTransmissionExp  WlanPerformance  DnPerformance |
| supis | array(Supi) | O | 1..N | Each element represents a SUPI for a UE.  (NOTE 2) | UeMobility  UeCommunication  NetworkPerformance  AbnormalBehaviour  UserDataCongestion  NfLoad  ServiceExperience  Dispersion  RedundantTransmissionExp  WlanPerformance  SMCCE  DnPerformance |
| gpsis | array(Gpsi) | O | 1..N | Each element represents a GPSI for a UE.  (NOTE 2) | UserDataCongestionExt  DnPerformance |
| intGroupIds | array(GroupId) | O | 1..N | Each element represents an internal group identifier and identifies a group of UEs.  (NOTE 2) | UeMobility  UeCommunication  NetworkPerformance  AbnormalBehaviour  ServiceExperience  Dispersion  RedundantTransmissionExp  WlanPerformance  DnPerformance |
| NOTE 1: For an applicable feature or UserDataCongestion and UserDataCongestionExt features are both applicable, only one attribute identifying the target UE shall be provided.  NOTE 2: Only one element in the attribute shall be provided for the applicable events except the "SERVICE\_EXPERIENCE" event, the "DISPERSION" event and/or the "SMCCE" event.  NOTE 3: For feature "Dispersion", any UE is only supported in combination with S-NSSAI, Area of Interest and/or Dispersion Class. | | | | | |

##### 5.1.6.2.9 Void

##### 5.1.6.2.10 Type UeMobility

Table 5.1.6.2.10-1: Definition of type UeMobility

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

##### 5.1.6.2.11 Type LocationInfo

Table 5.1.6.2.11-1: Definition of type LocationInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| loc | UserLocation | M | 1 | This attribute contains the detailed location, the ueLocationTimestamp attribute in the 3GPP access type of UserLocation data type shall not be provided. |  |
| ratio | SamplingRatio | C | 0..1 | This attribute contains the percentage of UEs with same analytics result in the group.  Shall be present if the analytics result applies for a group of UEs. |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.12 Void

##### 5.1.6.2.13 Type UeCommunication

Table 5.1.6.2.13-1: Definition of type UeCommunication

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| commDur | DurationSec | M | 1 | Identifies the duration of the communication.  If the analytics result applies for a group of UEs, it indicates the average duration for the subset of UEs indicated by a given ratio in the group. |  |
| commDurVariance | Float | C | 0..1 | This attribute indicates the variance of the analysed durations for the subset of UEs indicated by a given ratio in the group. It shall be provided if the analytics result applies for a group of UEs. |  |
| perioTime | DurationSec | O | 0..1 | Identifies interval time of periodic communication, e.g. every 10 minutes or 1 hour. (NOTE 2)  If the analytics result applies for a group of UEs, it indicates the average interval time of periodic communication for the subset of UEs indicated by a given ratio in the group. |  |
| perioTimeVariance | Float | C | 0..1 | This attribute indicates the variance of the analysed intervals of periodic communication for the subset of UEs indicated by a given ratio in the group. It shall be provided if the analytics result applies for a group of UEs. |  |
| ts | DateTime | C | 0..1 | Identifies the start time of the communication. (NOTE 1) |  |
| tsVariance | Float | O | 0..1 | This attribute indicates the variance of the analysed start time for the subset of UEs indicated by a given ratio in the group. It may only be provided if the ts attribute is provided. |  |
| recurringTime | ScheduledCommunicationTime | C | 0..1 | Identifies time of the day and day of the week which are valid within the observation period when the UE has communication. Providing the end time in ScheduledCommunicationTime data type is not required. (NOTE 1, NOTE 3) |  |
| trafChar | TrafficCharacterization | M | 1 | Identifies the detailed traffic characterization. |  |
| ratio | SamplingRatio | C | 0..1 | This attribute contains the percentage of UEs with same analytics result in the group.  Shall be present if the analytics result applies for a group of UEs. |  |
| perioCommInd | boolean | O | 0..1 | This attribute indicates whether the UE communicates periodically or not.  Set to "true" to indicate the UE communicates periodically, otherwise set to "false" or omit. | UeCommunicationExt |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE 4)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| anaOfAppList | AppListForUeComm | C | 0..1 | Represents the analytics of the application list used by UE.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to APP\_LIST\_FOR\_UE\_COMM. | UeCommunicationExt |
| sessInactTimer | SessInactTimerForUeComm | C | 0..1 | Represents the N4 Session inactivity timer.  Shall be present only if one of the elements in the "listOfAnaSubsets" attribute was set to N4\_SESS\_INACT\_TIMER\_FOR\_UE\_COMM and the identified NF service consumer is an SMF. (NOTE 5) | UeCommunicationExt |
| NOTE 1: Either "ts" or "recurringTime" shall be provided.  NOTE 2: If this attribute is present, it indicates the communication is periodic and its value shall be larger than the commDur value. If this attribute is present with the ts attribute, it indicates the periodic communication time valid within the observation period; if it is present with the recurringTime attribute, it indicates the periodic communication time valid within the day(s).  NOTE 3: If this attribute is present, it indicates the communication is periodic. This attribute is suitable to be present for a recurring communication in a long observation time.  NOTE 4: If the requested period identified by the "startTs" and "endTs" attributes in the EventReportingRequirement type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence.  NOTE 5: This attribute shall not be provided if the NWDAF does not know the NF service consumer type or if the NWDAF knows that the NF service consumer is not an SMF. | | | | | |

##### 5.1.6.2.14 Type TrafficCharacterization

Table 5.1.6.2.14-1: Definition of type TrafficCharacterization

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| appId | ApplicationId | O | 0..1 | Contains the application identifier. |  |
| dnn | Dnn | O | 0..1 | Identifies DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only.  Shall be present if the "dnns" was provided within EventSubscription during the subscription for event notification procedure. |  |
| snssai | Snssai | C | 0..1 | Identifies the network slice.  Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |  |
| fDescs | array(IpEthFlowDescription) | O | 1..2 | Contains the flow description for the Uplink and/or Downlink flows. |  |
| ulVol | Volume | C | 0..1 | Identifies the uplink traffic volume. (NOTE)  If the analytics result applies for a group of UEs, it indicates the average uplink traffic volume for the subset of UEs indicated by a given ratio in the group. |  |
| ulVolVariance | Float | C | 0..1 | This attribute indicates the variance of the uplink traffic volumes for the subset of UEs indicated by a given ratio in the group. It shall be provided if the analytics result applies for a group of UEs. |  |
| dlVol | Volume | C | 0..1 | Identifies the downlink traffic volume. (NOTE)  If the analytics result applies for a group of UEs, it indicates the average downlink traffic volume for the subset of UEs indicated by a given ratio in the group. |  |
| dlVolVariance | Float | C | 0..1 | This attribute indicates the variance of the downlink traffic volumes for the subset of UEs indicated by a given ratio in the group. It shall be provided if the analytics result applies for a group of UEs. |  |
| NOTE: At least one of "ulVol" or "dlVol" shall be provided. | | | | | |

##### 5.1.6.2.15 Type AbnormalBehaviour

Table 5.1.6.2.15-1: Definition of type AbnormalBehaviour

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| supis | array(Supi) | C | 1..N | Each element identifies a UE which is affected with the Exception.  Shall be present if the subscription request applies to more than one UE. |  |
| dnn | Dnn | C | 0..1 | Identifies DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only.  Shall be present if the "dnns" was provided within EventSubscription during the subscription for event notification procedure. |  |
| excep | Exception | M | 1 | Contains the exception information. |  |
| snssai | Snssai | C | 0..1 | Identifies the network slice information.  Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |  |
| ratio | SamplingRatio | C | 0..1 | Contains the percentage of UEs with same analytics result in the group or among all UEs.  Shall be present if the analytics result applies for a group of UEs or any UE. |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| addtMeasInfo | AdditionalMeasurement | O | 0..1 | Additional measurement. |  |
| NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.16 Type Exception

Table 5.1.6.2.16-1: Definition of type Exception

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| excepId | ExceptionId | M | 1 | Indicating the Exception ID. |  |
| excepLevel | integer | O | 0..1 | Measured level, compared to the threshold |  |
| excepTrend | ExceptionTrend | O | 0..1 | Measured trend |  |

##### 5.1.6.2.17 Type UserDataCongestionInfo

Table 5.1.6.2.17-1: Definition of type UserDataCongestionInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| networkArea | NetworkAreaInfo | M | 1 | Identification of network area to which the subscription applies. |  |
| congestionInfo | CongestionInfo | M | 1 | The congestion information of the specific location. |  |
| snssai | Snssai | C | 0..1 | Identifies an S-NSSAI.  Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |  |

##### 5.1.6.2.18 Type CongestionInfo

Table 5.1.6.2.18-1: Definition of type CongestionInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| congType | CongestionType | M | 1 | Identification congestion analytics type. |  |
| timeIntev | TimeWindow | M | 1 | Represents the start time and the stop time to which requested for the congestion information applies. |  |
| nsi | ThresholdLevel | M | 1 | Network Status Indication. |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| topAppListUl | array(TopApplication) | C | 1..N | List of top applications in Uplink. Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to LIST\_OF\_TOP\_APP\_UL. | UserDataCongestionExt |
| topAppListDl | array(TopApplication) | C | 1..N | List of top applications in Downlink. Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to LIST\_OF\_TOP\_APP\_DL. | UserDataCongestionExt |
| NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the EventReportingRequirement type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.19 Type QosSustainabilityInfo

Table 5.1.6.2.19-1: Definition of type QosSustainabilityInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| areaInfo | NetworkAreaInfo | M | 1 | Identification(s) of applicable location areas to which the subscription. |  |
| startTs | DateTime | M | 1 | Represents the start time of the applicable observing period. |  |
| endTs | DateTime | M | 1 | Represents the end time of the applicable observing period. |  |
| qosFlowRetThd | RetainabilityThreshold | C | 0..1 | The reporting QoS Flow Retainability Threshold that are met or crossed for 5QI of GBR resource type.  (NOTE 1) |  |
| ranUeThrouThd | BitRate | C | 0..1 | The reporting RAN UE Throughput Threshold that are met or crossed for 5QI of non-GBR resource type.  (NOTE 1) |  |
| snssai | Snssai | C | 0..1 | Identifies an S-NSSAI.  Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE 2)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| NOTE 1: Either "qosFlowRetThd" or "ranUeThrouThd" attribute shall be provided.  NOTE 2: If the requested period identified by the "startTs" and "endTs" attributes in the EventReportingRequirement type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.20 Type QosRequirement

Table 5.1.6.2.20-1: Definition of type QosRequirement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| 5qi | 5Qi | C | 0..1 | Represents a 5G QoS Identifier. It shall be included for standardized or preconfigured 5QIs. (NOTE) |  |
| gfbrUl | BitRate | C | 0..1 | Indicates GFBR in the uplink.  It shall be included for GBR 5QIs. |  |
| gfbrDl | BitRate | C | 0..1 | Indicates GFBR in the downlink.  It shall be included for GBR 5QIs. |  |
| resType | QosResourceType | C | 0..1 | Resource type.  Shall be provided for the non-standardized and non-preconfigured QoS characteristics. (NOTE) |  |
| pdb | PacketDelBudget | O | 0..1 | Packet Delay Budget.  May be supplied for the non-standardized and non-pre-configured QoS characteristics. |  |
| per | PacketErrRate | O | 0..1 | Packet Error Rate.  May be supplied for the non-standardized and non-pre-configured QoS characteristics. |  |
| NOTE: Either 5QI within "5qi" attribute or the resource type within "resType" attribute shall be provided. | | | | | |

##### 5.1.6.2.21 Type RetainabilityThreshold

Table 5.1.6.2.21-1: Definition of type RetainabilityThreshold

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| relFlowNum | Uinteger | C | 0..1 | Represents the number of abnormally released QoS flows. (NOTE) |  |
| relTimeUnit | TimeUnit | C | 0..1 | Represents the unit for the session active time, shall be present if relFlowNum is present. (NOTE) |  |
| relFlowRatio | SamplingRatio | C | 0..1 | Represents the ratio of abnormally released QoS flows to the total released QoS flows, expressed in percentage. (NOTE) |  |
| NOTE: Either "relFlowNum" and its associated "relTimeUnit" attributes or "relFlowRatio" attributes shall be provided. The "relFlowNum" and "relTimeUnit" attributes together represents the number of abnormally released QoS flows (i.e. relFlowNum) within the time unit (i.e. relTimeUnit). | | | | | |

##### 5.1.6.2.22 Type NetworkPerfRequirement

Table 5.1.6.2.22-1: Definition of type NetworkPerfRequirement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| nwPerfType | NetworkPerfType | M | 1 | The type of the network performance. |  |
| relativeRatio | SamplingRatio | C | 0..1 | The relative ratio expressed in percentage. (NOTE) |  |
| absoluteNum | Uinteger | C | 0..1 | The absolute number (NOTE) |  |
| NOTE: Either "relativeRatio" or "absoluteNum" shall be provided if the "notifMethod" in "evtReq" is set to "ON\_EVENT\_DETECTION" or "notificationMethod" in "eventSubscriptions" is set to "THRESHOLD" or omitted. | | | | | |

##### 5.1.6.2.23 Type NetworkPerfInfo

Table 5.1.6.2.23-1: Definition of type NetworkPerfInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| networkArea | NetworkAreaInfo | M | 1 | Identification of network area to which the subscription applies. |  |
| nwPerfType | NetworkPerfType | M | 1 | The type of the network performance |  |
| relativeRatio | SamplingRatio | C | 0..1 | The reported relative ratio expressed in percentage. (NOTE 1) |  |
| absoluteNum | Uinteger | C | 0..1 | The reported absolute number (NOTE 1) |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE 2)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| NOTE 1: Either "relativeRatio" or "absoluteNum" shall be provided.  NOTE 2: If the requested period identified by the "startTs" and "endTs" attributes in the EventReportingRequirement type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.24 Type ServiceExperienceInfo

Table 5.1.6.2.24-1: Definition of type ServiceExperienceInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| svcExprc | SvcExperience | M | 1 | Service experience |  |
| svcExprcVariance | Float | O | 0..1 | This attribute indicates the variance . |  |
| supis | array(Supi) | O | 1..N | Each element identifies a UE.  May only be present if the subscription request applies to more than one UE. (NOTE 3) |  |
| snssai | Snssai | C | 0..1 | Identifies an S-NSSAI.  Shall be presented if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |  |
| appId | ApplicationId | C | 0..1 | Identifies an application.  Shall be present if the "appIds" was provided within EventSubscription during the subscription for event notification procedure. |  |
| srvExpcType | ServiceExperienceType | O | 0..1 | Indicates the type of Service Experience analytics. | ServiceExperienceExt |
| ueLocs | array(LocationInfo) | C | 1..N | This attribute includes a list of UE location information during the time duration.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to UE\_LOCATION.  (NOTE 2) | ServiceExperienceExt |
| upfInfo | UpfInformation | C | 0..1 | Represents the information of the UPF serving the UE.  Shall be present only if the "upfInfo" attribute was provided in the request or subscription and the NF service consumer is identified as not an AF or a NEF. (NOTE 4) | ServiceExperienceExt |
| dnai | Dnai | C | 0..1 | Indicates the DN Access Identifier representing location of the service flow. Shall be present if the "dnais" attribute was provided in the request or subscription.  Shall be present if the "dnais" attribute was provided in the request or subscription. | ServiceExperienceExt |
| appServerInst | AddrFqdn | C | 0..1 | Represents the Application Server Instance (IP address or FQDN of the Application Server).  Shall be present if the "appServerAddrs" attribute was provided in the request or subscription. | ServiceExperienceExt |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE 1)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| dnn | Dnn | C | 0..1 | Identifies DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only.  Shall be present if the "dnns" was provided within EventSubscription during the subscription for event notification procedure. |  |
| networkArea | NetworkAreaInfo | C | 0..1 | Identifies the network area where the service experience applies. Shall be presented if the "networkArea" was provided within EventSubscription during the subscription for event notification procedure. |  |
| nsiId | NsiId | C | 0..1 | Identifies a network slice instance which is associated with the S-NSSAI identified by the "snssai" attribute.  Shall be presented if the "nsiIds" was provided within the NsiIdInfo data in the EventSubscription data during the subscription. |  |
| ratio | SamplingRatio | C | 0..1 | Contains the percentage of UEs with same analytics result in the group or among all UEs.  Shall be present if the analytics result applies for a group of UEs or any UE. (NOTE 3) |  |
| ratFreq | RatFreqInformation | C | 0..1 | Identification of the RAT type(s) and/or frequency(ies) of UE's serving cell(s) which the service experience applies.  Shall be present if the "ratFreqs" was provided in the EventSubscription data during the subscription.  When "allRat" and/or "allFreq" are included in the subscription, the NWDAF provides an instance of the Application service experience per combination of RAT Type(s) and/or Frequency value(s) having the same Service Experience. | ServiceExperienceExt |
| NOTE 1: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence.  NOTE 2: The "ueLocs" attribute shall only be included if the consumer analytics request is for a single UE or a list of UEs. Inclusion of such UE location requires user consent during the UE location data collection.  NOTE 3: The SUPI list and Ratio in the service experience information for an application may be omitted if the reported service experience information is provided and is assigned with the same value(s) for the slice instance which the application belongs to. Otherwise, the SUPI list and Ratio shall be provided for an application service experience.  NOTE 4: This attribute shall not be provided if the NWDAF does not know the NF service consumer type or if the NWDAF knows that the NF service consumer is an AF or a NEF. | | | | | |

##### 5.1.6.2.25 Type BwRequirement

Table 5.1.6.2.25-1: Definition of type BwRequirement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| appId | ApplicationId | M | 1 | Represents an application.  (NOTE) |  |
| marBwUl | BitRate | O | 0..1 | Maximum requested bandwidth for the Uplink. |  |
| marBwDl | BitRate | O | 0..1 | Maximum requested bandwidth for the Downlink. |  |
| mirBwUl | BitRate | O | 0..1 | Minimum requested bandwidth for the Uplink. |  |
| mirBwDl | BitRate | O | 0..1 | Minimum requested bandwidth for the Downlink. |  |
| NOTE: If the "appIds" attribute is provided within EventSubscription data, this attribute shall be indicated by the "appIds" attribute. | | | | | |

##### 5.1.6.2.26 Type AdditionalMeasurement

Table 5.1.6.2.26-1: Definition of type AdditionalMeasurement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| unexpLoc | NetworkAreaInfo | C | 0..1 | The unexpected locations which the UE stays.  It may only be present when the "excepId" within the Exception data sets to "UNEXPECTED\_UE\_LOCATION" |  |
| unexpFlowTeps | array(IpEthFlowDescription) | C | 1..N | Unexpected IP or Ethernet flow templates.  It may only be present when the "excepId" within the Exception data sets to "UNEXPECTED\_LONG\_LIVE\_FLOW" or "UNEXPECTED\_LARGE\_RATE\_FLOW". |  |
| unexpWakes | array(DateTime) | C | 1..N | Unexpected wake up times.  It may only be present when the "excepId" within the Exception data sets to "UNEXPECTED\_WAKEUP". |  |
| ddosAttack | AddressList | C | 0..1 | Victim's address list.  It may only be present when the "excepId" within the Exception data sets to "SUSPICION\_OF\_DDOS\_ATTACK". |  |
| wrgDest | AddressList | C | 0..1 | Wrong destination address list.  It may only be present when the "excepId" within the Exception data sets to "WRONG\_DESTINATION\_ADDRESS". |  |
| circums | array(CircumstanceDescription) | C | 1..N | The description of circumstances.  It may only be present when the "excepId" within the Exception data sets to "TOO\_FREQUENT\_SERVICE\_ACCESS", "UNEXPECTED\_RADIO\_LINK\_FAILURES" or "PING\_PONG\_ACROSS\_CELLS". |  |

##### 5.1.6.2.27 Type IpEthFlowDescription

Table 5.1.6.2.27-1: Definition of type FlowDescription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ipTrafficFilter | FlowDescription | 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. | | | | | |

##### 5.1.6.2.28 Type AddressList

Table 5.1.6.2.28-1: Definition of type AddressList

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ipv4Addrs | array(Ipv4Addr) | O | 1..N | Each element identifies an IPv4 address. |  |
| ipv6Addrs | array(Ipv6Addr) | O | 1..N | Each element identifies an IPv6 address. |  |
| NOTE: At least one of "ipv4Addrs" or "ipv6Addrs" shall be provided. | | | | | |

##### 5.1.6.2.29 Type CircumstanceDescription

Table 5.1.6.2.29-1: Definition of type CircumstanceDescription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| freq | Float | O | 0..1 | Communication frequency of the UE in units of MHz. |  |
| tm | DateTime | O | 0..1 | Time when UE enters the location. |  |
| locArea | NetworkAreaInfo | C | 0..1 | The location of the UE.  It shall be present when the "excepId" within the Exception data sets to "UNEXPECTED\_RADIO\_LINK\_FAILURES" or "PING\_PONG\_ACROSS\_CELLS". |  |
| vol | Volume | C | 0..1 | The traffic volume.  It shall be present when the "excepId" within the Exception data sets to "TOO\_FREQUENT\_SERVICE\_ACCESS" or "UNEXPECTED\_LARGE\_RATE\_FLOW ". |  |

##### 5.1.6.2.30 Type ThresholdLevel

Table 5.1.6.2.30 -1: Definition of type ThresholdLevel

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| congLevel | integer | C | 0..1 | Value of Congestion that triggers notification (NOTE 1) | UserDataCongestion |
| nfLoadLevel | integer | C | 0..1 | Value of NF Load that triggers notification (NOTE 2)  Minimum = 0. Maximum = 100. | NfLoad |
| nfCpuUsage | integer | C | 0..1 | Value of NF CPU Usage that triggers notification (NOTE 2)  Minimum = 0. Maximum = 100. | NfLoad |
| nfMemoryUsage | integer | C | 0..1 | Average usage of memory (NOTE 2)  Minimum = 0. Maximum = 100. | NfLoad |
| nfStorageUsage | integer | C | 0..1 | Average usage of storage (NOTE 2)  Minimum = 0. Maximum = 100. | NfLoad |
| avgTrafficRate | BitRate | C | 0..1 | Threshold level of average traffic rate.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to AVG\_TRAFFIC\_RATE.  (NOTE 3) | DnPerformance |
| maxTrafficRate | BitRate | C | 0..1 | Threshold level of maximum traffic rate.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to MAX\_TRAFFIC\_RATE.  (NOTE 3) | DnPerformance |
| avgPacketDelay | PacketDelBudget | C | 0..1 | Threshold level of average Packet Delay.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to AVG\_PACKET\_DELAY.  (NOTE 3) | DnPerformance |
| maxPacketDelay | PacketDelBudget | C | 0..1 | Threshold level of maximum Packet Delay.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to MAX\_PACKET\_DELAY.  (NOTE 3) | DnPerformance |
| avgPacketLossRate | PacketLossRate | C | 0..1 | Threshold level of average Loss Rate.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to AVG\_PACKET\_LOSS\_RATE.  (NOTE 3) | DnPerformance |
| svcExpLevel | float | C | 0..1 | Service Experience MOS value. Shall be present when subscribed event is "SERVICE\_EXPERIENCE". | ServiceExperienceExt |
| NOTE 1: This attribute shall be provided when subscribed event is "USER\_DATA\_CONGESTION".  NOTE 2: At least one attribute should be provided when subscribed event is "NF\_LOAD".  NOTE 3: At least one attribute should be provided when subscribed event is "DN\_PERFORMANCE". | | | | | |

##### 5.1.6.2.31 Type NfLoadLevelInformation

Table 5.1.6.2.31-1: Definition of type NfLoadLevelInformation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| nfType | NFType | M | 1 | Type of the NF instance |  |
| nfInstanceId | NfInstanceId | M | 1 | Identification of the NF instance |  |
| nfSetId | NfSetId | O | 0..1 | Identification of the NF instance set |  |
| nfStatus | NfStatus | C | 0..1 | Availability status of the NF (NOTE 1) |  |
| nfCpuUsage | integer | C | 0..1 | Average usage CPU (NOTE 1, NOTE 2)  Minimum = 0. Maximum = 100. |  |
| nfMemoryUsage | integer | C | 0..1 | Average usage of memory (NOTE 1, NOTE 2)  Minimum = 0. Maximum = 100. |  |
| nfStorageUsage | integer | C | 0..1 | Average usage of storage (NOTE 1, NOTE 2)  Minimum = 0. Maximum = 100. |  |
| nfLoadLevelAverage | integer | C | 0..1 | Average load information (NOTE 1, NOTE 2)  Minimum = 0. Maximum = 100. |  |
| nfLoadLevelPeak | integer | C | 0..1 | Peak load information (NOTE 1, NOTE 2)  Minimum = 0. Maximum = 100. |  |
| nfLoadAvgInAoi | integer | C | 0..1 | The average load of the NF instances over the area of interest. (NOTE 1, NOTE 2, NOTE 4)  Minimum = 0. Maximum = 100. | NfLoadExt |
| snssai | Snssai | C | 0..1 | Identifies an S-NSSAI.  Shall be present if the "snssais" was provided within EventSubscription during the subscription for event notification procedure. |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE 3)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| NOTE 1: At least one value shall be provided. If the "listofAnaSubsets" attribute with value only applicable to NF\_LOAD event is present in the subscription request, then only the corresponding attribute(s) shall be present.  NOTE 2: The values are percentages which are provided as estimated over a given period.  NOTE 3: If the requested period identified by the "startTs" and "endTs" attributes in the EventReportingRequirement type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence.  NOTE 4: Applicable only to AMF load If the "networkArea" attribute is present in the subscription request. | | | | | |

##### 5.1.6.2.32 Type NfStatus

Table 5.1.6.2.32-1: Definition of type NfStatus

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| statusRegistered | SamplingRatio | C | 0..1 | Percentage of time with status "registered" (NOTE) |  |
| statusUnregistered | SamplingRatio | C | 0..1 | Percentage of time with status "unregistered" (NOTE) |  |
| statusUndiscoverable | SamplingRatio | C | 0..1 | Percentage of time with status "undiscoverable" (NOTE) |  |
| NOTE: The availability statuses of the NF on the Analytics target period are expressed as a percentage of time. The total of status values should be equal or lower than 100%. At least one value shall be provided. | | | | | |

##### 5.1.6.2.33 Type NsiIdInfo

Table 5.1.6.2.33-1: Definition of type NsiIdInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| snssai | Snssai | M | 1 | Identification of network slice to which the subscription for event notification procedure applies. |  |
| nsiIds | array(NsiId) | O | 1..N | Identification of network slice instance(s) associated with the subscribed S-NSSAI identified by the "snssai" attribute.  May be included when subscribed event is "NSI\_LOAD\_LEVEL" or  "SERVICE\_EXPERIENCE".  (NOTE) |  |
| NOTE: This attribute is not applicable when the NF service consumer is CEF or PCF. | | | | | |

##### 5.1.6.2.34 Type NsiLoadLevelInfo

Table 5.1.6.2.34-1: Definition of type NsiLoadLevelInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| loadLevelInformation | LoadLevelInformation | M | 1 | Load level information of the network slice identified by the "snssai" attribute and if provided, the associated NSI ID identified by the "nsiId" attribute. |  |
| snssai | Snssai | M | 1 | Identification of network slice to which the subscription applies. |  |
| nsiId | NsiId | C | 0..1 | Identification of network slice instance associated with the S-NSSAI identified by the "snssai" attribute.  Shall be presented if the "nsiIds" attribute was provided within the NsiIdInfo data in the EventSubscription data during the subscription. |  |
| resUsage | ResourceUsage | C | 0..1 | The current usage of the virtual resources assigned to the NF instances belonging to a particular network slice instance.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to RES\_USAGE. | NsiLoadExt |
| numOfExceedLoadLevelThr | integer | C | 0..1 | Indicates the number of times the resource usage threshold of the network slice instance is reached or exceeded if a threshold value is provided by the consumer.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to NUM\_OF\_EXCEED\_RES\_USAGE\_LOAD\_LEVEL\_THR. | NsiLoadExt |
| exceedLoadLevelThrInd | boolean | C | 0..1 | Indicates whether the Load Level Threshold is met or exceeded by the statistics value. Set to "true" if the Load Level Threshold is met or exceeded, otherwise set to "false".  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to EXCEED\_LOAD\_LEVEL\_THR\_IND. | NsiLoadExt |
| networkArea | NetworkAreaInfo | O | 0..1 | Identification of network area to which the subscription or analytics request applies. | NsiLoadExt |
| timePeriod | TimeWindow | O | 0..1 | Indicates a start time and a stop time of the load level information identified by the "loadLevelInformation" attribute. | NsiLoadExt |
| resUsgThrCrossTimePeriod | array(TimeWindow) | O | 1..N | Each element indicates the time elapsed between times each threshold is met or exceeded or crossed. The start time and end time are the exact time stamps of the resource usage threshold is reached or exceeded. May be present if the "listOfAnaSubsets" attribute is provided and the maximum number of instances shall not exceed the value provided in the "numOfExceedLoadLevelThr" attribute. | NsiLoadExt |
| numOfUes | NumberAverage | C | 0..1 | Indicates the average and variance number of UE registered at the S-NSSAI and the optionally associated network slice instance.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to NUM\_OF\_UE\_REG. | NsiLoadExt |
| numOfPduSess | NumberAverage | C | 0..1 | Indicates the average and variance number of PDU session established at the S-NSSAI and the optionally associated network slice instance.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to NUM\_OF\_PDU\_SESS\_ESTBL. | NsiLoadExt |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. | NsiLoadExt |
| NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.35 Type FailureEventInfo

Table 5.1.6.2.35-1: Definition of type FailureEventInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| event | NwdafEvent | M | 1 | Event that is subscribed. |  |
| failureCode | NwdafFailureCode | M | 1 | Identifies the failure reason |  |

##### 5.1.6.2.36 Type AnalyticsMetadataIndication

Table 5.1.6.2.36-1: Definition of type AnalyticsMetadataIndication

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| dataWindow | TimeWindow | O | 0..1 | Data time window of the data samples. |  |
| dataStatProps | array(DatasetStatisticalProperty) | O | 1..N | List of dataset statistical properties of the data to be used to generate the analytics. |  |
| strategy | OutputStrategy | O | 0..1 | Output strategy to be used for the reporting of the analytics. |  |
| aggrNwdafIds | array(NfInstanceId) | O | 1..N | NWDAF identifiers of NWDAF instances used by the NWDAF service consumer when aggregating multiple analytics subscriptions. |  |

##### 5.1.6.2.37 Type AnalyticsMetadataInfo

Table 5.1.6.2.37-1: Definition of type AnalyticsMetadataInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| numSamples | Uinteger | O | 0..1 | Number of data samples used for the generation of the output analytics. |  |
| dataWindow | TimeWindow | O | 0..1 | Data time window of the data samples. |  |
| dataStatProps | array(DatasetStatisticalProperty) | O | 1..N | List of dataset statistical properties of the data used to generate the analytics. |  |
| strategy | OutputStrategy | O | 0..1 | Output strategy used for the reporting of the analytics. |  |
| accuracy | Accuracy | O | 0..1 | Level of accuracy reached for the analytics. |  |

##### 5.1.6.2.38 Type NumberAverage

Table 5.1.6.2.38-1: Definition of type NumberAverage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| number | Float | M | 1 | The average number. |  |
| variance | Float | M | 1 | Identifies the variance. |  |
| skewness | Float | O | 0..1 | Contains the skewness. |  |

##### 5.1.6.2.39 Type TopApplication

Table 5.1.6.2.39-1: Definition of type TopApplication

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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) |  |
| ratio | SamplingRatio | O | 0..1 | The application's throughput as a percentage of the total throughput in the Area of Interest. |  |
| NOTE: Either "appId" or "ipTrafficFilter" shall be provided. | | | | | |

##### 5.1.6.2.40 Type AnalyticsSubscriptionsTransfer

Table 5.1.6.2.40-1: Definition of type AnalyticsSubscriptionsTransfer

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| subsTransInfos | array(SubscriptionTransferInfo) | M | 1..N | Contains information about the subscription(s) that are requested to be transferred. |  |

##### 5.1.6.2.41 Type SubscriptionTransferInfo

Table 5.1.6.2.41-1: Definition of type SubscriptionTransferInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| transReqType | TransferRequestType | M | 1 | Indicates the type of the transfer request (i.e. if it is a request for transfer preparation or transfer execution) |  |
| nwdafEvSub | NnwdafEventsSubscription | M | 1 | Contains information about the analytics subscription that is to be transferred. (NOTE) |  |
| consumerId | NfInstanceId | M | 1 | NF instance identifer of the consumer of the analytics subscription that is to be transferred. |  |
| contextId | AnalyticsContextIdentifier | O | 0..1 | Identifier of analytics context information available at the NF service consumer. |  |
| sourceNfIds | array(NfInstanceId) | O | 1..N | NF instance identifer(s) of active data source(s) the NF service consumer is currently using for the analytics of the subscription that is to be transferred. |  |
| sourceSetIds | array(NfSetId) | O | 1..N | NF set identifer(s) of active data source(s) the NF service consumer is currently using for the analytics of the subscription that is to be transferred. |  |
| modelInfos | array(ModelInfo) | O | 1..N | Contains information identifying the ML model(s) that the NF service consumer is currently using for the analytics. |  |
| NOTE: The "nwdafEvSub" attribute shall contain the "notificationURI" attribute. | | | | | |

##### 5.1.6.2.42 Type ModelInfo

Table 5.1.6.2.42-1: Definition of type ModelInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| analyticsId | NwdafEvent | M | 1 | Type of analytics for which this ML model is used. |  |
| mlModelInfos | array(MLModelInfo) | M | 1..N | The information of the ML models which are applicable to the event indicated by "analyticsId" attribute. |  |

##### 5.1.6.2.43 Type AnalyticsContextIdentifier

Table 5.1.6.2.43-1: Definition of type AnalyticsContextIdentifier

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| subscriptionId | string | M | 1 | Identifies a subscription to the Nnwdaf\_EventsSubscription Service. |  |
| nfAnaCtxts | array(NwdafEvent) | O | 1..N | List of analytics types for which NF related analytics contexts can be retrieved. (NOTE) |  |
| ueAnaCtxts | array(UeAnalyticsContextDescriptor) | O | 1..N | List of objects that indicate for which SUPI and analytics types combinations analytics context can be retrieved. (NOTE) |  |
| NOTE: At least one of "nfAnaCtxts" and "ueAnaCtxts" shall be provided. | | | | | |

##### 5.1.6.2.44 Type UeAnalyticsContextDescriptor

Table 5.1.6.2.44-1: Definition of type UeAnalyticsContextDescriptor

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| supi | Supi | M | 1 | SUPI of the UE for which analytics context can be retrieved. |  |
| anaTypes | array(NwdafEvent) | M | 1..N | List of analytics types for which UE related analytics contexts can be retrieved. |  |

##### 5.1.6.2.45 Type DnPerfInfo

Table 5.1.6.2.45-1: Definition of type DnPerfInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| appId | ApplicationId | C | 0..1 | Indicates an application identifier. Shall be present if the "appIds" attribute was provided in the request or subscription. |  |
| dnn | Dnn | C | 0..1 | Identifies DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only.  Shall be present if the "dnns" was provided in the request or subscription. |  |
| snssai | Snssai | C | 0..1 | Identifies the network slice information.  Shall be present if the "snssais" was provided in the request or subscription. |  |
| dnPerf | array(DnPerf) | M | 1..N | List of DN performances for the application. |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE 1)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| NOTE 1: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.46 Type DnPerf

Table 5.1.6.2.46-1: Definition of type DnPerf

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| appServerInsAddr | AddrFqdn | C | 0..1 | Represents the Application Server Instance (IP address/FQDN of the Application Server). Shall be present if the "appServerAddrs" attribute was provided in the request or subscription. |  |
| upfInfo | UpfInformation | C | 0..1 | Identifies the UPF. Shall be present only if the "upfInfo" attribute was provided in the request or subscription and the identified NF service consumer is not an AF or a NEF. (NOTE) |  |
| dnai | Dnai | C | 0..1 | Indicates the DN Access Identifier representing location of the service flow. Shall be present if the "dnais" attribute was provided in the request or subscription. |  |
| perfData | PerfData | M | 1 | Represents the performance data. |  |
| spatialValidCon | NetworkAreaInfo | C | 0..1 | Represents the area where the DN performance analytics applies. Shall be present if "networkArea" attribute was provided in the request or subscription. |  |
| temporalValidCon | TimeWindow | O | 0..1 | Represents the valid period for the DN performance analytics. |  |
| NOTE: This attribute shall not be provided if the NWDAF does not know the NF service consumer type or if the NWDAF knows that the NF service consumer is an AF or a NEF. | | | | | |

##### 5.1.6.2.47 Type PerfData

Table 5.1.6.2.47-1: Definition of type PerfData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| avgTrafficRate | BitRate | O | 0..1 | Indicates average traffic rate. |  |
| maxTrafficRate | BitRate | O | 0..1 | Indicates maximum traffic rate. |  |
| avePacketDelay | PacketDelBudget | O | 0..1 | Indicates average Packet Delay. |  |
| maxPacketDelay | PacketDelBudget | O | 0..1 | Indicates maximum Packet Delay. |  |
| avgPacketLossRate | PacketLossRate | O | 0..1 | Indicates average Loss Rate. |  |

##### 5.1.6.2.48 Type ResourceUsage

Table 5.1.6.2.48-1: Definition of type ResourceUsage

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| cpuUsage | Uinteger | O | 0..1 | Average usage of virtual CPU.  (NOTE)  Minimum=0. Maximum=100. |  |
| memoryUsage | Uinteger | O | 0..1 | Average usage of memory.  (NOTE)  Minimum=0. Maximum=100. |  |
| storageUsage | Uinteger | O | 0..1 | Average usage of storage.  (NOTE)  Minimum=0. Maximum=100. |  |
| NOTE: The values are percentages which are provided as estimated over a given period. | | | | | |

##### 5.1.6.2.49 Type ConsumerNfInformation

Table 5.1.6.2.49-1: Definition of type ConsumerNfInformation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| nfId | NfInstanceId | C | 0..1 | Identifies the analytics consumer NF instance. (NOTE) |  |
| nfSetId | NfSetId | C | 0..1 | Identifies the analytics consumer NF set. (NOTE) |  |
| taiList | array(Tai) | C | 1..N | The list of TAIs the analytics consumer NF can serve. (NOTE) |  |
| NOTE: Either "taiList" or one of "nfId", "nfSetId" shall be provided. | | | | | |

##### 5.1.6.2.50 Type DispersionRequirement

Table 5.1.6.2.50-1: Definition of type DispersionRequirement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| disperType | DispersionType | M | 1 | Indicates the required dispersion analytics type. |  |
| classCriters | array(ClassCriterion) | C | 1..N | Indicates the dispersion mobility class criterion for fixed, camper and/or traveller UE, and/or the top-heavy UE dispersion class criterion. |  |
| rankCriters | array(RankingCriterion) | O | 1..N | Indicates the usage ranking criterion between the high, medium and low usage UE. |  |
| dispOrderCriter | DispersionOrderingCriterion | O | 0..1 | Indicates the ordering criterion for the list of UE Dispersion Analytics information. |  |
| order | MatchingDirection | O | 0..1 | Indicate the order: ascending or descending. May be present when the "dispOrderCriter" attribute is included. (NOTE) |  |
| NOTE: "CROSSED" value in date type "MatchingDirection" is not applicable for the "order" attribute. | | | | | |

##### 5.1.6.2.51 Type ClassCriterion

Table 5.1.6.2.51-1: Definition of type ClassCriterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| disperClass | DispersionClass | M | 1 | Indicates the dispersion class. |  |
| classThreshold | SamplingRatio | M | 1 | Indicates the dispersion class threshold. |  |
| thresMatch | MatchingDirection | M | 1 | Indicates the dispersion class threshold matching direction. (NOTE) |  |
| NOTE: "CROSSED" value in date type "MatchingDirection" is not applicable for the "thresMatch" attribute. | | | | | |

##### 5.1.6.2.52 Type RankingCriterion

Table 5.1.6.2.52-1: Definition of type RankingCriterion

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| highBase | SamplingRatio | M | 1 | Indicates the "high" ranking bottom baseline percentage. |  |
| lowBase | SamplingRatio | M | 1 | Indicates the "low" ranking top baseline percentage. |  |
| NOTE: UE is ranked high (i.e.value 1), medium (2) or low (3) when its data/transactions dispersed during the period of observation at the location/slice, is higher than "highBase" attribute value, within the range between the "highBase" attribute to "lowBase" attribute value or less than "lowBase" value, respectively. | | | | | |

##### 5.1.6.2.53 Type DispersionInfo

Table 5.1.6.2.53-1: Definition of type DispersionInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| tsStart | DateTime | M | 1 | Indicates the timestamp when the time slot starts during the Analytics target period. |  |
| tsDuration | DurationSec | M | 1 | Indicates the time slot duration. |  |
| disperCollects | array(DispersionCollection) | M | 1..N | Dispersion collections on UE location(s) and/or slice(s). |  |
| disperType | DispersionType | M | 1 | Indicates the dispersion type. Only applicable to DVDA or TDA value. |  |

##### 5.1.6.2.54 Type DispersionCollection

Table 5.1.6.2.54-1: Definition of type DispersionCollection

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ueLoc | UserLocation | C | 0..1 | TA or cells where the UE or group of UEs dispersed its transactions and/or data. Shall be present if "networkArea" attribute is included in the event subscription or analytics request. (NOTE 1) |  |
| snssai | Snssai | C | 0..1 | Slice where the UE or group of UEs disperse its transactions and/or data. Shall be present if "snssais" attribute is included in the event subscription or analytics request. (NOTE 1) |  |
| supis | array(Supi) | C | 1..N | Each element identifies a SUPI of an UE. May only be present if reporting inside 5GC and the event subscription or analytics request applies to more than one UE. (NOTE 2) |  |
| gpsis | array(Gpsi) | C | 1..N | Each element identifies a GPSI of an UE.  May only be present if reused by the Nnef\_AnalyticsExposure service reporting to external AF and the event subscription or analytics request applies to more than one UE. (NOTE 2) |  |
| appVolumes | array(ApplicationVolume) | O | 1..N | Application data volumes. May be present if "appIds" attribute is included in the event subscription or analytics request (NOTE 6). |  |
| disperAmount | Uinteger | C | 0..1 | Indicates the dispersion amount of the reported data volume or transaction dispersion type.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to DISPER\_AMOUNT. (NOTE 3) |  |
| disperClass | DispersionClass | C | 0..1 | Indicates the UE dispersion mobility class: fixed, camper, traveller, and/or the top-heavy dispersion class.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to DISPER\_CLASS. (NOTE 3, NOTE 5). |  |
| usageRank | integer | C | 0..1 | Usage ranked high (i.e.value 1), medium (2) or low (3).  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to RANKING. (NOTE 3, NOTE 6). |  |
| percentileRank | SamplingRatio | C | 0..1 | Percentile ranking of the target UE in the Cumulative Distribution Function of data usage for the population of all UEs.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to PERCENTILE\_RANKING. (NOTE 3, NOTE 6). |  |
| ueRatio | SamplingRatio | C | 0..1 | Contains the percentage of UEs with same analytics result in the group or among all UEs.  Shall be present if the analytics result applies for a group of UEs or any UE. |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE 4)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| NOTE 1: One of "ueLoc" attribute or "snssai" attribute shall be provided.  NOTE 2: When Target of Analytics Reporting is a UE group ID, or "Any UE" and a filter for Top-Heavy UEs, fixed, camper or traveller is included in the subscription, the NWDAF shall include the list of UEs matching the filter. This information element shall not be present when Target of Analytic Reporting is "Any UE" and no filter for Top-Heavy UEs, fixed, camper or traveller is included.  NOTE 3: At least one value shall be provided. If the "listofAnaSubsets" attribute with value only applicable to "DISPERSION" event is present in the subscription request, then only the corresponding attribute(s) shall be present.  NOTE 4: If the requested period identified by the "startTs" and "endTs" attributes in the EventReportingRequirement type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence.  NOTE 5: This parameter may only be provided when the Target of Analytics Reporting contains the "supis" attribute or the "gpsis" attribute in the "tgtUe" attribute.  NOTE 6: This parameter shall not be provided when the "anyUe" attribute in the "tgtUe" attribute for the Target of Analytics Reporting was set to true. | | | | | |

##### 5.1.6.2.55 Type ApplicationVolume

Table 5.1.6.2.55-1: Definition of type ApplicationVolume

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| appId | ApplicationId | M | 1 | Application where the UE or group of UEs disperse its transactions and/or data. May be present if "appIds" attribute is included in the event subscription or analytics request. |  |
| appVolume | Volume | M | 1 | Indicates the dispersion data volume per application in units of bytes. |  |

##### 5.1.6.2.56 Type RedundantTransmissionExpReq

Table 5.1.6.2.56-1: Definition of type RedundantTransmissionExpReq

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| redTOrderCriter | RedTransExpOrderingCriterion | O | 0..1 | Indicates the ordering criterion for the list of UE Redundant Transmission Experience Analytics information. (NOTE 1) |  |
| order | MatchingDirection | O | 0..1 | Indicate the order: ascending or descending. May be present when the "redTOrderCriter" attribute is included. (NOTE 1) (NOTE 2) |  |
| NOTE 1: If no attribute or no value is provided, default ordering may be applied.  NOTE 2: "CROSSED" value in date type "MatchingDirection" is not applicable for the "order" attribute. | | | | | |

##### 5.1.6.2.57 Type RedundantTransmissionExpInfo

Table 5.1.6.2.57-1: Definition of type RedundantTransmissionInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| spatialValidCon | NetworkAreaInfo | C | 0..1 | Area where the Redundant Transmission Experience applies.  If "networkArea" attribute was provided in the request or subscription, shall be the requested network area. |  |
| dnn | Dnn | C | 0..1 | Data Network Name associated for URLLC service. Shall be present if the "dnns" attribute was provided in the request or subscription. |  |
| redTransExps | array(RedundantTransmissionExpPerTS) | M | 1..N | Redundant Transmission Experiences. |  |

##### 5.1.6.2.58 Type RedundantTransmissionExpPerTS

Table 5.1.6.2.58-1: Definition of type RedundantTransmissionExpPerTS

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| tsStart | DateTime | M | 1 | Indicates the timestamp when the time slot starts during the Analytics target period. |  |
| tsDuration | DurationSec | M | 1 | Indicates the time slot duration. |  |
| obsvRedTransExp | ObservedRedundantTransExp | M | 1 | Represents the observed Redundant Transmission Experience. |  |
| redTransStatus | boolean | O | 0..1 | Redundant Transmission Status. Set to "true" if redundant transmission was activated, otherwise set to "false". Default value is "false" if omitted. |  |
| ueRatio | SamplingRatio | O | 0..1 | Percentage on which UE, any UE, or UE group efficiently use the PDU session with redundant transmission. |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| NOTE: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.59 Type WlanPerformanceReq

Table 5.1.6.2.59-1: Definition of type WlanPerformanceReq

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ssIds | array(string) | O | 1..N | SSIDs of WLAN access points. |  |
| bssIds | array(string) | O | 1..N | BSSIDs of WLAN access points. |  |
| wlanOrderCriter | WlanOrderingCriterion | O | 0..1 | Indicates the ordering criterion for the list of WLAN performance information. |  |
| order | MatchingDirection | O | 0..1 | Indicate the order: ascending or descending. May be present when the "wlanOrderCriter" attribute is included. (NOTE 1) |  |
| NOTE 1: "CROSSED" value in date type "MatchingDirection" is not applicable for the "order" attribute. | | | | | |

##### 5.1.6.2.60 Type WlanPerformanceInfo

Table 5.1.6.2.60-1: Definition of type WlanPerformanceInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| networkArea | NetworkAreaInfo | C | 0..1 | A list of TAIs or Cell Ids as the Area of Interest where the WLAN performance analytics applies. Shall be present if the "networkArea" attribute is included in the event subscription or analytics request. |  |
| wlanPerSsidInfos | array(WlanPerSsIdPerformanceInfo) | M | 1..N | WLAN performance information for SSID(s) of WLAN access points deployed in the Area of Interest. |  |

##### 5.1.6.2.61 Type WlanPerSsIdPerformanceInfo

Table 5.1.6.2.61-1: Definition of type WlanPerSsIdPerformanceInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ssId | string | M | 1 | SSID of WLAN access point. |  |
| wlanPerTsInfos | array(WlanPerTsPerformanceInfo) | M | 1..N | WLAN performance information per Time Slot during the analytics target period. |  |

##### 5.1.6.2.62 Type WlanPerTsPerformanceInfo

Table 5.1.6.2.62-1: Definition of type WlanPerTsPerformanceInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| tsStart | DateTime | M | 1 | Indicates the timestamp when the time slot starts during the Analytics target period. |  |
| tsDuration | DurationSec | M | 1 | Indicates the time slot duration. |  |
| rssi | integer | C | 0..1 | Indicated the RSSI in the unit of dBm.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to RSSI. (NOTE 1) |  |
| rtt | Uinteger | C | 0..1 | Indicates the RTT in the unit of millisecond.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to RTT. (NOTE 1) |  |
| trafficInfo | TrafficInformation | C | 0..1 | Traffic information including UL/DL data rate and/or Traffic volume.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to TRAFFIC\_INFO. (NOTE 1) |  |
| numberOfUes | Uinteger | C | 0..1 | Number of UEs observed for the SSID.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set to NUMBER\_OF\_UES. (NOTE 1) |  |
| confidence | Uinteger | C | 0..1 | Indicates the confidence of the prediction. (NOTE 2)  Shall be present if the analytics result is a prediction.  Minimum = 0. Maximum = 100. |  |
| NOTE 1: At least one value shall be provided. If the "listOfAnaSubsets" attribute with value only applicable to WLAN event is present in the subscription request, then only the corresponding attribute(s) shall be present.  NOTE 2: If the requested period identified by the "startTs" and "endTs" attributes in the "EventReportingRequirement" type is a future time period, which means the analytics result is a prediction. If no sufficient data is collected to provide the confidence of the prediction before the time deadline, the NWDAF shall return a zero confidence. | | | | | |

##### 5.1.6.2.63 Type TrafficInformation

Table 5.1.6.2.63-1: Definition of type TrafficInformation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| uplinkRate | BitRate | C | 0..1 | Uplink data rate. |  |
| downlinkRate | BitRate | C | 0..1 | Downlink data rate. |  |
| uplinkVolume | Volume | C | 0..1 | Uplink traffic volume in unit of octet. |  |
| downlinkVolume | Volume | C | 0..1 | Downlink traffic volume in unit of octet. |  |
| totalVolume | Volume | C | 0..1 | Total data octets for both uplink and downlink traffic volume. |  |
| NOTE: At least one of above attributes shall be present. | | | | | |

##### 5.1.6.2.64 Type AppListForUeComm

Table 5.1.6.2.64-1: Definition of type AppListForUeComm

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| appId | ApplicationId | M | 1 | Identification of the application. |  |
| startTime | DateTime | O | 0..1 | The time when the UE start to use the application. |  |
| appDur | DurationSec | O | 0..1 | The length of time that the UE uses the application. |  |
| occurRatio | SamplingRatio | O | 0..1 | In UE Communication Statistics, it represents the proportion of UE using the application in the requested time period.  In UE Communication Predictions, it represents the probability that the UE uses the application. |  |
| spatialValidity | NetworkAreaInfo | O | 0..1 | The area where the service behavior applies. |  |

##### 5.1.6.2.65 Type SessInactTimerForUeComm

Table 5.1.6.2.65-1: Definition of type SessInactTimerForUeComm

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| n4SessId | PduSessionId | M | 1 | The identification of the N4 Session. |  |
| sessInactiveTimer | DurationSec | M | 1 | The value of the N4 Session inactivity timer. |  |

##### 5.1.6.2.66 Type DnPerformanceReq

Table 5.1.6.2.66-1: Definition of type DnPerformanceReq

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| dnPerfOrderCriter | DnPerfOrderingCriterion | O | 0..1 | Indicates the preferred order criterion of a list of Network Performance analytics results. |  |
| order | MatchingDirection | O | 0..1 | Indicate the order: ascending or descending. May be present when the "dnPerfOrderCriter" attribute is included. (NOTE 1) |  |
| reportThresholds | array(ThresholdLevel) | C | 1..N | Each of the element represents the reporting threshold of an analytics subset. (NOTE 2) |  |
| NOTE 1: "CROSSED" value in data type "MatchingDirection" is not applicable for the "order" attribute.  NOTE 2: The value of "reportThresholds" attribute match in sequence with the properties in the "listOfAnaSubsets" attribute. This property shall only be provided if the "notifMethod" in "evtReq" is set to "ON\_EVENT\_DETECTION" or "notificationMethod" in "eventSubscriptions" is set to "THRESHOLD" or omitted. | | | | | |

##### 5.1.6.2.67 Type: RatFreqInformation

Table 5.1.6.2.67-1: Definition of type RatFreqInformation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| allFreq | boolean | C | 0..1 | Set to "true" to indicate to handle all the frequencies the NWDAF received, otherwise set to "false" or omit. (NOTE 1) |  |
| allRat | boolean | C | 0..1 | Set to "true" to indicate to handle all the RAT types the NWDAF received, otherwise set to "false" or omit. (NOTE 1) |  |
| freq | ArfcnValueNR | C | 0..1 | Idenfication of the frequency of UE's serving cell(s) where the subscription/request applies. (NOTE 1) |  |
| ratType | RatType | C | 0..1 | Identification of the RAT type where the subscription/request applies. (NOTE 1) |  |
| svcExpThreshold | ThresholdLevel | C | 0..1 | Service Experience Threshold value. (NOTE 2). |  |
| matchingDir | MatchingDirection | O | 0..1 | The matching direction may be provided alongside the service experience threshold. If omitted, the default value is CROSSED. |  |
| NOTE 1: The "allFreq" attribute and the "freq" attribute are mutually exclusive. The "allRat" attribute and the "ratType" attribute are mutually exclusive. If both the "allFreq" attribute and the "allRat" attribute are present, then indicate all the RAT type(s) and Frequency(ies) values the NWDAFreceived.  NOTE 2: Shall only be present in the subscription request as the service experience threshold value(s) for the RAT Type(s) and/or Frequency value(s) if the "notifMethod" in "evtReq" is set to "ON\_EVENT\_DETECTION" or "notificationMethod" in "eventSubscriptions" is set to "THRESHOLD" or omitted. | | | | | |

##### 5.1.6.2.68 Type PrevSubInfo

Table 5.1.6.2.68-1: Definition of type PrevSubInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| producerId | NfInstanceId | C | 0..1 | NWDAF instance identifier to which the NF service consumer has established this subscription.  (NOTE) |  |
| producerSetId | NfSetId | C | 0..1 | NWDAF set identifier to which the NF service consumer has established this subscription.  (NOTE) |  |
| subscriptionId | string | M | 1 | The identifier of the specific analytics subscription. |  |
| nfAnaEvents | array(NwdafEvent) | O | 1..N | List of analytics types for which NF related analytics contexts can be retrieved. |  |
| ueAnaEvents | array(UeAnalyticsContextDescriptor) | O | 1..N | List of objects that indicate for which SUPI and analytics types combinations analytics context can be retrieved. |  |
| NOTE: One of "producerId" or "producerSetId" attributes shall be provided. | | | | | |

##### 5.1.6.2.69 Type MLModelInfo

Table 5.1.6.2.69-1: Definition of type MLModelInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| mlFileAddrs | array(MLModelAddr) | O | 1..N | Addresses of ML model files. May be included only when the source NWDAF itself provides the trained ML model(s) for the analytics subscription(s) being transferred |  |
| modelProvId | NfInstanceId | C | 0..1 | NF instance identifer of the ML model provider NWDAF from which the NF service consumer currently subscribes to the ML model information.  (NOTE) |  |
| modelProvSetId | NfSetId | C | 0..1 | The Set ID of NWDAF(s) to which the current NWDAF subscribe the ML model.  (NOTE) |  |
| NOTE: One of the "modelProvId" and "modelProvSetId" attributes shall be provided. | | | | | |

##### 5.1.6.2.70 Type ObservedRedundantTransExp

Table 5.1.6.2.70-1: Definition of type ObservedRedundantTransExp

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| avgPktDropRateUl | PacketLossRate | C | 0..1 | Average uplink packet drop rate on GTP-U path on N3.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to AVG\_UL\_PKT\_DROP\_RATE. |  |
| varPktDropRateUl | Float | C | 0..1 | Variance of uplink packet drop rate on GTP-U path on N3.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to VAR\_UL\_PKT\_DROP\_RATE. |  |
| avgPktDropRateDl | PacketLossRate | C | 0..1 | Average downlink packet drop rate on GTP-U path on N3.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to AVG\_DL\_PKT\_DROP\_RATE. |  |
| varPktDropRateDl | Float | C | 0..1 | Variance of downlink packet drop rate on GTP-U path on N3.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to VAR\_DL\_PKT\_DROP\_RATE. |  |
| avgPktDelayUl | PacketDelBudget | C | 0..1 | Average uplink packet delay round trip on GTP-U path on N3.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to AVG\_UL\_PKT\_DELAY. |  |
| varPktDelayUl | Float | C | 0..1 | Variance uplink packet delay round trip on GTP-U path on N3.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to VAR\_UL\_PKT\_DELAY. |  |
| avgPktDelayDl | PacketDelBudget | C | 0..1 | Average downlink packet delay round trip on GTP-U path on N3.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to AVG\_DL\_PKT\_DELAY. |  |
| varPktDelayDl | Float | C | 0..1 | Variance downlink packet delay round trip on GTP-U path on N3.  Shall be present if one of the element in the "listOfAnaSubsets" attribute was set to VAR\_DL\_PKT\_DELAY. |  |

#### 5.1.6.3 Simple data types and enumerations

##### 5.1.6.3.1 Introduction

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

##### 5.1.6.3.2 Simple data types

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

Table 5.1.6.3.2-1: Simple data types

|  |  |  |  |
| --- | --- | --- | --- |
| Type Name | Type Definition | Description | Applicability |
| AnySlice | boolean | "false" represents not applicable for all slices.  "true" represents applicable for all slices. |  |
| LoadLevelInformation | integer | Load level information of the network slice and the optionally associated network slice instance.  Minimum = 0. Maximum = 100. |  |

##### 5.1.6.3.3 Enumeration: NotificationMethod

Table 5.1.6.3.3-1: Enumeration NotificationMethod

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| PERIODIC | The subscription of NWDAF Event is peridodicly. The periodic of the notification is identified by repetitionPeriod defined in clause 5.1.6.2.3. |  |
| THRESHOLD | The subscription of NWDAF Event is upon threshold exceeded. |  |

##### 5.1.6.3.4 Enumeration: NwdafEvent

Table 5.1.6.3.4-1: Enumeration NwdafEvent

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| NF\_LOAD | Indicates that the event subscribed is NF Load. | NfLoad |
| QOS\_SUSTAINABILITY | Indicates that the event subscribed is QoS sustainability. | QoSSustainability |
| SLICE\_LOAD\_LEVEL | Indicates that the event subscribed is load level information of Network Slice |  |
| SERVICE\_EXPERIENCE | Indicates that the event subscribed is service experience. | ServiceExperience |
| UE\_MOBILITY | Indicates that the event subscribed is UE mobility information. | UeMobility |
| UE\_COMM | Indicates that the event subscribed is UE communication information. | UeCommunication |
| ABNORMAL\_BEHAVIOUR | Indicates that the event subscribed is abnormal behaviour information. | AbnormalBehaviour |
| USER\_DATA\_CONGESTION | Indicates that the event subscribed is user data congestion information | UserDataCongestion |
| NETWORK\_PERFORMANCE | Indicates that the event subscribed is network performance information | NetworkPerformance |
| NSI\_LOAD\_LEVEL | Indicates that the event subscribed is load level information of Network Slice and the optionally associated Network Slice Instance | NsiLoad |
| DISPERSION | Indicates that the event subscribed is dispersion information. | Dispersion |
| RED\_TRANS\_EXP | Indicates that the event subscribed is redundant transmission experience. | RedundantTransmissionExp |
| WLAN\_PERFORMANCE | Indicates that the event subscribed is WLAN performance. | WlanPerformance |
| DN\_PERFORMANCE | Indicates that the event subscribed is DN performance information. | DnPerformance |
| SM\_CONGESTION | Indicates the Session Management Congestion Control Experience information for specific DNN and/or S-NSSAI. | SMCCE |

##### 5.1.6.3.5 Enumeration: Accuracy

Table 5.1.6.3.5-1: Enumeration Accuracy

|  |  |  |
| --- | --- | --- |
| **Enumeration value** | **Description** | **Applicability** |
| LOW | Low accuracy. |  |
| HIGH | High accuracy. |  |

##### 5.1.6.3.6 Enumeration: ExceptionId

**Table 5.1.6.3.6-1: Enumeration ExceptionId**

|  |  |  |
| --- | --- | --- |
| **Enumeration value** | **Description** | **Applicability** |
| UNEXPECTED\_UE\_LOCATION | Unexpected UE location |  |
| UNEXPECTED\_LONG\_LIVE\_FLOW | Unexpected long-live rate flows |  |
| UNEXPECTED\_LARGE\_RATE\_FLOW | Unexpected large rate flows |  |
| UNEXPECTED\_WAKEUP | Unexpected wakeup |  |
| SUSPICION\_OF\_DDOS\_ATTACK | Suspicion of DDoS attack |  |
| WRONG\_DESTINATION\_ADDRESS | Wrong destination address |  |
| TOO\_FREQUENT\_SERVICE\_ACCESS | Too frequent Service Access |  |
| UNEXPECTED\_RADIO\_LINK\_FAILURES | Unexpected radio link failures |  |
| PING\_PONG\_ACROSS\_CELLS | Ping-ponging across neighbouring cells |  |

##### 5.1.6.3.7 Enumeration: ExceptionTrend

**Table 5.1.6.3.7-1: Enumeration ExceptionTrend**

|  |  |  |
| --- | --- | --- |
| **Enumeration value** | **Description** | **Applicability** |
| UP | Up trend of the exception level. |  |
| DOWN | Down trend of the exception level. |  |
| UNKNOWN | Unknown trend of the exception level. |  |
| STABLE | Stable trend of the exception level. |  |

##### 5.1.6.3.8 Enumeration: CongestionType

Table 5.1.6.3.8-1: Enumeration CongestionType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| USER\_PLANE | The congestion analytics type is User Plane. |  |
| CONTROL\_PLANE | The congestion analytics type is Control Plane. |  |
| USER\_AND\_CONTROL\_PLANE | The congestion analytics type is User Plane and Control Plane. |  |

##### 5.1.6.3.9 Enumeration: TimeUnit

Table 5.1.6.3.9-1: Enumeration TimeUnit

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| MINUTE | Time unit is per minute. |  |
| HOUR | Time unit is per hour. |  |
| DAY | Time unit is per day. |  |

##### 5.1.6.3.10 Enumeration: NetworkPerfType

Table 5.1.6.3.10-1: Enumeration NetworkPerfType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| GNB\_ACTIVE\_RATIO | Indicates the ratio of gNB active (i.e. up and running) number to the total number of gNB. |  |
| GNB\_COMPUTING\_USAGE | Indicates gNodeB computing resource usage. |  |
| GNB\_MEMORY\_USAGE | Indicates gNodeB memory usage. |  |
| GNB\_DISK\_USAGE | Indicates gNodeB disk usage. |  |
| NUM\_OF\_UE | Indicates number of UEs. |  |
| SESS\_SUCC\_RATIO | Indicates ratio of successful setup of PDU sessions to total PDU session setup attempts. |  |
| HO\_SUCC\_RATIO | Indicates Ratio of successful handovers to the total handover attempts. |  |

##### 5.1.6.3.11 Enumeration: ExpectedAnalyticsType

Table 5.1.6.3.11-1: Enumeration ExpectedAnalyticsType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| MOBILITY | Mobility related abnormal behaviour analytics is expected by the consumer |  |
| COMMUN | Communication related abnormal behaviour analytics is expected by the consumer |  |
| MOBILITY\_AND\_COMMUN | Both mobility and communication related abnormal behaviour analytics is expected by the consumer |  |

##### 5.1.6.3.12 Enumeration: MatchingDirection

Table 5.1.6.3.12-1: Enumeration MatchingDirection

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| ASCENDING | Threshold is crossed in ascending direction. |  |
| DESCENDING | Threshold is crossed in descending direction. |  |
| CROSSED | Threshold is crossed either in ascending or descending direction. |  |

##### 5.1.6.3.13 Enumeration: NwdafFailureCode

Table 5.1.6.3.13-1: Enumeration NwdafFailureCode

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| UNAVAILABLE\_DATA | Indicates the requested statistics information for the event is rejected since necessary data to perform the service is unavailable. |  |
| BOTH\_STAT\_PRED\_NOT\_ALLOWED | Indicates the requested analysis information for the event is rejected since the start time is in the past and the end time is in the future, which means the NF service consumer requested both statistics and prediction for the analytics. |  |
| UNSATISFIED\_REQUESTED\_ANALYTICS\_TIME | Indicates that the requested event is rejected since the analytics information is not ready when the time indicated by the "timeAnaNeeded" attribute (as provided during the creation or modification of subscription) is reached. | EneNA |
| OTHER | Indicates the requested analysis information for the event is rejected due to other reasons. |  |

##### 5.1.6.3.14 Enumeration: AnalyticsMetadata

Table 5.1.6.3.14-1: Enumeration AnalyticsMetadata

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| NUM\_OF\_SAMPLES | Number of data samples used for the generation of the output analytics. |  |
| DATA\_WINDOW | Data time window of the data samples. |  |
| DATA\_STAT\_PROPS | Dataset statistical properties of the data used to generate the analytics. |  |
| STRATEGY | Output strategy used for the reporting of the analytics. |  |
| ACCURACY | Level of accuracy reached for the analytics. |  |

##### 5.1.6.3.15 Enumeration: DatasetStatisticalProperty

Table 5.1.6.3.15-1: Enumeration DatasetStatisticalProperty

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| UNIFORM\_DIST\_DATA | Indicates the use of data samples that are uniformly distributed according to the different aspects of the requested analytics. |  |
| NO\_OUTLIERS | Indicates that the data samples shall disregard data samples that are at the extreme boundaries of the value range. |  |

##### 5.1.6.3.16 Enumeration: OutputStrategy

Table 5.1.6.3.16-1: Enumeration OutputStrategy

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| BINARY | Indicates that the analytics shall only be reported when the requested level of accuracy is reached within a cycle of periodic notification as defined in the analytics reporting information (i.e. in the ReportingInformation data type or the EventSubscription data type). |  |
| GRADIENT | Indicates that the analytics shall be reported according with the periodicity defined in the analytics reporting information (i.e. in the ReportingInformation data type or the EventSubscription data type) irrespective of whether the requested level of accuracy has been reached or not. |  |

##### 5.1.6.3.17 Enumeration: TransferRequestType

Table 5.1.6.3.17-1: Enumeration TransferRequestType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| PREPARE | Indicates that the request is for analytics subscription transfer preparation. |  |
| TRANSFER | Indicates that the request is for analytics subscription transfer execution. |  |

##### 5.1.6.3.18 Enumeration: AnalyticsSubset

Table 5.1.6.3.18-1: AnalyticsSubset

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| NUM\_OF\_UE\_REG | The number of UE registered. This value is only applicable to NSI\_LOAD\_LEVEL event. |  |
| NUM\_OF\_PDU\_SESS\_ESTBL | The number of PDU sessions established. This value is only applicable to NSI\_LOAD\_LEVEL event. |  |
| RES\_USAGE | The current usage of the virtual resources assigned to the NF instances belonging to a particular network slice instance. This value is only applicable to NSI\_LOAD\_LEVEL event. |  |
| NUM\_OF\_EXCEED\_RES\_USAGE\_LOAD\_LEVEL\_THR | The number of times the resource usage threshold of the network slice instance is reached or exceeded if a threshold value is provided by the consumer. This value is only applicable to NSI\_LOAD\_LEVEL event. |  |
| PERIOD\_OF\_EXCEED\_RES\_USAGE\_LOAD\_LEVEL\_THR | The time interval between each time the threshold being met or exceeded on the network slice (instance). This value is only applicable to NSI\_LOAD\_LEVEL event. |  |
| EXCEED\_LOAD\_LEVEL\_THR\_IND | Whether the Load Level Threshold is met or exceeded by the statistics value. This value is only applicable to NSI\_LOAD\_LEVEL event. |  |
| LIST\_OF\_TOP\_APP\_UL | The list of applications that contribute the most to the traffic in the UL direction. This value is only applicable to USER\_DATA\_CONGESTION event. |  |
| LIST\_OF\_TOP\_APP\_DL | The list of applications that contribute the most to the traffic in the DL direction. This value is only applicable to USER\_DATA\_CONGESTION event. |  |
| NF\_STATUS | The availability status of the NF on the Analytics target period, expressed as a percentage of time per status value (registered, suspended, undiscoverable). This value is only applicable to NF\_LOAD event. |  |
| NF\_RESOURCE\_USAGE | The average usage of assigned resources (CPU, memory, storage). This value is only applicable to NF\_LOAD event. |  |
| NF\_LOAD | The average load of the NF instance over the Analytics target period. This value is only applicable to NF\_LOAD event. |  |
| NF\_PEAK\_LOAD | The maximum load of the NF instance over the Analytics target period. This value is only applicable to NF\_LOAD event. |  |
| NF\_LOAD\_AVG\_IN\_AOI | The average load of the NF instances over the area of interest. This value is only applicable to NF\_LOAD event. |  |
| DISPER\_AMOUNT | Indicates the dispersion amount of the reported data volume or transaction dispersion type. This value is only applicable to DISPERSION event. |  |
| DISPER\_CLASS | Indicates the dispersion mobility class (fixed, camper or traveller) upon set its usage threshold, and/or the top-heavy class upon set its percentile rating threshold. This value is only applicable to DISPERSION event. |  |
| RANKING | Data/transaction usage ranked high (i.e.value 1), medium (2) or low (3). This value is only applicable to DISPERSION event. |  |
| PERCENTILE\_RANKING | Percentile ranking of the target UE in the Cumulative Distribution Function of data usage for the population of all UEs. This value is only applicable to DISPERSION event. |  |
| RSSI | Indicated the RSSI in the unit of dBm. This value is only applicable to WLAN\_PERFORMANCE event. |  |
| RTT | Indicates the RTT in the unit of millisecond. This value is only applicable to WLAN\_PERFORMANCE event. |  |
| TRAFFIC\_INFO | Traffic information including UL/DL data rate and/or Traffic volume. This value is only applicable to WLAN\_PERFORMANCE event. |  |
| NUMBER\_OF\_UES | Number of UEs observed for the SSID. This value is only applicable to WLAN\_PERFORMANCE event. |  |
| APP\_LIST\_FOR\_UE\_COMM | The analytics of the application list used by UE. This value is only applicable to UE\_COMM event. |  |
| N4\_SESS\_INACT\_TIMER\_FOR\_UE\_COMM | The N4 Session inactivity timer. This value is only applicable to UE\_COMM event. |  |
| AVG\_TRAFFIC\_RATE | Indicates average traffic rate. This value is only applicable to DN\_PERFORMANCE event. |  |
| MAX\_TRAFFIC\_RATE | Indicates maximum traffic rate. This value is only applicable to DN\_PERFORMANCE event. |  |
| AVG\_PACKET\_DELAY | Indicates average Packet Delay. This value is only applicable to DN\_PERFORMANCE event. |  |
| MAX\_PACKET\_DELAY | Indicates maximum Packet Delay. This value is only applicable to DN\_PERFORMANCE event. |  |
| AVG\_PACKET\_LOSS\_RATE | Indicates average Loss Rate. This value is only applicable to DN\_PERFORMANCE event. |  |
| UE\_LOCATION | Indicates UE location information. This value is only applicable to SERVICE\_EXPERIENCE event. |  |
| LIST\_OF\_HIGH\_EXP\_UE | Indicates list of high experienced UE. This value is only applicable to SM\_CONGESTION event. |  |
| LIST\_OF\_MEDIUM\_EXP\_UE | Indicates list of medium experienced UE. This value is only applicable to SM\_CONGESTION event. |  |
| LIST\_OF\_LOW\_EXP\_UE | Indicates list of low experienced UE. This value is only applicable to SM\_CONGESTION event. |  |
| AVG\_UL\_PKT\_DROP\_RATE | Indicates average uplink packet drop rate on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event. |  |
| VAR\_UL\_PKT\_DROP\_RATE | Indicates variance of uplink packet drop rate on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event. |  |
| AVG\_DL\_PKT\_DROP\_RATE | Indicates average downlink packet drop rate on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event. |  |
| VAR\_DL\_PKT\_DROP\_RATE | Indicates variance of downlink packet drop rate on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event. |  |
| AVG\_UL\_PKT\_DELAY | Indicates average uplink packet delay round trip on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event. |  |
| VAR\_UL\_PKT\_DELAY | Indicates variance uplink packet delay round trip on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event. |  |
| AVG\_DL\_PKT\_DELAY | Indicates average downlink packet delay round trip on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event. |  |
| VAR\_DL\_PKT\_DELAY | Indicates variance downlink packet delay round trip on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event. |  |

##### 5.1.6.3.19 Enumeration: DispersionType

Table 5.1.6.3.19-1: Enumeration DispersionType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| DVDA | Data Volume Dispersion Analytics. |  |
| TDA | Transactions Dispersion Analytics. |  |
| DVDA\_AND\_TDA | Data Volume Dispersion Analytics and Transactions Dispersion Analytics. |  |

##### 5.1.6.3.20 Enumeration: DispersionClass

Table 5.1.6.3.20-1: Enumeration DispersionClass

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| FIXED | Dispersion class as fixed UE, its data or transaction usage at a location or a slice, is higher than its class threshold set for its all data or transaction usage. |  |
| CAMPER | Dispersion class as camper UE, its data or transaction usage at a location or a slice, is higher than its class threshold and lower than the fixed class threshold set for its all data or transaction usage. |  |
| TRAVELLER | Dispersion class as traveller UE, its data or transaction usage at a location or a slice, is lower than the camper class threshold set for its all data or transaction usage. |  |
| TOP\_HEAVY | Dispersion class as Top\_Heavy UE, who's dispersion percentile rating at a location or a slice, is higher than its class threshold. |  |

##### 5.1.6.3.21 Enumeration: DispersionOrderingCriterion

Table 5.1.6.3.21-1: Enumeration DispersionOrderingCriterion

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| TIME\_SLOT\_START | Indicates the order of time slot start. |  |
| DISPERSION | Indicates the order of data/transaction dispersion. |  |
| CLASSIFICATION | Indicates the order of data/transaction classification. |  |
| RANKING | Indicates the order of data/transaction ranking. |  |
| PERCENTILE\_RANKING | Indicates the order of data/transaction percentile ranking. |  |

##### 5.1.6.3.22 Enumeration: RedTransExpOrderingCriterion

Table 5.1.6.3.22-1: Enumeration RedTransExpOrderingCriterion

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| TIME\_SLOT\_START | Indicates the order of time slot start. |  |
| RED\_TRANS\_EXP | Indicates the order of Redundant Transmission Experience. |  |

##### 5.1.6.3.23 Enumeration: WlanOrderingCriterion

Table 5.1.6.3.23-1: Enumeration WlanOrderingCriterion

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| TIME\_SLOT\_START | Indicates the order of time slot start. |  |
| NUMBER\_OF\_UES | Indicates the order of number of UEs. |  |
| RSSI | Indicates the order of RSSI. |  |
| RTT | Indicates the order of RTT. |  |
| TRAFFIC\_INFO | Indicates the order of Traffic Information |  |

##### 5.1.6.3.24 Enumeration: ServiceExperienceType

Table 5.1.6.3.24-1: Definition of type ServiceExperienceType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| VOICE | Indicates that the service experience analytics is for voice service. |  |
| VIDEO | Indicates that the service experience analytics is for video service. |  |
| OTHER | Indicates that the service experience analytics is for other service. |  |

##### 5.1.6.3.25 Enumeration: DnPerfOrderingCriterion

Table 5.1.6.3.25-1: Enumeration DnPerfOrderingCriterion

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| AVERAGE\_TRAFFIC\_RATE | Indicates the average traffic rate. |  |
| MAXIMUM\_TRAFFIC\_RATE | Indicates the maximum traffic rate. |  |
| AVERAGE \_PACKET\_DELAY | Indicates the average packet delay. |  |
| MAXIMUM \_PACKET\_DELAY | Indicates the maximum packet delay. |  |
| AVERAGE \_PACKET\_LOSS\_RATE | Indicates the average packet loss rate. |  |

### 5.1.7 Error handling

#### 5.1.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [6].

For the Nnwdaf\_EventsSubscription API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [7].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [6] 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 [6].

In addition, the requirements in the following clauses shall apply.

#### 5.1.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the Nnwdaf\_EventsSubscription API.

#### 5.1.7.3 Application Errors

The application errors defined for the Nnwdaf\_EventsSubscription API are listed in table 5.1.7.3-1.

Table 5.1.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| BOTH\_STAT\_PRED\_NOT\_ALLOWED | 400 Bad Request | For the requested observation period, the start time is in the past and the end time is in the future, which means the NF service consumer requested both statistics and prediction for the analytics. |
| UNAVAILABLE\_DATA | 500 Internal Server Error | Indicates the requested statistics in the past is rejected since necessary data to perform the service is unavailable. |
| NOTE: Including a "ProblemDetails" data structure with the "cause" attribute in the HTTP response is optional unless explicitly mandated in the service operation clauses. | | |

### 5.1.8 Feature negotiation

The optional features in table 5.1.8-1 are defined for the Nnwdaf\_EventsSubscription API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [6].

Table 5.1.8-1: 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 the support of analytics based on UE mobility information. | | |
| 3 | | UeCommunication | | This feature indicates the support of analytics based on UE communication information. | | |
| 4 | | QoSSustainability | | This feature indicates support for the event related to QoS sustainability. | | |
| 5 | | AbnormalBehaviour | | This feature indicates support for the event related to abnormal behaviour information. | | |
| 6 | | UserDataCongestion | | This feature indicates support for the event related to user data congestion. | | |
| 7 | | NfLoad | | This feature indicates the support of the analytics related to the load of NF instances. | | |
| 8 | | NetworkPerformance | | This feature indicates the support of analytics based on network performance. | | |
| 9 | | NsiLoad | | This feature indicates the support of the event related to the load level of Network Slice and the optionally associated Network Slice Instance. | | |
| 10 | | 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 [6] and according to HTTP redirection principles for indirect communication, as specified in clause 6.10.9 of 3GPP TS 29.500 [6]. | | |
| 11 | | EneNA | | This feature indicates support for the enhancements of network data analytics requirements. | | |
| 12 | | UserDataCongestionExt | | This feature indicates support for the extensions to the event related to user data congestion, including support of GPSI and/or list of Top applications. Supporting this feature also requires the support of feature UserDataCongestion. | |
| 13 | | Aggregation | | This feature indicates support for analytics aggregation. | |
| 14 | | NsiLoadExt | | This feature indicates support for the extensions to the event related to the load level of Network Slice and the optionally associated Network Slice Instance, including support of area of interest, NF load information and number of UE or number of PDU Session. Supporting this feature also requires the support of feature NsiLoad. | |
| 15 | | ServiceExperienceExt | | This feature indicates support for the extensions to the event related to service experience, including support of RAT type and/or Frequency. Supporting this feature also requires the support of feature ServiceExperience. | |
| 16 | | DnPerformance | | This feature indicates the support of the analytics related to DN performance. | |
| 17 | | NfLoadExt | | This feature indicates support for the extensions to the event related to the load of NF instances, including NF load over area of interest. Supporting this feature also requires the support of feature NfLoad. | |
| 18 | | Dispersion | | This feature indicates support of the analytics related to dispersion analytics information. | |
| 19 | | RedundantTransmissionExp | | This feature indicates support of the analytics related to redundant transmission experience analytics information. | |
| 20 | | WlanPerformance | | This feature indicates support of the analytics related to WLAN performance information. | |
| 21 | | UeCommunicationExt | | This feature indicates the support of the analytics related to UE communication. | |
| 22 | | UeMobilityExt | | This feature indicates support for extensions to the event related to UE mobility, including support of LADN DNN to refer the LADN service area as the AOI. Supporting this feature also requires the support of feature UeMobility. | |
| 23 | | AnaCtxTransfer | | This feature indicates support for functionality related to Analytics Context Transfer. | |
| 24 | | AnaSubTransfer | | This feature indicates support for Analytics Subscription Transfer initiated by the source NWDAF. | |

### 5.1.9 Security

As indicated in 3GPP TS 33.501 [13] and 3GPP TS 29.500 [6], the access to the Nnwdaf\_EventsSubscription API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [14]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, an NF service consumer, prior to consuming services offered by the Nnwdaf\_EventsSubscription API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [12], 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 Nnwdaf\_EventsSubscription service.

The Nnwdaf\_EventsSubscription API defines a single scope "nnwdaf-eventssubscription" for the entire service, and it does not define any additional scopes at resource or operation level.

## 5.2 Nnwdaf\_AnalyticsInfo Service API

### 5.2.1 Introduction

The Nnwdaf\_AnalyticsInfo service shall use the Nnwdaf\_AnalyticsInfo API.

The API URI of the Nnwdaf\_AnalyticsInfo API shall be:

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

The request URIs used in each HTTP requests from the NF service consumer towards the NWDAF shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [7], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [7].

- The<apiName>shall be "nnwdaf-analyticsinfo".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 5.2.3.

### 5.2.2 Usage of HTTP

#### 5.2.2.1 General

HTTP/2, IETF RFC 7540 [9], shall be used as specified in clause 5 of 3GPP TS 29.500 [6].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [6].

The OpenAPI [11] specification of HTTP messages and content bodies for the Nnwdaf\_AnalyticsInfo is contained in Annex A.

#### 5.2.2.2 HTTP standard headers

##### 5.2.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [6] for the usage of HTTP standard headers.

##### 5.2.2.2.2 Content type

JSON, IETF RFC 8259 [10], 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 [6]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [15].

#### 5.2.2.3 HTTP custom headers

The Nnwdaf\_AnalyticsInfo Service API shall support the mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [6] and may support the optional HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [6].

In this release of the specification, no specific custom headers are defined for the Nnwdaf\_AnalyticsInfo Service API.

### 5.2.3 Resources

#### 5.2.3.1 Resource Structure

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

Figure 5.2.3.1-1 depicts the resource URIs structure for the Nnwdaf\_AnalyticsInfo API.



Figure 5.2.3.1-1: Resource URI structure of the Nnwdaf\_AnalyticsInfo API

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

Table 5.2.3.1-1: Resources and methods overview

|  |  |  |  |
| --- | --- | --- | --- |
| Resource name | Resource URI | HTTP method or custom operation | Description |
| NWDAF Analytics | /analytics | GET | Retrieves the NWDAF analytics. |
| NWDAF Context | /context | GET | Retrieves the NWDAF context information related to analytics subscriptions. |

#### 5.2.3.2 Resource: NWDAF Analytics

##### 5.2.3.2.1 Description

The NWDAF Analytics resource represents the analytics to the Nnwdaf\_AnalyticsInfo service at a given NWDAF.

##### 5.2.3.2.2 Resource definition

Resource URI: {apiRoot}/nnwdaf-analyticsinfo/<apiVersion>/analytics

The <apiVersion> shall be set as described in clause 5.2.1.

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

Table 5.2.3.2.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.2.1 |

##### 5.2.3.2.3 Resource Standard Methods

###### 5.2.3.2.3.1 GET

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| ana-req | EventReportingRequirement | O | 0..1 | Identifies the analytics reporting requirement information. |
| event-id | EventId | M | 1 | Shall be included to identify the analytics. |
| event-filter | EventFilter | C | 0..1 | Shall be included to identify the analytics when filter information is needed for the related event. |
| supported-features | SupportedFeatures | O | 0..1 | To filter irrelevant responses related to unsupported features. |
| tgt-ue | TargetUeInformation | O | 0..1 | Identifies the target UE information. |

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

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

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| AnalyticsData | M | 1 | 200 OK | Containing the analytics with parameters as relevant for the requesting NF service consumer |
| n/a |  |  | 204 No Content | If the request NWDAF Analytics data does not exist, the NWDAF shall respond with "204 No Content ". |
| ProblemDetailsAnalyticsInfoRequest | O | 0..1 | 500 Internal Server Error | The request is rejected by the NWDAF and more details (not only the ProblemDetails) are returned. (NOTE 2) |
| ProblemDetails | O | 0..1 | 500 Internal Server Error | (NOTE 2) |
| ProblemDetails | O | 0..1 | 400 Bad Request | (NOTE 2) |
| NOTE 1: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.  NOTE 2: Failure cases are described in clause 5.2.7. | | | | |

##### 5.2.3.2.4 Resource Custom Operations

None in this release of the specification.

#### 5.2.3.3 Resource: NWDAF Context

##### 5.2.3.3.1 Description

The NWDAF Context resource represents the context information related to analytics subscriptions at the Nnwdaf\_AnalyticsInfo service at a given NWDAF.

##### 5.2.3.3.2 Resource definition

Resource URI: {apiRoot}/nnwdaf-analyticsinfo/<apiVersion>/context

The <apiVersion> shall be set as described in clause 5.2.1.

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

Table 5.2.3.3.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.2.1 |

##### 5.2.3.3.3 Resource Standard Methods

###### 5.2.3.3.3.1 GET

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name | Data type | P | Cardinality | Description |
| context-ids | ContextIdList | M | 1 | Identifies specific context information related to analytics subscriptions. |
| req-context | RequestedContext | O | 0..1 | Identfies the types of the analytics context information the consumer wishes to receive. Absence of this attribute means that the consumer wishes to receive available context information of all types. |
| supported-features | SupportedFeatures | O | 0..1 | The features supported by the NF service consumer. |

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

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

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| ContextData | M | 1 | 200 OK | Contains the context information corresponding with the context identifiers provided in the request. |
| n/a |  |  | 204 No Content | If the requested context information does not exist, the NWDAF shall respond with "204 No Content". |
| NOTE: The mandatory HTTP error status codes for the GET method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | |

### 5.2.4 Custom Operations without associated resources

None in this release of the specification.

### 5.2.5 Notifications

None in this release of the specification.

### 5.2.6 Data Model

#### 5.2.6.1 General

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

Table 5.2.6.1-1 specifies the data types defined for the Nnwdaf\_AnalyticsInfo service based interface protocol.

Table 5.2.6.1-1: Nnwdaf\_AnalyticsInfo specific Data Types

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Data type | | | | Section defined | Description | Applicability |
| AdditionInfoAnalyticsInfoRequest | | | 5.2.6.2.5 | Contains more details (not only the ProblemDetails) in case an Nnwdaf\_AnalyticsInfo request is rejected. | EneNA | |
| AdrfDataType | | | 5.2.6.3.5 | Represents a type of data that is stored in the ADRF. | AnaCtxTransfer | |
| AnalyticsData | | | | 5.2.6.2.2 | Describes analytics with parameters indicated in the request. |  |
| ContextData | | | 5.2.6.2.6 | Contains context information related to analytics subscriptions corresponding with one or more context identifiers. | AnaCtxTransfer | |
| ContextElement | | | 5.2.6.2.7 | Contains context information corresponding with a specific context identifier. | AnaCtxTransfer | |
| ContextIdList | | | 5.2.6.2.8 | Contains list of context identifiers of context information of analytics subscriptions. | AnaCtxTransfer | |
| ContextType | | | 5.2.6.3.4 | Identfies the type of analytics context information. | AnaCtxTransfer | |
| EventFilter | | 5.2.6.2.3 | | | Represents the event filters used to identify the requested analytics. |  |
| EventId | | 5.2.6.3.3 | | | Describes the type of analytics. |  |
| HistoricalData | | 5.2.6.2.9 | | Contains historical data related to an analytics subscription. | AnaCtxTransfer | |
| ProblemDetailsAnalyticsInfoRequest | | 5.2.6.4.1 | | | Data type that extends ProblemDetails. | EneNA |
| RequestedContext | | | 5.2.6.2.11 | Contains types of analytics context information. | AnaCtxTransfer | |
| SmcceInfo | | | 5.2.6.2.12 | Represents the analytics of Session Management congestion control experience information. | SMCCE | |
| SmcceUeList | | | 5.2.6.2.13 | Represents the List of UEs classified based on experience level of Session Management congestion control. | SMCCE | |
| SpecificAnalyticsSubscription | | | 5.2.6.2.10 | Represents an existing subscription for a specific type of analytics to a specific NWDAF. | AnaCtxTransfer | |
| SpecificDataSubscription | | | 5.2.6.2.14 | Represents an existing data collection subscription to a specific data source NF. | AnaCtxTransfer | |

Table 5.2.6.1-2 specifies data types re-used by the Nnwdaf\_AnalyticsInfo 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 Nnwdaf service based interface.

Re-used data types of clause 5.1.6 refer here to requests instead of subscriptions.

Table 5.2.6.1-2: Nnwdaf\_AnalyticsInfo re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| AbnormalBehaviour | 5.1.6.2.15 | Represents the abnormal behaviour information. | AbnormalBehaviour |
| AnalyticsContextIdentifier | 5.1.6.2.43 | Contains information about the available analytics contexts. | AnaCtxTransfer |
| AnalyticsMetadataInfo | 5.1.6.2.37 | Contains analytics metadata information required for analytics aggregation. | Aggregation |
| AnalyticsSubset | 5.1.6.3.18 | Contains information about the analytics subsets provided in the subscription request. | EneNA |
| AnySlice | 5.1.6.3.2 |  |  |
| ApplicationId | 3GPP TS 29.571 [8] | Identifies the application. | ServiceExperience  UeCommunication  AbnormalBehaviour  DnPerformance |
| BwRequirement | 5.1.6.2.25 |  | ServiceExperience |
| DataNotification | 3GPP TS 29.575 [27] | Describes Notifications about data collection events that occurred. | EneNA |
| DataSubscription | 3GPP TS 29.575 [27] | Represents data subscription from data source (e.g. AMF, SMF, UDM, NEF, AF). | EneNA |
| DateTime | 3GPP TS 29.571 [8] | Identifies the time. |  |
| DispersionRequirement | 5.1.6.2.50 | Dispersion analytics requirement. | Dispersion |
| DispersionInfo | 5.1.6.2.53 | Dispersion analytics information. | Dispersion |
| Dnai | 3GPP TS 29.571 [8] | Identifies a user plane access to one or more DN(s). | ServiceExperience  DnPerformance |
| Dnn | 3GPP TS 29.571 [8] | Identifies the DNN. | ServiceExperience  AbnormalBehaviour  UeCommunication  SMCCE  DnPerformance |
| DnPerfInfo | 5.1.6.2.45 | Represents DN performance information | DnPerformance |
| DnPerformanceReq | 5.1.6.2.66 | Represents the DN performance requirements. | DnPerformance |
| DurationSec | 3GPP TS 29.571 [8] |  |  |
| EventNotification | 5.1.6.2.5 | Describes Notifications about analytics events that occurred. | AnaCtxTransfer |
| EventReportingRequirement | 5.1.6.2.7 |  |  |
| ExceptionId | 5.1.6.3.6 |  | AbnormalBehaviour |
| ExpectedUeBehaviourData | 3GPP TS 29.503 [23] |  | AbnormalBehaviour |
| ExpectedAnalyticsType | 5.1.6.3.11 |  | AbnormalBehaviour |
| ModelInfo | 5.1.6.2.42 | The information of the ML models. | AnaCtxTransfer |
| NetworkAreaInfo | 3GPP TS 29.554 [18] | The network area information. | UeMobility  UeCommunication  NetworkPerformance  QoSSustainability  ServiceExperience  UserDataCongestion  AbnormalBehaviour  NsiLoadExt  Dispersion  RedundantTransmissionExp  WlanPerformance  DnPerformance |
| NetworkPerfInfo | 5.1.6.2.23 |  | NetworkPerformance |
| NetworkPerfType | 5.1.6.3.10 | Represents the network performance types. | NetworkPerformance |
| NfLoadLevelInformation | 5.1.6.2.31 | Represents load level information of a given NF instance. | NfLoad |
| NfInstanceId | 3GPP TS 29.571 [8] | Identifies an NF instance | NfLoad |
| NfSetId | 3GPP TS 29.571 [8] | Identifies an NF Set instance. | NfLoad |
| NFType | 3GPP TS 29.510 [12] | Indentifies a type of NF. | NfLoad |
| NsiIdInfo | 5.1.6.2.33 | Identify the S-NSSAI and the associated Network Slice Instance(s). | ServiceExperience  NsiLoad  DnPerformance |
| NsiLoadLevelInfo | 5.1.6.2.34 | Represents the load level information for an S-NSSAI and the associated network slice instance. | NsiLoad |
| NnwdafEventsSubscription | 5.1.6.2.2 | Represents an Individual NWDAF Event Subscription resource. | AnaCtxTransfer |
| ProblemDetails | 3GPP TS 29.571 [8] | Used in error responses to provide more detailed information about an error. |  |
| QosRequirement | 5.1.6.2.20 |  | QoSSustainability |
| QosSustainabilityInfo | 5.1.6.2.19 |  | QoSSustainability |
| RatFreqInformation | 5.1.6.2.67 | Represents the RAT type and/or Frequency information | ServiceExperienceExt |
| RedundantTransmissionExpInfo | 5.1.6.2.57 | Redundant transmission experience analytics information. | RedundantTransmissionExp |
| RedundantTransmissionExpReq | 5.1.6.2.56 | Redundant transmission experience analytics requirement. | RedundantTransmissionExp |
| ServiceExperienceInfo | 5.1.6.2.24 |  | ServiceExperience |
| Supi | 3GPP TS 29.571 [8] | Identifies the UE. | ServiceExperience,  NfLoad  NetworkPerformance  UserDataCongestion  UeMobility  UeCommunication  AbnormalBehaviour  SMCCE  Dispersion  RedundantTransmissionExp  WlanPerformance |
| SupportedFeatures | 3GPP TS 29.571 [8] | Used to negotiate the applicability of the optional features defined in table 5.2.8-1. |  |
| Snssai | 3GPP TS 29.571 [8] |  |  |
| SliceLoadLevelInformation | 5.1.6.2.6 |  |  |
| TargetUeInformation | 5.1.6.2.8 | Identifies the target UE information. | ServiceExperience  NfLoad  NetworkPerformance  UserDataCongestion  UeMobility  UeCommunication  AbnormalBehaviour  QoSSustainability  Dispersion  RedundantTransmissionExp  WlanPerformance  SMCCE  DnPerformance |
| UeCommunication | 5.1.6.2.13 |  | UeCommunication |
| UeMobility | 5.1.6.2.10 |  | UeMobility |
| Uinteger | 3GPP TS 29.571 [8] | Unsigned Integer, i.e. only value 0 and integers above 0 are permissible. |  |
| UpfInformation | 3GPP TS 29.508 [29] | The information of the UPF serving the UE. | ServiceExperienceExt  DnPerformance |
| UserDataCongestionInfo | 5.1.6.2.17 |  | UserDataCongestion |
| WlanPerformanceInfo | 5.1.6.2.60 | WLAN performance analytics information. | WlanPerformance |
| WlanPerformanceReq | 5.1.6.2.59 | WLAN performance analytics requirement. | WlanPerformance |

#### 5.2.6.2 Structured data types

##### 5.2.6.2.1 Introduction

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

##### 5.2.6.2.2 Type AnalyticsData

Table 5.2.6.2.2-1: Definition of type AnalyticsData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| start | DateTime | O | 0..1 | It defines the start time of which the statistics analytics information is applicable or predictions analytics information is valid. (NOTE 1) (NOTE 4) |  |
| expiry | DateTime | O | 0..1 | It defines the expiration time after which the statistics analytics information is applicable or predictions analytics information is invalid. (NOTE 1) (NOTE 4) |  |
| timeStampGen | DateTime | C | 0..1 | It defines the timestamp of analytics generation. (NOTE 3) |  |
| anaMetaInfo | AnalyticsMetadataInfo | C | 0..1 | Contains information about analytics metadata required to aggregate the analytics. It shall be present if the "anaMeta" attribute was included in the request, containing the information indicated by the "anaMeta" attribute. | Aggregation |
| sliceLoadLevelInfos | array(SliceLoadLevelInformation) | C | 1..N | The slices and the load level information. Shall be present when the requested event is "LOAD\_LEVEL\_INFORMATION". |  |
| nsiLoadLevelInfos | array(NsiLoadLevelInfo) | C | 1..N | Each element identifies the load level information for an S-NSSAI and the optionally associated network slice instance.  Shall be presented when the requested event is "NSI\_LOAD\_LEVEL" | NsiLoad |
| nwPerfs | array(NetworkPerfInfo) | C | 1..N | The network performance information.  Shall be present when the requested event is "NETWORK\_PERFORMANCE". | NetworkPerformance |
| nfLoadLevelInfos | array(NfLoadLevelInformation) | C | 1..N | The NF load information.  When the requestedevent is "NF\_LOAD", the nfLoadLevelInfos shall be included. | NfLoad |
| qosSustainInfos | array(QosSustainabilityInfo) | C | 1..N | The QoS sustainability informations in the certain geographic areas.  It shall be present if the requested eventis "QOS\_SUSTAINABILITY".  (NOTE 2) | QoSSustainability |
| ueMobs | array(UeMobility) | C | 1..N | The UE mobility information.  When the requested event is "UE\_MOBILITY", the "ueMobs" attribute shall be included. | UeMobility |
| ueComms | array(UeCommunication) | C | 1..N | The UE communication information.  When the requested event is "UE\_COMM", the "ueComms" attribute shall be included. | UeCommunication |
| userDataCongInfos | array(UserDataCongestionInfo) | C | 1..N | The user data congestion information.  Shall be present when the requested event is "USER\_DATA\_CONGESTION". | UserDataCongestion |
| suppFeat | SupportedFeatures | C | 0..1 | List of Supported features used as described in clause 5.2.8.  This parameter shall be supplied by NWDAF in the reply of GET request that request the analytics resource, if the consumer includes "supported-features" in the GET request. |  |
| svcExps | array(ServiceExperienceInfo) | C | 1..N | The service experience information.  Shall be present when the requested event is "SERVICE\_EXPERIENCE". | ServiceExperience |
| abnorBehavrs | array(AbnormalBehaviour) | C | 1..N | The abnormal behaviour information.  Shall be present when the requested event is "ABNORMAL\_BEHAVIOUR". | AbnormalBehaviour |
| smccExps | array(SmcceInfo) | C | 1..N | The Session Management congestion control experience information.  Shall be present when the requested event is "SM\_CONGESTION". | SMCCE |
| disperInfos | array(DispersionInfo) | C | 1..N | The Dispersion information.  Shall be present when the requested event is "DISPERSION". | Dispersion |
| redTransInfos | array(RedundantTransmissionExpInfo) | C | 1..N | The Redundant Transmission Experience analytics information.  Shall be present when the requested event is "RED\_TRANS\_EXP". | RedundantTransmissionExp |
| wlanInfos | array(WlanPerformanceInfo) | C | 1..N | The WLAN performance related information.  When requested event is "WLAN\_PERFORMANCE", the "wlanInfos" attribute shall be included. | WlanPerformance |
| dnPerfInfos | array(DnPerfInfo) | C | 1..N | The DN performance information.  Shall be present when the requested event is "DN\_PERFORMANCE". | DnPerformance |
| NOTE 1: If the "start" attribute and the "expiry" attribute are both provided, the DateTime of the "expiry" attribute shall not be earlier than the DateTime of the "start" attribute.  NOTE 2: The "qosFlowRetThd" and "ranUeThrouThd" attributes in QosSustainabilityInfo data type are not applicable.  NOTE 3: This attribute shall be included when ADRF is deployed.  NOTE 4: The validity period specified by "start" and "expiry" attributes is determined by NWDAF internal logic, and is a subset of the analytics target period indicated by "startTs" and "endTs", or "offsetPeriod" attributes contained in "ana-req" attribute. If the analytics target period refers to the past, the period specified by these two attributes indicate the time period over which the statistics are applicable. If the analytics target period refers to the future, the period specified by these two attributes indicate the time period over which the predictions are valid. | | | | | |

##### 5.2.6.2.3 Type EventFilter

Table 5.2.6.2.3-1: Definition of type EventFilter

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Attribute name | | Data type | | | P | Cardinality | | Description | | Applicability | |
| anySlice | | AnySlice | | | C | 0..1 | | Default is "false". (NOTE 1) | |  | |
| appIds | | array(ApplicationId) | | | C | 1..N | | Represents the Application Identifier(s). The absence of appIds means applicable to all applications. (NOTE 4) | | ServiceExperience  UeCommunication AbnormalBehaviour  Dispersion  DnPerformance | |
| dnns | | array(Dnn) | | | C | 1..N | | Represents the DNN(s). Each DNN is a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only. The absence of dnns means applicable to all DNNs. (NOTE 4) | | ServiceExperience  UeCommunication  AbnormalBehaviour  SMCCE  DnPerformance | |
| dnais | | array(Dnai) | | | C | 1..N | | Represents the Data Network Access Identifier(s) of user plane accesses to DN(s) where applications are deployed. It may be included when event-id is "SERVICE\_EXPERIENCE" or "DN\_PERFORMANCE". | | ServiceExperience  DnPerformance | |
| ladnDnns | | array(Dnn) | | | O | 1..N | | Represents the LADN DNN(s) to indicate the LADN service area(s) as the AoI(s). | | UeMobilityExt | |
| snssais | | array(Snssai) | | | C | 1..N | | Identification(s) of network slice(s). (NOTE 1), (NOTE 4) | |  | |
| nfInstanceIds | | array(NfInstanceId) | | | O | 1..N | | Identification(s) of NF instance(s). | | NfLoad | |
| nfSetIds | | array(NfSetId) | | | O | 1..N | | Identification(s) of NF instance set(s). | | NfLoad | |
| nfTypes | | array(NFType) | | | O | 1..N | | Identification(s) of NF type(s). (NOTE 8) | | NfLoad  NsiLoadExt | |
| networkArea | | NetworkAreaInfo | | | C | 0..1 | | This IE represents the network area where the NF service consumer wants to know the analytics result. (NOTE 2), (NOTE 4) | | UeMobility  UeCommunication  NetworkPerformance  QoSSustainability  ServiceExperience  UserDataCongestion  AbnormalBehaviour  NsiLoadExt  NfLoadExt  Dispersion  RedundantTransmissionExp  WlanPerformance  DnPerformance | |
| visitedAreas | | array(NetworkAreaInfo) | | | O | 1..N | | Identification(s) of network area(s) which the UEs had previously been in at least one of the Visited Area(s) of Interest. (NOTE 9) | | UeMobilityExt | |
| maxTopAppUlNbr | | Uinteger | | | O | 0..1 | | Indicates the requested maximum number of top applications that contribute the most to the traffic in Uplink direction.  Minimum = 1.  May be included when one of the elements in the "listOfAnaSubsets" attribute is set to LIST\_OF\_TOP\_APP\_UL. | | UserDataCongestionExt | |
| maxTopAppDlNbr | | Uinteger | | | O | 0..1 | | Indicates the requested maximum number of top applications that contribute the most to the traffic in Downlink direction.  Minimum = 1.  May be included when one of the elements in the "listOfAnaSubsets" attribute is set to LIST\_OF\_TOP\_APP\_DL. | | UserDataCongestionExt | |
| nsiIdInfos | | array(NsiIdInfo) | | | O | 1..N | | Each element identifies the S-NSSAI and the optionally associated network slice instance(s).  May be included when subscribed event is "NSI\_LOAD\_LEVEL",  "SERVICE\_EXPERIENCE" or "DN\_PERFORMANCE".  (NOTE 1) | | ServiceExperience  NsiLoad  DnPerformance | |
| nwPerfTypes | | array(NetworkPerfType) | | | C | 1..N | | Represents the network performance types. This attribute shall be included when event-id is "NETWORK\_PERFORMANCE". | | NetworkPerformance | |
| qosRequ | | QoSRequirement | | | C | 0..1 | | Represents the QoS requirements. This attribute shall be included when event-id is "QOS\_SUSTAINABILITY". | | QoSSustainability | |
| bwRequs | | array(BwRequirement) | | | O | 1..N | | Represents the media/application bandwidth requirement for each application.  It may only be present if "appIds" attribute is provided. | | ServiceExperience | |
| excepIds | | array(ExceptionId) | | | C | 1..N | | Represents a list of Exception Ids.  (NOTE 3), (NOTE 4) | | AbnormalBehaviour | |
| exptAnaType | | ExpectedAnalyticsType | | | C | 0..1 | | Represents expected UE analytics type.  (NOTE 3), (NOTE 4) | | AbnormalBehaviour | |
| exptUeBehav | | ExpectedUeBehaviourData | | | O | 0..1 | | Represents expected UE behaviour. | | AbnormalBehaviour | |
| ratFreqs | | array(RatFreqInformation) | | O | 1..N | | | Identification(s) of the RAT type(s) and/or frequency(ies) of UE's serving cell(s) which the request applies. (NOTE 5) | | ServiceExperienceExt | |
| disperReqs | | array(DispersionRequirement) | | O | 1..N | | | Represents the dispersion analytics requirements. | | Dispersion | |
| redTransReqs | | array(RedundantTransmissionExpReq) | | O | 1..N | | | Represents the redundant transmission experience analytics requirements. | | RedundantTransmissionExp | |
| wlanReqs | | array(WlanPerformanceReq) | | O | 1..N | | | Represents other WLAN performance analytics requirements. If the attribute contains no content, may take default handling action. | | WlanPerformance | |
| listOfAnaSubsets | | array(AnalyticsSubset) | | O | 1..N | | | The list of analytics subsets used to indicate the content of the analytics. | | EneNA | |
| upfInfo | | UpfInformation | | O | 0..1 | | | Identifies the UPF. (NOTE 7) | | ServiceExperienceExt  DnPerformance | |
| appServerAddrs | | array(AddrFqdn) | | C | 1..N | | | Each element represents the Application Server Instance (IP address/FQDN of the Application Server). (NOTE 6) | | ServiceExperienceExt  DnPerformance | |
| dnPerfReqs | | array(DnPerformanceReq) | | O | 1..N | | | Represents the DN performance requirements. This attribute shall be included when event-id is "DN\_PERFORMANCE". | | DnPerformance | |
| NOTE 1: The "anySlice" attribute is not applicable to features "UeMobility" and "NetworkPerformance". The "snssais" attribute is not applicable to features "ServiceExperience", "NsiLoad", "UeMobility" and "NetworkPerformance". When event-id in the request is "LOAD\_LEVEL\_INFORMATION", the identifications of network slices, either information about slice(s) identified by the "snssais" attribute, or "anySlice" set to "true", shall be included. When subscribed event is "NSI\_LOAD\_LEVEL" or "SERVICE\_EXPERIENCE", either the "nsiIdInfos" attribute or anySlice set to "true" shall be included. When subscribed event is "QOS\_SUSTAINABILITY", "NF\_LOAD", "UE\_COMM", "ABNORMAL\_BEHAVIOUR", "USER\_DATA\_CONGESTION", "DISPERSION" or "RED\_TRANS\_EXP", the identifications of network slices identified by the "snssais" attribute is optional.  NOTE 2: For "NETWORK\_PERFORMANCE", "SERVICE\_EXPERIENCE" or "USER\_DATA\_CONGESTION" event, this attribute shall be provided if the event applied for all UEs (i.e. "anyUe" attribute set to true). For "QOS\_SUSTAINABILITY", this attribute shall be provided.  NOTE 3: Either "excepIds" or "exptAnaType" shall be provided if event-id in the request is "ABNORMAL\_BEHAVIOUR".  NOTE 4: For "ABNORMAL\_BEHAVIOUR" event with "anyUe" attribute in "tgt-ue" attribute sets to true,  - at least one of the "networkArea" and the "snssais" attribute should be included, if the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via the "excepIds" attribute is mobility related;  - at least one of the "networkArea", "appIds", "dnns" and "snssais" attribute should be included, if the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via the "excepIds" attribute is communication related;  - the expected analytics type via the"exptAnaType" attribute or the list of Exception Ids via "excepIds" attribute shall not be requested for both mobility and communication related analytics at the same time.  NOTE 5: If both the "allFreq" attribute and the "allRat" attributes in RatFreqInformation data type are present, then the only one instance of the RatFreqInformation data type shall be present to indicate for all the RAT type and Frequency value the NWDAF has received for the application.  NOTE 6: This parameter shall be provided when a consumer requires analytics for an edge application over a UP path.  NOTE 7: This parameter may be provided when a consumer requires analytics for an edge application over a UP path.  NOTE 8: When event-id in the request is "NSI\_LOAD\_LEVEL" and the NsiLoadExt feature is supported, and the NF service consumer provides the "nfTypes" attribute, then the NWDAF accounts only for the resource usage of the NF types included in "nfTypes" to derive the output analytics.  NOTE 9: If this attribute is provided, the analytics target period shall be a past time period (i.e. only statistics is supported). | | | | | | | | | | | |

NOTE: Care needs to be taken to avoid excessive signalling.

##### 5.2.6.2.4 Void

##### 5.2.6.2.5 Type AdditionInfoAnalyticsInfoRequest

Table 5.2.6.2.5-1: Definition of type AdditionInfoAnalyticsInfoRequest

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| rvWaitTime | DurationSec | O | 0..1 | Recommended minimum time interval (in seconds) to be used to determine the time when analytics information is needed in similar future requests.  It may only be included if the "cause" attribute within the ProblemDetails data type is set to "UNSATISFIED\_REQUESTED\_ANALYTICS\_TIME". |  |

##### 5.2.6.2.6 Type ContextData

Table 5.2.6.2.6-1: Definition of type ContextData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| contextElems | array(ContextElement) | M | 1..N | List of items that contain context information corresponding with a context identifier. |  |
| suppFeat | SupportedFeatures | C | 0..1 | List of Supported features used as described in clause 5.2.8.  This parameter shall be supplied by NWDAF in the reply of GET request that request the analytics context information, if the consumer includes "supported-features" in the GET request. |  |

##### 5.2.6.2.7 Type ContextElement

Table 5.2.6.2.7-1: Definition of type ContextElement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| contextId | AnalyticsContextIdentifier | M | 1 | Context identifier of the context information contained in the rest of the attributes. |  |
| pendAnalytics | array(EventNotification) | C | 1..N | Contains output analytics for the analytics subscription this context element is associated with, which have not yet been sent to the analytics consumer. It shall be provided if such analytics are available and the NF service consumer has requested the "PENDING\_ANALYTICS" context type. |  |
| histAnalytics | array(EventNotification) | C | 1..N | Contains historical output analytics for the analytics subscription this context element is associated with. It shall be provided if such analytics are available and the NF service consumer has requested the "HISTORICAL\_ANALYTICS" context type. |  |
| lastOutputTime | DateTime | C | 0..1 | Timestamp of the last output analytics provided to the analytics consumer. It shall be provided if output analytics had been provided and the NF service consumer has requested the "PENDING\_ANALYTICS" and/or "HISTORICAL\_ANALYTICS" context type. Absence of this attribute means that no output analytics had been sent. |  |
| aggrSubs | array(SpecificAnalyticsSubscription) | C | 1..N | Contains analytics subscription aggregation information, i.e. information about analytics subscriptions that the NWDAF has with other NWDAFs that collectively serve an analytics subscription. It shall be provided if such subscriptions exist and the NF service consumer has requested the "AGGR\_SUBS" context type. |  |
| histData | array(HistoricalData) | C | 1..N | Contains historical data related to the analytics subscription this context element is associated with. It shall be provided if such data exists and the NF service consumer has requested the "DATA" context type. |  |
| adrfId | NfInstanceId | O | 0..1 | Identifier of the ADRF in which the NWDAF stores analytics context information. |  |
| adrfDataTypes | array(AdrfDataType) | C | 1..N | Type(s) of data stored in the ADRF by the NWDAF. It shall be provided if the attribute "adrfId" is provided. |  |
| aggrNwdafIds | array(NfInstanceId) | C | 1..N | NWDAF identifiers of NWDAF instances used by the NWDAF service consumer when aggregating multiple analytics subscriptions. It shall be provided if such information is available and the NF service consumer has requested the "AGGR\_INFO" context type. |  |
| modelInfos | array(ModelInfo) | C | 1..N | Contains information identifying the ML model(s) that the consumer NWDAF is currently subscribing for the analytics. It shall be provided if such information is available and the NF service consumer has requested the "ML\_MODELS" context type. |  |

##### 5.2.6.2.8 Type ContextIdList

Table 5.2.6.2.8-1: Definition of type ContextIdList

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| contextIds | array(AnalyticsContextIdentifier) | M | 1..N | List of context identifiers of context information of analytics subscriptions. |  |

##### 5.2.6.2.9 Type HistoricalData

Table 5.2.6.2.9-1: Definition of type HistoricalData

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| startTime | DateTime | O | 0..1 | Start of the time period during which the data was collected. |  |
| endTime | DateTime | O | 0..1 | End of the time period during which the data was collected. |  |
| subsWithSources | array(SpecificDataSubscription) | O | 1..N | Information about subscriptions with the data sources. |  |
| data | array(DataNotification) | M | 1..N | Historical data related to the analytics. |  |

##### 5.2.6.2.10 Type SpecificAnalyticsSubscription

Table 5.2.6.2.10-1: Definition of type SpecificAnalyticsSubscription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| subscriptionId | string | M | 1 | The identifier of the specific analytics subscription. |  |
| producerId | NfInstanceId | C | 0..1 | NWDAF instance identifier to which the NF service consumer has established this subscription. (NOTE) |  |
| producerSetId | NfSetId | C | 0..1 | NWDAF set identifier to which the NF service consumer has established this subscription. (NOTE) |  |
| nwdafEvSub | NnwdafEventsSubscription | M | 1 | Contains information about the analytics subscription. |  |
| NOTE: Exactly One of "producerId" and "producerSetId" shall be included. | | | | | |

##### 5.2.6.2.11 Type RequestedContext

Table 5.2.6.2.11-1: Definition of type RequestedContext

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| contexts | array(ContextType) | M | 1..N | Contains the types of the analytics context information the consumer wishes to receive. |  |

##### 5.2.6.2.12 Type SmcceInfo

Table 5.2.6.2.12-1: Definition of type SmcceInfo

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| dnn | Dnn | C | 0..1 | Identifies DNN, a full DNN with both the Network Identifier and Operator Identifier, or a DNN with the Network Identifier only.  Shall be present if the "dnns" was provided in the event subscription or analytics request. |  |
| snssai | Snssai | C | 0..1 | Identifies the network slice information.  Shall be present if the "snssais" was provided in the event subscription or analytics request. |  |
| smcceUeList | SmcceUeList | M | 1 | Contains the list of UEs classified based on experience level of SM congestion control. |  |

##### 5.2.6.2.13 Type SmcceUeList

Table 5.2.6.2.13-1: Definition of type SmcceUeList

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| highLevel | array(Supi) | C | 1..N | A list of UEs whose experience level of SMCC for specific DNN and/or S-NSSAI is high.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set with value as "LIST\_OF\_HIGH\_EXP\_UE". (NOTE 1) (NOTE 2) |  |
| mediumLevel | array(Supi) | C | 1..N | A list of UEs whose experience level of SMCC for specific DNN and/or S-NSSAI is medium.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set with value as "LIST\_OF\_MEDIUM\_EXP\_UE". (NOTE 1) (NOTE 2) |  |
| lowLevel | array(Supi) | C | 1..N | A list of UEs whose experience level of SMCC for specific DNN and/or S-NSSAI is low.  Shall be present if one of the elements in the "listOfAnaSubsets" attribute was set with value as "LIST\_OF\_LOW\_EXP\_UE". (NOTE 1) (NOTE 2) |  |
| NOTE 1: At least one of "highLevel", "mediumLevel" or "lowLevel" shall be provided.  NOTE 2: If the "listOfAnaSubsets" attribute with value only applicable to SMCCE event is present in the request, then only the corresponding attribute(s) shall be present. | | | | | |

##### 5.2.6.2.14 Type SpecificDataSubscription

Table 5.2.6.2.14-1: Definition of type SpecificDataSubscription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| subscriptionId | string | M | 1 | The identifier of the specific data subscription. |  |
| producerId | NfInstanceId | C | 0..1 | NF instance identifier to which the NF service consumer has established this subscription. (NOTE) |  |
| producerSetId | NfSetId | C | 0..1 | NF set identifier to which the NF service consumer has established this subscription. (NOTE) |  |
| dataSub | DataSubscription | M | 1 | Contains information about the subscription with the data source. |  |
| NOTE: One of "producerId" and "producerSetId" shall be included. | | | | | |

#### 5.2.6.3 Simple data types and enumerations

##### 5.2.6.3.1 Introduction

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

##### 5.2.6.3.2 Simple data types

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

Table 5.2.6.3.2-1: Simple data types

|  |  |  |  |
| --- | --- | --- | --- |
| Type Name | Type Definition | Description | Applicability |
| n/a |  |  |  |

##### 5.2.6.3.3 Enumeration: EventId

Table 5.2.6.3.3-1: Enumeration EventId

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| LOAD\_LEVEL\_INFORMATION | Represents the analytics of load level information of corresponding network slice. |  |
| NETWORK\_PERFORMANCE | Represents the analytics of network performance information | NetworkPerformance |
| NF\_LOAD | Represents the analytics of NF Load information. | NfLoad |
| QOS\_SUSTAINABILITY | Represents the analytics of QoS sustainability in the certain area. | QoSSustainability |
| SERVICE\_EXPERIENCE | Represents the analytics of service experience of corresponding application and/or network slice. | ServiceExperience |
| UE\_MOBILITY | Represents the analytics of UE mobility. | UeMobility |
| UE\_COMM | Represents the analytics of UE communication. | UeCommunication |
| USER\_DATA\_CONGESTION | Represents the analytics of the user data congestion in the certain area. | UserDataCongestion |
| ABNORMAL\_BEHAVIOUR | Represents the analytics of abnormal behaviour information. | AbnormalBehaviour |
| NSI\_LOAD\_LEVEL | Represents the analytics of load level information of Network Slice and the optionally associated Network Slice Instance | NsiLoad |
| SM\_CONGESTION | Represents the analytics of Session Management congestion control experience information for specific DNN and/or S-NSSAI. | SMCCE |
| DN\_PERFORMANCE | Represents the analytics of DN performance. | DnPerformance |
| DISPERSION | Represents the analytics of dispersion. | Dispersion |
| RED\_TRANS\_EXP | Represents the analytics of Redundant Transmission Experience. | RedundantTransmissionExp |
| WLAN\_PERFORMANCE | Represents the analytics of WLAN performance. | WlanPerformance |

##### 5.2.6.3.4 Enumeration: ContextType

Table 5.2.6.3.4-1: Enumeration ContextType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| PENDING\_ANALYTICS | Represents context information that relates to pending output analytics. |  |
| HISTORICAL\_ANALYTICS | Represents context information that relates to historical output analytics. |  |
| AGGR\_SUBS | Represents context information about the analytics subscriptions that an NWDAF has with other NWDAFs that collectively serve an analytics subscription. |  |
| DATA | Represents context information about historical data that is available. |  |
| AGGR\_INFO | Represents context information that is related to aggregation of analytics from multiple NWDAF subscriptions. |  |
| ML\_MODELS | Represents context information about used ML models. |  |

##### 5.2.6.3.5 Enumeration: AdrfDataType

Table 5.2.6.3.5-1: Enumeration AdrfDataType

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| HISTORICAL\_ANALYTICS | Indicates that historical analytics are stored in the ADRF. |  |
| HISTORICAL\_DATA | Indicates that historical data are stored in the ADRF. |  |

#### 5.2.6.4 Data types describing alternative data types or combinations of data types

##### 5.2.6.4.1 Type ProblemDetailsAnalyticsInfoRequest

Table 5.2.6.4.1-1: Definition of type ProblemDetailsAnalyticsInfoRequest as a list of to be combined data types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Cardinality | Description | Applicability |
| ProblemDetails | 1 | Details of the problem as defined in TS 29.571 [8]. |  |
| AdditionInfoAnalyticsInfoRequest | 1 | Contains additional information why the analytics request is rejected. |  |

### 5.2.7 Error handling

#### 5.2.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [6].

For the Nnwdaf\_AnalyticsInfo API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [7]. Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [6] 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 [6]. In addition, the requirements in the following clauses shall apply.

#### 5.2.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the Nnwdaf\_AnalyticsInfo API.

#### 5.2.7.3 Application Errors

The application errors defined for the Nnwdaf\_AnalyticsInfo API are listed in table 5.2.7.3-1.

Table 5.2.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| BOTH\_STAT\_PRED\_NOT\_ALLOWED | 400 Bad Request | For the requested observation period, the start time is in the past and the end time is in the future, which means the NF service consumer requested both statistics and prediction for the analytics. |
| UNAVAILABLE\_DATA | 500 Internal Server Error | Indicates the requested statistics in the past is rejected since necessary data to perform the service is unavailable. |
| UNSATISFIED\_REQUESTED\_ANALYTICS\_TIME | 500 Internal Server Error | Indicates that the requested event is rejected since the analytics information is not ready when the time indicated by the "timeAnaNeeded" attribute (as provided during the request) is reached. |
| NOTE: Including a "ProblemDetails" data structure with the "cause" attribute in the HTTP response is optional unless explicitly mandated in the service operation clauses. | | |

### 5.2.8 Feature negotiation

The optional features in table 5.2.8-1 are defined for the Nnwdaf\_AnalyticsInfo API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [6].

Table 5.2.8-1: Supported Features

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Feature number | | Feature Name | | Description | |
| 1 | | UeMobility | | This feature indicates the support of analytics based on UE mobility information. | |
| 2 | | UeCommunication | | This feature indicates the support of analytics based on UE communication information. | |
| 3 | | NetworkPerformance | | This feature indicates the support of analytics based on network performance. | |
| 4 | | ServiceExperience | | This feature indicates support for the event related to service experience. | |
| 5 | | QoSSustainability | | This feature indicates support for the event related to QoS sustainability. | |
| 6 | | AbnormalBehaviour | | This feature indicates support for the event related to abnormal behaviour information. | |
| 7 | | UserDataCongestion | | This feature indicates the support of the analytics related on user data congestion. | |
| 8 | | NfLoad | | This feature indicates the support of the analytics related to the load of NF instances. | |
| 9 | | NsiLoad | | This feature indicates the support of the analytics related to the load level of Network Slice and the optionally associated Network Slice Instance. | |
| 10 | | EneNA | | This feature indicates support for the enhancements of network data analytics requirements. | |
| 11 | | UserDataCongestionExt | | This feature indicates support for the extensions to the event related to user data congestion, including support of GPSI and/or list of Top applications. Supporting this feature also requires the support of feature UserDataCongestion. | |
| 12 | | Aggregation | | This feature indicates support for analytics aggregation. | |
| 13 | | NsiLoadExt | | This feature indicates support for the extensions to the event related to the load level of Network Slice and the optionally associated Network Slice Instance, including support of area of interest, NF load information and number of UE or number of PDU Session. Supporting this feature also requires the support of feature NsiLoad. | |
| 14 | | ServiceExperienceExt | | This feature indicates support for the extensions to the event related to service experience, including support of RAT type and/or Frequency. Supporting this feature also requires the support of feature ServiceExperience. | |
| 15 | | SMCCE | | This feature indicates support for the event related to SM congestion control experience. | |
| 16 | | NfLoadExt | | This feature indicates support for the extensions to the event related to the load of NF instances, including NF load over area of interest. Supporting this feature also required the support of feature NfLoad. | |
| 17 | | Dispersion | | This feature indicates support for the event related to dispersion analytics information. | |
| 18 | | RedundantTransmissionExp | | This feature indicates support for the event related to redundant transmission experience analytics information. | |
| 19 | | WlanPerformance | | This feature indicates support of the event related to WLAN performance analytics information. | |
| 20 | | UeMobilityExt | | This feature indicates support for extensions to the event related to UE mobility, including support of LADN DNN to refer the LADN service area as the AOI. Supporting this feature also requires the support of feature UeMobility. | |
| 21 | | DnPerformance | | This feature indicates the support of the analytics related to DN performance. | |
| 22 | | AnaCtxTransfer | | This feature indicates the support of analytics context transfer. | |

### 5.2.9 Security

As indicated in 3GPP TS 33.501 [13] and 3GPP TS 29.500 [6], the access to the Nnwdaf\_AnalyticsInfo API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [14]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, an NF service consumer, prior to consuming services offered by the Nnwdaf\_AnalyticsInfo API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [12], 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 Nnwdaf\_AnalyticsInfo service.

The Nnwdaf\_AnalyticsInfo API defines a single scope "nnwdaf-analyticsinfo" for the entire service, and it does not define any additional scopes at resource or operation level.

## 5.3 Nnwdaf\_DataManagement Service API

### 5.3.1 Introduction

The Nnwdaf\_DataManagement service shall use the Nnwdaf\_DataManagement API.

The API URI of the Nnwdaf\_DataManagement API shall be:

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

The request URIs used in each HTTP requests from the NF service consumer towards the NWDAF shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [7], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [7].

- The<apiName>shall be "nnwdaf-datamanagement".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 5.3.3.

### 5.3.2 Usage of HTTP

#### 5.3.2.1 General

HTTP/2, IETF RFC 7540 [9], shall be used as specified in clause 5 of 3GPP TS 29.500 [6].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [6].

The OpenAPI [11] specification of HTTP messages and content bodies for the Nnwdaf\_DataManagement is contained in Annex A.

#### 5.3.2.2 HTTP standard headers

##### 5.3.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [6] for the usage of HTTP standard headers.

##### 5.3.2.2.2 Content type

JSON, IETF RFC 8259 [10], 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 [6]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [15].

#### 5.3.2.3 HTTP custom headers

The Nnwdaf\_DataManagement service API shall support mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [6] and may support HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [6].

In this release of the specification, no specific custom headers are defined for the Nnwdaf\_DataManagement service API.

### 5.3.3 Resources

#### 5.3.3.1 Resource Structure

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

Figure 5.3.3.1-1 depicts the resource URIs structure for the Nnwdaf\_DataManagement API.



Figure 5.3.3.1-1: Resource URI structure of the Nnwdaf\_DataManagement API

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

Table 5.3.3.1-1: Resources and methods overview

|  |  |  |  |
| --- | --- | --- | --- |
| Resource name | Resource URI | HTTP method or custom operation | Description |
| NWDAF Data Management Subscriptions | /subscriptions | POST | Creates a new Individual NWDAF Data Management Subscription resource. |
| Individual NWDAF Data Management Subscription | /subscriptions/{subscriptionId} | DELETE | Deletes an Individual NWDAF Data Management Subscription identified by subresource {subscriptionId}. |
| PUT | Modifies an existing Individual NWDAF Data Management Subscription identified by subresource {subscriptionId}. |

#### 5.3.3.2 Resource: NWDAF Data Management Subscriptions

##### 5.3.3.2.1 Description

The NWDAF Data Management Subscriptions resource represents all subscriptions to the Nnwdaf\_DataManagement Service at a given NWDAF. The resource allows an NF service consumer to create a new Individual NWDAF Data Management Subscription resource.

##### 5.3.3.2.2 Resource Definition

Resource URI: **{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions**

The <apiVersion> shall be set as described in clause 5.3.1.

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

Table 5.3.3.2.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.3.1 |

##### 5.3.3.2.3 Resource Standard Methods

###### 5.3.3.2.3.1 POST

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

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

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

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

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

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NnwdafDataManagementSubsc | M | 1 | Create a new Individual NWDAF Data Management Subscription resource. |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| NnwdafDataManagementSubsc | M | 1 | 201 Created | The creation of an Individual NWDAF Data Management Subscription resource is confirmed and a representation of that resource is returned. |
| ProblemDetails | O | 0..1 | 400 Bad Request | (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 [6] also apply.  NOTE 2: Failure cases are described in clause 5.3.7. | | | | |

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

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

##### 5.3.3.2.4 Resource Custom Operations

None in this release of the specification.

#### 5.3.3.3 Resource: Individual NWDAF Data Management Subscription

##### 5.3.3.3.1 Description

The Individual NWDAF Data Management Subscription resource represents a single subscription to the Nnwdaf\_DataManagement Service at a given NWDAF.

##### 5.3.3.3.2 Resource definition

Resource URI: **{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions/{subscriptionId}**

The <apiVersion> shall be set as described in clause 5.3.1.

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

Table 5.3.3.3.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.3.1 |
| subscriptionId | string | Identifies a subscription to the Nnwdaf\_DataManagement Service |

##### 5.3.3.3.3 Resource Standard Methods

###### 5.3.3.3.3.1 PUT

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

Table 5.3.3.3.3.1-1: URI query parameters supported by the PUT method on this resource

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

This method shall support the request data structures specified in table 5.3.3.3.3.1-2 and the response data structures and response codes specified in table 5.3.3.3.3.1-3.

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

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NnwdafDataManagementSubsc | M | 1 | Parameters to replace a subscription to NWDAF Data Management Subscription resource. |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| NnwdafDataManagementSubsc | M | 1 | 200 OK | The Individual NWDAF Data Management Subscription resource was modified successfully and a representation of that resource is returned. |
| n/a |  |  | 204 No Content | The Individual NWDAF Data Management Subscription resource was modified successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF Data Management Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF Data Management Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| ProblemDetails | O | 0..1 | 400 Bad Request | (NOTE 2) |
| NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.  NOTE 2: Failure cases are described in clause 5.3.7. | | | | |

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

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

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

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

###### 5.3.3.3.3.2 DELETE

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

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

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

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

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

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | Successful case: The Individual NWDAF Data Management Subscription resource matching the subscriptionId was deleted. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF Data Management Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF Data Management Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | |

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

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

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

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

##### 5.3.3.3.4 Resource Custom Operations

None in this release of the specification.

### 5.3.4 Custom Operations without associated resources

### 5.3.5 Notifications

#### 5.3.5.1 General

Notifications shall comply with clause 6.2 of 3GPP TS 29.500 [6] and clause 4.6.2.3 of 3GPP TS 29.501 [7].

Table 5.3.5.1-1: Notifications overview

|  |  |  |  |
| --- | --- | --- | --- |
| Notification | Callback URI | HTTP method or custom operation | Description (service operation) |
| Event Notification | {notificURI} | POST | Report one or several observed data. |
| Fetch Notification | {fetchUri} | POST | Fetch one or several notified data. |

#### 5.3.5.2 Event Notification

##### 5.3.5.2.1 Description

The Event Notification is used by the NWDAF to report one or several observed data to an NF service consumer that has subscribed to such Notifications.

##### 5.3.5.2.2 Operation Definition

Callback URI: **{notificURI}**

The operation shall support the callback URI variables defined in Table 5.3.5.2.2-1, the request data structures specified in table 5.3.5.2.2-2 and the response data structure and response codes specified in Table 5.3.5.2.2-3.

Table 5.3.5.2.2-1: Callback URI variables

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| notificURI | Uri | The Notification Uri is assigned within the Individual NWDAF Data Management Subscription Resource and described within the NnwdafDataManagementSubsc type (see table 5.3.6.2.2-1). |

Table 5.3.5.2.2-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NnwdafDataManagementNotif | M | 1 | Provides Information about observed data. |

Table 5.3.5.2.2-3: 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 the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | | |

Table 5.3.5.2.2-4: Headers supported by the 307 Response Code on this resource

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

Table 5.3.5.2.2-5: Headers supported by the 308 Response Code on this resource

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

#### 5.3.5.3 Fetch Notification

##### 5.3.5.3.1 Description

The Fetch Notification is used by the NF service consumer to retrieve data from the NWDAF.

##### 5.3.5.3.2 Target URI

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

Table 5.3.5.3.2-1: Callback URI variables

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| fetchUri | Uri | Fetch Uri as assigned during the procedure of notification about the subscribed data within the FetchInstruction data type. |

##### 5.3.5.3.3 Standard Methods

###### 5.3.5.3.3.1 POST

This method shall support the URI query parameters specified in table 5.3.5.3.3.1-1.

Table 5.3.5.3.3.1-1: URI query parameters supported by the POST method on this resource

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

This method shall support the request data structures specified in table 5.3.5.3.3.1-2 and the response data structures and response codes specified in table 5.3.5.3.3.1-3.

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

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| array(string) | M | 1..N | Indicate the fetch correlation identifier(s). |

Table 5.3.5.3.3.1-3: Data structures supported by the POST Response Body on this resource

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| NnwdafDataManagementNotif | M | 1 | 200 OK | The stored data related to the fetch correlation identifier(s). |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during subscription retrieval. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF. |
| NOTE: The manadatory HTTP error status code for the POST method listed in Table 5.2.7.1-1 of 3GPP TS 29.500 [4] also apply. | | | | |

Table 5.3.5.3.3.1-4: Headers supported by the by the 307 Response Code on this resource

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

Table 5.3.5.3.3.1-5: Headers supported by the 308 response code on this resource

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

### 5.3.6 Data Model

#### 5.3.6.1 General

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

Table 5.3.6.1-1 specifies the data types defined for the Nnwdaf\_DataManagement service based interface protocol.

Table 5.3.6.1-1: Nnwdaf\_DataManagement specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Clause defined | Description | Applicability |
| NnwdafDataManagementSubsc | 5.3.6.2.2 | Represents an Individual NWDAF Data Management Subscription resource. |  |
| NnwdafDataManagementNotif | 5.3.6.2.3 | Represents a notification that corresponds with an Individual NWDAF Data Management Subscription resource. |  |

Table 5.3.6.1-2 specifies data types re-used by the Nnwdaf\_DataManagement 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 Nnwdaf\_DataManagement service based interface.

Table 5.3.6.1-2: Nnwdaf\_DataManagement re-used Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Reference | Comments | Applicability |
| DataCollectionPurpose | 3GPP TS 29.574 [26] | Represents the purpose for data collection, e.g. analytics or model training. |  |
| DataNotification | 3GPP TS 29.575 [27] | Represents data subscription notification from data source (e.g. AMF, SMF, UDM, NEF, AF). |  |
| DataSubscription | 3GPP TS 29.575 [27] | Represents data subscription from data source (e.g. AMF, SMF, UDM, NEF, AF). |  |
| DateTime | 3GPP TS 29.571 [8] | Identifies the time. |  |
| FormattingInstruction | 3GPP TS 29.574 [26] | DCCF formatting Instructions. |  |
| FetchInstruction | 3GPP TS 29.576 [28] | The fetch instruction indicates whether the data can be fetched by the consumer. |  |
| NfInstanceId | 3GPP TS 29.571 [8] | NF instance identifier. |  |
| NfSetId | 3GPP TS 29.571 [8] | NF set identifier. |  |
| NnwdafEventsSubscription | 5.1.6.2.2 | Represents an NWDAF analytics subscription. |  |
| NotifSummaryReport | 3GPP TS 29.574 [26] | Contains a summary report of processed notifications. |  |
| ProcessingInstruction | 3GPP TS 29.574 [26] | DCCF processing Instructions. |  |
| SupportedFeatures | 3GPP TS 29.571 [8] |  |  |
| TimeWindow | 3GPP TS 29.122 [19] | Represents a time window. |  |
| Uri | 3GPP TS 29.571 [8] | URI. |  |

#### 5.3.6.2 Structured data types

##### 5.3.6.2.1 Introduction

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

##### 5.3.6.2.2 Type NnwdafDataManagementSubsc

Table 5.3.6.2.2-1: Definition of type NnwdafDataManagementSubsc

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| adrfId | NfInstanceId | O | 0..1 | Identifier of the ADRF to be used by the NWDAF.  If the subscription is for runtime data (i.e. the "timePeriod" attribute is either absent or contains a time window in the future) then the NWDAF shall store the notifications in this ADRF.  If the subscription is for historical data (i.e. the "timePeriod" attribute contains a time window in the past) then the NWDAF shall retrieve the data from this ADRF. (NOTE 2) |  |
| adrfSetId | NfSetId | O | 0..1 | Identifier of the ADRF Set to be used by the NWDAF.  If the subscription is for runtime data (i.e. the "timePeriod" attribute is either absent or contains a time window in the future) then the NWDAF shall store the notifications in this ADRF Set.  If the subscription is for historical data (i.e. the "timePeriod" attribute contains a time window in the past) then the NWDAF shall retrieve the data from this ADRF Set. (NOTE 2) |  |
| anaSub | NnwdafEventsSubscription | C | 0..1 | Analytics subscription information to be used by the NWDAF to determine the data that is relevant to these analytics and shall thus be collected and reported.  (NOTE 1) |  |
| dataCollectPurposes | array(DataCollectionPurpose) | O | 1..N | The purpose of data collection. This attribute may only be provided if user consent is required depending on local policy and regulations, and the consumer has not checked user consent. |  |
| dataSub | DataSubscription | C | 0..1 | Subscribed data events.  (NOTE 1) |  |
| formatInstruct | FormattingInstruction | O | 0..1 | Formatting instructions to be used for sending event notifications. |  |
| notifCorrId | string | M | 1 | Notification correlation identifier. |  |
| notificURI | Uri | M | 1 | Notification target address. |  |
| procInstruct | ProcessingInstruction | O | 0..1 | Processing instructions to be used for sending event notifications.  This attribute may only be provided if the "dataSub" attribute is provided. |  |
| suppFeat | SupportedFeatures | C | 0..1 | This IE represents a list of Supported features as described in clause 5.3.8.  It shall be present if at least one feature defined in clause 5.3.8 is supported. |  |
| targetNfId | NfInstanceId | O | 0..1 | NF instance identifier to which the NWDAF shall create the requested subscription. (NOTE 2) |  |
| targetNfSetId | NfSetId | O | 0..1 | NF set identifier to which the NWDAF shall create the requested subscription. (NOTE 2) |  |
| timePeriod | TimeWindow | O | 0..1 | Represents a start time and a stop time during which data was collected or is requested to be collected. If this attribute is included, then the internal attributes of the data subscription that indicate a subscription duration (e.g. the "targetPeriod" attribute of an "eventSubs" attribute of an "smfDataSub" attribute, or the "monDur" attribute of the ReportingInformation data type) shall not be provided.  (NOTE 3) |  |
| NOTE 1: Exactly one of these attributes shall be provided.  NOTE 2: "targetNfId" and "targetNfSetId" are mutually exclusive. "adrfId" and "adrfSetId" are also mutually exclusive.  NOTE 3: It includes the time period either in the past or in the future (i.e., start time as past time and stop time as future time is not allowed). | | | | | |

##### 5.3.6.2.3 Type NnwdafDataManagementNotif

able 5.3.6.2.3-1: Definition of type NnwdafDataManagementNotif

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| dataNotification | DataNotification | C | 0..1 | List of data subscription notifications.  (NOTE 1, NOTE 3) |  |
| dataReports | array(NotifSummaryReport) | C | 1..N | List of reports with summarized data from multiple notifications received from data producer. (NOTE 1) (NOTE 2) |  |
| notifCorrId | string | M | 1 | Notification correlation identifier. |  |
| terminationReq | string | O | 0..1 | If set to "true", it indicates that the termination of the data management subscription is requested by the NWDAF, i.e. NWDAF will not provide further notifications related to this subscription.  If absent, no termination is requested. |  |
| fetchInstruct | FetchInstruction | C | 0..1 | The fetch instruction indicates whether the data are to be fetched by the Consumer. This attribute may not be present in the response of a Fetch request.  (NOTE 1) |  |
| notifTimestamp | DateTime | M | 1 | It represents time when NWDAF completes preparation of the requested data. |  |
| NOTE 1: One of these attributes shall be provided.  NOTE 2: For every entry of the array, the "eventId" attribute shall not contain the "nwdafEvent" attribute.  NOTE 3: If the NWDAF has received the notifications from another source without a timestamp, then the NWDAF adds itself a timestamp based on the time it received the notification in timeStamp attribute contained in dataNotification attribute. . | | | | | |

### 5.3.7 Error handling

#### 5.3.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of TS 29.500 [6].

For the Nnwdaf\_DataManagement API, HTTP error responses shall be supported as specified in clause 4.8 of TS 29.501 [7]. Protocol errors and application errors specified in table 5.2.7.2-1 of TS 29.500 [6] 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 TS 29.500 [6]. In addition, the requirements in the following clauses shall apply.

#### 5.3.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the Nnwdaf\_DataManagement API.

#### 5.3.7.3 Application Errors

The application errors defined for the Nnwdaf\_DataManagement API are listed in table 5.3.7.3-1.

Table 5.3.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| SUBSCRIPTION\_CANNOT\_BE\_SERVED | 400 Bad Request | Indicates that the NWDAF cannot use the contents of the request to either a) determine whether the subscription can already be served or interactions with the ADRF and/or data sources are required or b) determine what interactions with the ADRF and/or data sources are required (if it has determined that they are required). |
| NOTE: Including a "ProblemDetails" data structure with the "cause" attribute in the HTTP response is optional unless explicitly mandated in the service operation clauses. | | |

### 5.3.8 Feature negotiation

The optional features in table 5.3.8-1 are defined for the Nnwdaf\_DataManagement API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [6].

Table 5.3.8-1: Supported Features

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

### 5.3.9 Security

As indicated in TS 33.501 [13] and TS 29.500 [6], the access to the Nnwdaf\_DataManagement API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [14]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, an NF service consumer, prior to consuming services offered by the Nnwdaf\_DataManagement API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in TS 29.510 [12], 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 Nnwdaf\_DataManagement service.

The Nnwdaf\_DataManagement API defines a single scope "nnwdaf-datamanagement" for the entire service, and it does not define any additional scopes at resource or operation level.

## 5.4 Nnwdaf\_MLModelProvision Service API

### 5.4.1 Introduction

The Nnwdaf\_MLModelProvision service shall use the Nnwdaf\_MLModelProvision API.

The API URI of the Nnwdaf\_MLModelProvision API shall be:

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

The request URIs used in each HTTP requests from the NF service consumer towards the NWDAF shall have the Resource URI structure defined in clause 4.4.1 of 3GPP TS 29.501 [7], i.e.:

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

with the following components:

- The {apiRoot} shall be set as described in 3GPP TS 29.501 [7].

- The<apiName>shall be "nnwdaf-mlmodelprovision".

- The <apiVersion> shall be "v1".

- The <apiSpecificResourceUriPart> shall be set as described in clause 5.4.3.

### 5.4.2 Usage of HTTP

#### 5.4.2.1 General

HTTP/2, IETF RFC 7540 [9], shall be used as specified in clause 5 of 3GPP TS 29.500 [6].

HTTP/2 shall be transported as specified in clause 5.3 of 3GPP TS 29.500 [6].

The OpenAPI [11] specification of HTTP messages and content bodies for the Nnwdaf\_MLModelProvision is contained in Annex A.

#### 5.4.2.2 HTTP standard headers

##### 5.4.2.2.1 General

See clause 5.2.2 of 3GPP TS 29.500 [6] for the usage of HTTP standard headers.

##### 5.4.2.2.2 Content type

JSON, IETF RFC 8259 [10], 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 [6]. The use of the JSON format shall be signalled by the content type "application/json".

"Problem Details" JSON object shall be used to indicate additional details of the error in a HTTP response body and shall be signalled by the content type "application/problem+json", as defined in IETF RFC 7807 [15].

#### 5.4.2.3 HTTP custom headers

The Nnwdaf\_MLModelProvision service API shall support mandatory HTTP custom header fields specified in clause 5.2.3.2 of 3GPP TS 29.500 [6] and may support HTTP custom header fields specified in clause 5.2.3.3 of 3GPP TS 29.500 [6].

In this release of the specification, no specific custom headers are defined for the Nnwdaf\_MLModelProvision service API.

### 5.4.3 Resources

#### 5.4.3.1 Resource Structure

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

Figure 5.4.3.1-1 depicts the resource URIs structure for the Nnwdaf\_MLModelProvision API.



Figure 5.4.3.1-1: Resource URI structure of the Nnwdaf\_MLModelProvision API

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

Table 5.4.3.1-1: Resources and methods overview

|  |  |  |  |
| --- | --- | --- | --- |
| Resource name | Resource URI | HTTP method or custom operation | Description |
| NWDAF ML Model Provision Subscriptions | /subscriptions | POST | Creates a new Individual NWDAF ML Model Provision Subscription resource. |
| Individual NWDAF ML Model Provision Subscription | /subscriptions/{subscriptionId} | DELETE | Deletes an Individual NWDAF ML Model Provision Subscription identified by subresource {subscriptionId}. |
| PUT | Modifies an existing Individual NWDAF ML Model Provision Subscription identified by subresource {subscriptionId}. |

#### 5.4.3.2 Resource: NWDAF ML Model Provision Subscriptions

##### 5.4.3.2.1 Description

The NWDAF ML Model Provision Subscriptions resource represents all subscriptions to the Nnwdaf\_MLModelProvision service at a given NWDAF. The resource allows an NF service consumer to create a new Individual NWDAF ML Model Provision Subscription resource.

##### 5.4.3.2.2 Resource definition

Resource URI: **{apiRoot}/nnwdaf-mlmodelprovision/<apiVersion>/subscriptions**

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

Table 5.4.3.2.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.4.1 |

##### 5.4.3.2.3 Resource Standard Methods

###### 5.4.3.2.3.1 POST

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

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

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

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

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

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NwdafMLModelProvSubsc | M | 1 | Creates a new Individual NWDAF ML Model Provision Subscription resource. |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| NwdafMLModelProvSubsc | M | 1 | 201 Created | The creation of an Individual NWDAF ML Model Provision Subscription resource is confirmed and a representation of that resource is returned. |
| ProblemDetails | O | 0..1 | 500 Internal Server Error | (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 [6] also apply.  NOTE 2: Failure causes are described in subclause 5.4.7.3. | | | | |

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

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

##### 5.4.3.2.4 Resource Custom Operations

None in this release of the specification.

#### 5.4.3.3 Resource: Individual NWDAF ML Model Provision Subscription

##### 5.4.3.3.1 Description

The Individual NWDAF ML Model Provision Subscription resource represents a single subscription to the Nnwdaf\_MLModelProvision service at a given NWDAF.

##### 5.4.3.3.2 Resource definition

Resource URI: **{apiRoot}/nnwdaf-mlmodelprovision/<apiVersion>/subscriptions/{subscriptionId}**

The <apiVersion> shall be set as described in clause 5.4.1.

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

Table 5.4.3.3.2-1: Resource URI variables for this resource

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| apiRoot | string | See clause 5.4.1. |
| subscriptionId | string | Identifies a subscription to the Nnwdaf\_MLModelProvision service. |

##### 5.4.3.3.3 Resource Standard Methods

###### 5.4.3.3.3.1 PUT

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

Table 5.4.3.3.3.1-1: URI query parameters supported by the PUT method on this resource

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

This method shall support the request data structures specified in table 5.4.3.3.3.1-2 and the response data structures and response codes specified in table 5.4.3.3.3.1-3.

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

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| NwdafMLModelProvSubsc | M | 1 | Parameters to replace a subscription to NWDAF ML Model Provision Subscription resource. |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response codes | Description |
| NwdafMLModelProvSubsc | M | 1 | 200 OK | The Individual NWDAF ML Model Provision Subscription resource was modified successfully and a representation of that resource is returned. |
| n/a |  |  | 204 No Content | The Individual NWDAF ML Model Provision Subscription resource was modified successfully. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF ML Model Provision Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF ML Model Provision Subscription modification. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| ProblemDetails | O | 0..1 | 500 Internal Server Error | (NOTE 2) |
| NOTE 1: The mandatory HTTP error status codes for the PUT method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply.  NOTE 2: Failure causes are described in subclause 5.4.7.3. | | | | |

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

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

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

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

###### 5.4.3.3.3.2 DELETE

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

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

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

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

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

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Data type | P | Cardinality | Response  codes | Description |
| n/a |  |  | 204 No Content | Successful case: The Individual NWDAF ML Model Provision Subscription resource matching the subscriptionId was deleted. |
| RedirectResponse | O | 0..1 | 307 Temporary Redirect | Temporary redirection, during Individual NWDAF ML Model Provision Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during Individual NWDAF ML Model Provision Subscription deletion. The response shall include a Location header field containing an alternative URI of the resource located in an alternative NWDAF (service) instance. |
| NOTE: The mandatory HTTP error status codes for the DELETE method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | |

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

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

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

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

##### 5.4.3.3.4 Resource Custom Operations

None in this release of the specification.

### 5.4.4 Custom Operations without associated resources

None in this release of the specification.

### 5.4.5 Notifications

#### 5.4.5.1 General

Notifications shall comply with clause 6.2 of 3GPP TS 29.500 [6] and clause 4.6.2.3 of 3GPP TS 29.501 [7].

Table 5.4.3.4.1-1: Notifications overview

|  |  |  |  |
| --- | --- | --- | --- |
| Notification | Callback URI | HTTP method or custom operation | Description (service operation) |
| Event Notification | {notifUri} | POST | Report one or several observed Events. |

#### 5.4.5.2 Event Notification

##### 5.4.5.2.1 Description

The Event Notification is used by the NWDAF to report one or several observed Events to a NF service consumer that has subscribed to such Notifications via the Individual NWDAF ML Model Provision Subscription Resource.

##### 5.4.5.2.2 Operation Definition

Callback URI: **{notifUri}**

The operation shall support the callback URI variables defined in table 5.4.5.2.2-1, the request data structures specified in table 5.4.5.2.2-2 and the response data structure and response codes specified in table 5.4.5.2.2-3.

Table 5.4.5.2.2-1: Callback URI variables

|  |  |  |
| --- | --- | --- |
| Name | Data type | Definition |
| notifUri | Uri | The Notification Uri as assigned within the Individual NWDAF ML Model Provision Subscription and described within the NwdafMLModelProvSubsc type (see table 5.4.6.2.2-1). |

Table 5.4.5.2.2-2: Data structures supported by the POST Request Body on this resource

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | P | Cardinality | Description |
| array(NwdafMLModelProvNotif) | M | 1..N | Provides Information about observed events. |

Table 5.4.5.2.2-3: 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 the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| RedirectResponse | O | 0..1 | 308 Permanent Redirect | Permanent redirection, during the event notification. The response shall include a Location header field containing an alternative URI representing the end point of an alternative NF consumer (service) instance where the notification should be sent. |
| NOTE: The mandatory HTTP error status codes for the POST method listed in table 5.2.7.1-1 of 3GPP TS 29.500 [6] also apply. | | | | | |

Table 5.4.5.2.2-4: Headers supported by the 307 Response Code on this resource

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

Table 5.4.5.2.2-5: Headers supported by the 308 Response Code on this resource

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

### 5.4.6 Data Model

#### 5.4.6.1 General

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

Table 5.4.6.1-1 specifies the data types defined for the Nnwdaf\_MLModelProvision service based interface protocol.

Table 5.4.6.1-1: Nnwdaf\_MLModelProvision specific Data Types

|  |  |  |  |
| --- | --- | --- | --- |
| Data type | Section defined | Description | Applicability |
| FailureEventInfoForMLModel | 5.4.6.2.7 |  |  |
| MLEventNotif | 5.4.6.2.6 |  |  |
| MLEventSubscription | 5.4.6.2.3 |  |  |
| MLModelAddr | 5.4.6.2.8 |  |  |
| NwdafMLModelProvNotif | 5.4.6.2.5 |  |  |
| NwdafMLModelProvSubsc | 5.4.6.2.2 |  |  |

Table 5.4.6.1-2 specifies data types re-used by the Nnwdaf\_MLModelProvision 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 Nnwdaf\_MLModelProvision service based interface.

Table 5.4.6.1-2: Nnwdaf\_MLModelProvision re-used Data Types

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Data type | | Reference | | Comments | | Applicability | |
| DateTime | | 3GPP TS 29.571 [8] | | Identifies the time. | |  | |
| EventFilter | | 5.2.6.2.3 | | Identifies the filter for the subscribed event. | |  | |
| NetworkAreaInfo | | 3GPP TS 29.554 [18] | | Identifies the network area. | |  | |
| NwdafEvent | | 5.1.6.3.4 | |  | |  | |
| RedirectResponse | | 3GPP TS 29.571 [8] | |  | |  | |
| ReportingInformation | | 3GPP TS 29.523 [20] | | Represents the requirements of reporting the subscription. | |  | |
| SupportedFeatures | | 3GPP TS 29.571 [8] | |  | |  | |
| TargetUeInformation | | 5.1.6.2.8 | |  | |  | |
| TimeWindow | | 3GPP TS 29.122 [19] | |  | |  | |
| Uri | | 3GPP TS 29.571 [8] | |  | |  | |

#### 5.4.6.2 Structured data types

##### 5.4.6.2.1 Introduction

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

##### 5.4.6.2.2 Type NwdafMLModelProvSubsc

Table 5.4.6.2.2-1: Definition of type NwdafMLModelProvSubsc

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| mLEventSubscs | array(MLEventSubscription) | M | 1..N | Each element identifies the subscription for each event. |  |
| notifUri | Uri | M | 1 | Identifies the recipient of Notifications sent by the NWDAF. |  |
| mLEventNotifs | array(MLEventNotif) | C | 1..N | Notifications about Individual Events.  Shall only be present if the immediate reporting indication in the "immRep" attribute within the "eventReq" attribute sets to true in the event subscription, and the reports are available. |  |
| suppFeats | SupportedFeatures | C | 0..1 | List of Supported features used as described in clause 5.4.8.  It shall be supplied by NF service consumer in the POST requests that request the creation of an NWDAF ML Model Provision Subscriptions resource, and shall be supplied by the NWDAF in the reply of corresponding request. |  |
| notifCorreId | string | O | 0..1 | The value of Notification Correlation ID in the corresponding notification. |  |
| eventReq | ReportingInformation | O | 0..1 | Reporting requirement information of the subscription.  If omitted, the default values within the ReportingInformation data type apply. |  |
| failEventReports | array(FailureEventInfoForMLModel) | O | 1..N | Supplied by the NWDAF containing MTLF when available, shall contain the event(s) that the subscription is not successful including the failure reason(s). |  |

##### 5.4.6.2.3 Type MLEventSubscription

Table 5.4.6.2.3-1: Definition of type MLEventSubscription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| mLEvent | NwdafEvent | M | 1 | Identifies the subscribed event. |  |
| mLEventFilter | EventFilter | M | 1 | Identifies the analytics filter for the subscribed event. |  |
| tgtUe | TargetUeInformation | O | 0..1 | Identifies target UE information |  |
| mLTargetPeriod | TimeWindow | O | 0..1 | Indicates the time interval during which the ML model shall be reported. |  |
| expiryTime | DateTime | O | 0..1 | Indicates the time when the subscription expired. |  |

##### 5.4.6.2.4 Void

##### 5.4.6.2.5 Type NwdafMLModelProvNotif

Table 5.4.6.2.5-1: Definition of type NwdafMLModelProvNotif

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| eventNotifs | array(MLEventNotif) | M | 1..N | Notifications about Individual Events |  |
| subscriptionId | string | M | 1 | String identifying a subscription to the Nnwdaf\_MLModelProvision Service |  |

##### 5.4.6.2.6 Type MLEventNotif

Table 5.4.6.2.6-1: Definition of type MLEventNotif

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| event | NwdafEvent | M | 1 | Identifies the subscribed event. |  |
| notifCorreId | string | O | 0..1 | Notification correlation ID used to identify the subscription to which the notification relates. It shall be set to the same value as the "notifCorreId" attribute of NwdafMLModelProvSubsc data type. |  |
| mLFileAddr | MLModelAddr | M | 1 | Indicates the address (e.g. a URL or an FQDN) of the ML model file. |  |
| validityPeriod | TimeWindow | O | 0..1 | Indicates the time period when the provided ML model applies. |  |
| spatialValidity | NetworkAreaInfo | O | 0..1 | Indicates the area where the provided ML model applies. |  |

##### 5.4.6.2.7 Type FailureEventInfoForMLModel

Table 5.1.6.2.7-1: Definition of type FailureEventInfoForMLModel

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| event | NwdafEvent | M | 1 | Event that is subscribed. |  |
| failureCode | FailureCode | M | 1 | Identifies the failure reason. |  |

##### 5.4.6.2.8 Type MLModelAddr

Table 5.4.6.2.8-1: Definition of type MLModelAddr

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| mLModelUrl | Uri | C | 0..1 | The URL of the ML Model file.  (NOTE) |  |
| mlFileFqdn | string | C | 0..1 | The FQDN of the ML Model file.  (NOTE) |  |
| NOTE: One of the "mLModelUrl" and "mlFileFqdn" attributes shall be provided. | | | | | |

#### 5.4.6.3 Simple data types and enumerations

##### 5.4.6.3.1 Introduction

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

##### 5.4.6.3.2 Simple data types

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

Table 5.4.6.3.2-1: Simple data types

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

##### 5.4.6.3.3 Enumeration: FailureCode

Table 5.4.6.3.3-1: Enumeration FailureCode

|  |  |  |
| --- | --- | --- |
| Enumeration value | Description | Applicability |
| UNAVAILABLE\_ML\_MODEL | Indicates the requested ML model for the event is unavailable. |  |

### 5.4.7 Error handling

#### 5.4.7.1 General

HTTP error handling shall be supported as specified in clause 5.2.4 of 3GPP TS 29.500 [6].

For the Nnwdaf\_MLModelProvision API, HTTP error responses shall be supported as specified in clause 4.8 of 3GPP TS 29.501 [7].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [6] 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 [6].

Protocol errors and application errors specified in table 5.2.7.2-1 of 3GPP TS 29.500 [6] for HTTP redirections shall be supported.

In addition, the requirements in the following clauses shall apply.

#### 5.4.7.2 Protocol Errors

In this Release of the specification, there are no additional protocol errors applicable for the Nnwdaf\_MLModelProvision API.

#### 5.4.7.3 Application Errors

The application errors defined for the Nnwdaf\_MLModelProvision API are listed in table 5.4.7.3-1.

Table 5.4.7.3-1: Application errors

|  |  |  |
| --- | --- | --- |
| Application Error | HTTP status code | Description |
| UNAVAILABLE\_ML\_MODEL\_FOR\_ALLEVENTS | 500 Internal Server Error | Indicates the requested all events ML model is unavailable. |
| NOTE: Including a "ProblemDetails" data structure with the "cause" attribute in the HTTP response is optional unless explicitly mandated in the service operation clauses. | | |

### 5.4.8 Feature negotiation

The optional features in table 5.4.8-1 are defined for the Nnwdaf\_MLModelProvision API. They shall be negotiated using the extensibility mechanism defined in clause 6.6 of 3GPP TS 29.500 [6].

Table 5.4.8-1: Supported Features

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

### 5.4.9 Security

As indicated in 3GPP TS 33.501 [13] and 3GPP TS 29.500 [6], the access to the Nnwdaf\_MLModelProvision API may be authorized by means of the OAuth2 protocol (see IETF RFC 6749 [14]), based on local configuration, using the "Client Credentials" authorization grant, where the NRF (see 3GPP TS 29.510 [12]) plays the role of the authorization server.

If OAuth2 is used, a n NF Service Consumer, prior to consuming services offered by the Nnwdaf\_MLModelProvision API, shall obtain a "token" from the authorization server, by invoking the Access Token Request service, as described in 3GPP TS 29.510 [12], 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 Nnwdaf\_MLModelProvision service.

The Nnwdaf\_MLModelProvision API defines a single scope "nnwdaf-mlmodelprovision" for the entire service, and it does not define any additional scopes at resource or operation level.

Annex A (normative):  
OpenAPI specification

# A.1 General

The present Annex contains an OpenAPI [11] specification of HTTP messages and content bodies used by the Nnwdaf\_EventsSubscription, the Nnwdaf\_AnalyticsInfo, Nnwdaf\_DataManagement and Nnwdaf\_MLModelProvision APIs.

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: 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 [16] and clause 5.3.1 of the 3GPP TS 29.501 [7] for further information).

# A.2 Nnwdaf\_EventsSubscription API

openapi: 3.0.0

info:

version: 1.2.3

title: Nnwdaf\_EventsSubscription

description: |

Nnwdaf\_EventsSubscription Service API.

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externalDocs:

description: 3GPP TS 29.520 V17.10.0; 5G System; Network Data Analytics Services.

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.520/'

security:

- {}

- oAuth2ClientCredentials:

- nnwdaf-eventssubscription

servers:

- url: '{apiRoot}/nnwdaf-eventssubscription/v1'

variables:

apiRoot:

default: https://example.com

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

paths:

/subscriptions:

post:

summary: Create a new Individual NWDAF Events Subscription

operationId: CreateNWDAFEventsSubscription

tags:

- NWDAF Events Subscriptions (Collection)

requestBody:

required: true

content:

application/json:

schema:

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

responses:

'201':

description: Create a new Individual NWDAF Event Subscription resource.

headers:

Location:

description: >

Contains the URI of the newly created resource, according to the structure

{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/subscriptions/{subscriptionId}

required: true

schema:

type: string

content:

application/json:

schema:

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

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

callbacks:

myNotification:

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

post:

requestBody:

required: true

content:

application/json:

schema:

type: array

items:

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

minItems: 1

responses:

'204':

description: The receipt of the Notification is acknowledged.

'307':

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

'308':

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

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

/subscriptions/{subscriptionId}:

delete:

summary: Delete an existing Individual NWDAF Events Subscription

operationId: DeleteNWDAFEventsSubscription

tags:

- Individual NWDAF Events Subscription (Document)

parameters:

- name: subscriptionId

in: path

description: String identifying a subscription to the Nnwdaf\_EventsSubscription Service

required: true

schema:

type: string

responses:

'204':

description: >

No Content. The Individual NWDAF Event Subscription resource matching the subscriptionId

was 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'

'501':

$ref: 'TS29571\_CommonData.yaml#/components/responses/501'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

put:

summary: Update an existing Individual NWDAF Events Subscription

operationId: UpdateNWDAFEventsSubscription

tags:

- Individual NWDAF Events Subscription (Document)

requestBody:

required: true

content:

application/json:

schema:

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

parameters:

- name: subscriptionId

in: path

description: String identifying a subscription to the Nnwdaf\_EventsSubscription Service

required: true

schema:

type: string

responses:

'200':

description: >

The Individual NWDAF Event Subscription resource was modified successfully and a

representation of that resource is returned.

content:

application/json:

schema:

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

'204':

description: The Individual NWDAF Event Subscription resource was modified successfully.

'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'

'501':

$ref: 'TS29571\_CommonData.yaml#/components/responses/501'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

/transfers:

post:

summary: Provide information about requested analytics subscriptions transfer and potentially create a new Individual NWDAF Event Subscription Transfer resource.

operationId: CreateNWDAFEventSubscriptionTransfer

tags:

- NWDAF Event Subscription Transfers (Collection)

requestBody:

required: true

content:

application/json:

schema:

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

responses:

'201':

description: Create a new Individual NWDAF Event Subscription Transfer resource.

headers:

Location:

description: >

Contains the URI of the newly created resource, according to the structure

{apiRoot}/nnwdaf-eventssubscription/<apiVersion>/transfers/{transferId}

required: true

schema:

type: string

'204':

description: >

No Content. The receipt of the information about analytics subscription(s) that are

requested to be transferred and the ability to handle this information (e.g. execute the

steps required to transfer an analytics subscription directly) is confirmed.

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

/transfers/{transferId}:

delete:

summary: Delete an existing Individual NWDAF Event Subscription Transfer

operationId: DeleteNWDAFEventSubscriptionTransfer

tags:

- Individual NWDAF Event Subscription Transfer (Document)

parameters:

- name: transferId

in: path

description: >

String identifying a request for an analytics subscription transfer to the

Nnwdaf\_EventsSubscription Service

required: true

schema:

type: string

responses:

'204':

description: >

No Content. The Individual NWDAF Event Subscription Transfer resource matching the

transferId was 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'

'501':

$ref: 'TS29571\_CommonData.yaml#/components/responses/501'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

put:

summary: Update an existing Individual NWDAF Event Subscription Transfer

operationId: UpdateNWDAFEventSubscriptionTransfer

tags:

- Individual NWDAF Event Subscription Transfer (Document)

requestBody:

required: true

content:

application/json:

schema:

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

parameters:

- name: transferId

in: path

description: >

String identifying a request for an analytics subscription transfer to the

Nnwdaf\_EventsSubscription Service

required: true

schema:

type: string

responses:

'204':

description: >

The Individual NWDAF Event Subscription Transfer resource was modified successfully.

'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'

'501':

$ref: 'TS29571\_CommonData.yaml#/components/responses/501'

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nnwdaf-eventssubscription: Access to the Nnwdaf\_EventsSubscription API

schemas:

NnwdafEventsSubscription:

description: Represents an Individual NWDAF Event Subscription resource.

type: object

properties:

eventSubscriptions:

type: array

items:

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

minItems: 1

description: Subscribed events

evtReq:

$ref: 'TS29523\_Npcf\_EventExposure.yaml#/components/schemas/ReportingInformation'

notificationURI:

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

notifCorrId:

type: string

description: Notification correlation identifier.

supportedFeatures:

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

eventNotifications:

type: array

items:

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

minItems: 1

failEventReports:

type: array

items:

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

minItems: 1

prevSub:

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

consNfInfo:

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

required:

- eventSubscriptions

EventSubscription:

description: Represents a subscription to a single event.

type: object

properties:

anySlice:

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

appIds:

type: array

items:

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

minItems: 1

description: Identification(s) of application to which the subscription applies.

dnns:

type: array

items:

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

minItems: 1

description: Identification(s) of DNN to which the subscription applies.

dnais:

type: array

items:

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

minItems: 1

event:

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

extraReportReq:

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

ladnDnns:

type: array

items:

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

minItems: 1

description: Identification(s) of LADN DNN to indicate the LADN service area as the AOI.

loadLevelThreshold:

type: integer

description: >

Indicates that the NWDAF shall report the corresponding network slice load level to the NF

service consumer where the load level of the network slice identified by snssais is

reached.

notificationMethod:

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

matchingDir:

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

nfLoadLvlThds:

type: array

items:

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

minItems: 1

description: >

Shall be supplied in order to start reporting when an average load level is reached.

nfInstanceIds:

type: array

items:

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

minItems: 1

nfSetIds:

type: array

items:

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

minItems: 1

nfTypes:

type: array

items:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/NFType'

minItems: 1

networkArea:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

visitedAreas:

type: array

items:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

minItems: 1

maxTopAppUlNbr:

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

maxTopAppDlNbr:

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

nsiIdInfos:

type: array

items:

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

minItems: 1

nsiLevelThrds:

type: array

items:

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

minItems: 1

qosRequ:

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

qosFlowRetThds:

type: array

items:

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

minItems: 1

ranUeThrouThds:

type: array

items:

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

minItems: 1

repetitionPeriod:

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

snssaia:

type: array

items:

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

minItems: 1

description: >

Identification(s) of network slice to which the subscription applies. It corresponds to

snssais in the data model definition of 3GPP TS 29.520.

tgtUe:

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

congThresholds:

type: array

items:

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

minItems: 1

nwPerfRequs:

type: array

items:

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

minItems: 1

bwRequs:

type: array

items:

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

minItems: 1

excepRequs:

type: array

items:

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

minItems: 1

exptAnaType:

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

exptUeBehav:

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

ratFreqs:

type: array

items:

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

minItems: 1

listOfAnaSubsets:

type: array

items:

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

minItems: 1

disperReqs:

type: array

items:

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

minItems: 1

redTransReqs:

type: array

items:

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

minItems: 1

wlanReqs:

type: array

items:

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

minItems: 1

upfInfo:

$ref: 'TS29508\_Nsmf\_EventExposure.yaml#/components/schemas/UpfInformation'

appServerAddrs:

type: array

items:

$ref: 'TS29517\_Naf\_EventExposure.yaml#/components/schemas/AddrFqdn'

minItems: 1

dnPerfReqs:

type: array

items:

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

minItems: 1

required:

- event

NnwdafEventsSubscriptionNotification:

description: Represents an Individual NWDAF Event Subscription Notification resource.

type: object

properties:

eventNotifications:

type: array

items:

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

minItems: 1

description: Notifications about Individual Events

subscriptionId:

type: string

description: String identifying a subscription to the Nnwdaf\_EventsSubscription Service

notifCorrId:

type: string

description: Notification correlation identifier.

oldSubscriptionId:

type: string

description: >

Subscription ID which was allocated by the source NWDAF. This parameter shall be present

if the notification is for informing the assignment of a new Subscription Id by the

target NWDAF.

resourceUri:

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

required:

- subscriptionId

oneOf:

- required: [eventNotifications]

- allOf:

- required: [resourceUri]

- required: [oldSubscriptionId]

EventNotification:

description: Represents a notification on events that occurred.

type: object

properties:

event:

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

start:

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

expiry:

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

timeStampGen:

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

failNotifyCode:

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

rvWaitTime:

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

anaMetaInfo:

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

nfLoadLevelInfos:

type: array

items:

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

minItems: 1

nsiLoadLevelInfos:

type: array

items:

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

minItems: 1

sliceLoadLevelInfo:

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

svcExps:

type: array

items:

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

minItems: 1

qosSustainInfos:

type: array

items:

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

minItems: 1

ueComms:

type: array

items:

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

minItems: 1

ueMobs:

type: array

items:

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

minItems: 1

userDataCongInfos:

type: array

items:

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

minItems: 1

abnorBehavrs:

type: array

items:

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

minItems: 1

nwPerfs:

type: array

items:

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

minItems: 1

dnPerfInfos:

type: array

items:

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

minItems: 1

disperInfos:

type: array

items:

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

minItems: 1

redTransInfos:

type: array

items:

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

minItems: 1

wlanInfos:

type: array

items:

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

minItems: 1

smccExps:

type: array

items:

$ref: 'TS29520\_Nnwdaf\_AnalyticsInfo.yaml#/components/schemas/SmcceInfo'

minItems: 1

required:

- event

ServiceExperienceInfo:

description: Represents service experience information.

type: object

properties:

svcExprc:

$ref: 'TS29517\_Naf\_EventExposure.yaml#/components/schemas/SvcExperience'

svcExprcVariance:

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

supis:

type: array

items:

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

minItems: 1

snssai:

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

appId:

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

srvExpcType:

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

ueLocs:

type: array

items:

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

minItems: 1

upfInfo:

$ref: 'TS29508\_Nsmf\_EventExposure.yaml#/components/schemas/UpfInformation'

dnai:

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

appServerInst:

$ref: 'TS29517\_Naf\_EventExposure.yaml#/components/schemas/AddrFqdn'

confidence:

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

dnn:

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

networkArea:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

nsiId:

$ref: 'TS29531\_Nnssf\_NSSelection.yaml#/components/schemas/NsiId'

ratio:

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

ratFreq:

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

required:

- svcExprc

BwRequirement:

description: Represents bandwidth requirements.

type: object

properties:

appId:

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

marBwDl:

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

marBwUl:

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

mirBwDl:

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

mirBwUl:

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

required:

- appId

SliceLoadLevelInformation:

description: Contains load level information applicable for one or several slices.

type: object

properties:

loadLevelInformation:

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

snssais:

type: array

items:

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

minItems: 1

description: Identification(s) of network slice to which the subscription applies.

required:

- loadLevelInformation

- snssais

NsiLoadLevelInfo:

description: >

Represents the network slice and optionally the associated network slice instance and the

load level information.

type: object

properties:

loadLevelInformation:

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

snssai:

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

nsiId:

$ref: 'TS29531\_Nnssf\_NSSelection.yaml#/components/schemas/NsiId'

resUsage:

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

numOfExceedLoadLevelThr:

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

exceedLoadLevelThrInd:

type: boolean

networkArea:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

timePeriod:

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

resUsgThrCrossTimePeriod:

type: array

items:

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

minItems: 1

description: >

Each element indicates the time elapsed between times each threshold is met or exceeded

or crossed. The start time and end time are the exact time stamps of the resource usage

threshold is reached or exceeded. May be present if the "listOfAnaSubsets" attribute is

provided and the maximum number of instances shall not exceed the value provided in the

"numOfExceedLoadLevelThr" attribute.

numOfUes:

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

numOfPduSess:

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

confidence:

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

required:

- loadLevelInformation

- snssai

NsiIdInfo:

description: Represents the S-NSSAI and the optionally associated Network Slice Instance(s).

type: object

properties:

snssai:

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

nsiIds:

type: array

items:

$ref: 'TS29531\_Nnssf\_NSSelection.yaml#/components/schemas/NsiId'

minItems: 1

required:

- snssai

EventReportingRequirement:

description: Represents the type of reporting that the subscription requires.

type: object

properties:

accuracy:

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

accPerSubset:

type: array

items:

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

minItems: 1

description: >

Each element indicates the preferred accuracy level per analytics subset. It may be

present if the "listOfAnaSubsets" attribute is present in the subscription request when

the subscription event is NF\_LOAD, UE\_COMM, DISPERSION, NETWORK\_PERFORMANCE,

WLAN\_PERFORMANCE, DN\_PERFORMANCE or SERVICE\_EXPERIENCE.

startTs:

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

endTs:

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

offsetPeriod:

type: integer

description: >

Offset period in units of seconds to the reporting time, if the value is negative means

statistics in the past offset period, otherwise a positive value means prediction in the

future offset period. May be present if the "repPeriod" attribute is included within the

"evtReq" attribute.

sampRatio:

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

maxObjectNbr:

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

maxSupiNbr:

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

timeAnaNeeded:

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

anaMeta:

type: array

items:

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

minItems: 1

anaMetaInd:

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

histAnaTimePeriod:

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

TargetUeInformation:

description: Identifies the target UE information.

type: object

properties:

anyUe:

type: boolean

supis:

type: array

items:

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

minItems: 1

gpsis:

type: array

items:

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

minItems: 1

intGroupIds:

type: array

items:

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

minItems: 1

UeMobility:

description: Represents UE mobility information.

type: object

properties:

ts:

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

recurringTime:

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

duration:

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

durationVariance:

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

locInfos:

type: array

items:

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

minItems: 1

allOf:

- required: [duration]

- required: [locInfos]

- oneOf:

- required: [ts]

- required: [recurringTime]

LocationInfo:

description: Represents UE location information.

type: object

properties:

loc:

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

ratio:

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

confidence:

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

required:

- loc

UeCommunication:

description: Represents UE communication information.

type: object

properties:

commDur:

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

commDurVariance:

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

perioTime:

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

perioTimeVariance:

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

ts:

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

tsVariance:

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

recurringTime:

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

trafChar:

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

ratio:

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

perioCommInd:

type: boolean

confidence:

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

anaOfAppList:

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

sessInactTimer:

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

allOf:

- required: [commDur]

- required: [trafChar]

- oneOf:

- required: [ts]

- required: [recurringTime]

TrafficCharacterization:

description: Identifies the detailed traffic characterization.

type: object

properties:

dnn:

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

snssai:

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

appId:

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

fDescs:

type: array

items:

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

minItems: 1

maxItems: 2

ulVol:

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

ulVolVariance:

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

dlVol:

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

dlVolVariance:

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

anyOf:

- required: [ulVol]

- required: [dlVol]

UserDataCongestionInfo:

description: Represents the user data congestion information.

type: object

properties:

networkArea:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

congestionInfo:

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

snssai:

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

required:

- networkArea

- congestionInfo

CongestionInfo:

description: Represents the congestion information.

type: object

properties:

congType:

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

timeIntev:

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

nsi:

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

confidence:

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

topAppListUl:

type: array

items:

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

minItems: 1

topAppListDl:

type: array

items:

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

minItems: 1

required:

- congType

- timeIntev

- nsi

TopApplication:

description: Top application that contributes the most to the traffic.

type: object

properties:

appId:

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

ipTrafficFilter:

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

ratio:

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

oneOf:

- required: [appId]

- required: [ipTrafficFilter]

QosSustainabilityInfo:

description: Represents the QoS Sustainability information.

type: object

properties:

areaInfo:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

startTs:

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

endTs:

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

qosFlowRetThd:

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

ranUeThrouThd:

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

snssai:

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

confidence:

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

oneOf:

- required: [qosFlowRetThd]

- required: [ranUeThrouThd]

QosRequirement:

description: Represents the QoS requirements.

type: object

properties:

5qi:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/5Qi'

gfbrUl:

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

gfbrDl:

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

resType:

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

pdb:

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

per:

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

oneOf:

- required: [5qi]

- required: [resType]

ThresholdLevel:

description: Represents a threshold level.

type: object

properties:

congLevel:

type: integer

nfLoadLevel:

type: integer

nfCpuUsage:

type: integer

nfMemoryUsage:

type: integer

nfStorageUsage:

type: integer

avgTrafficRate:

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

maxTrafficRate:

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

avgPacketDelay:

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

maxPacketDelay:

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

avgPacketLossRate:

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

svcExpLevel:

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

NfLoadLevelInformation:

description: Represents load level information of a given NF instance.

type: object

properties:

nfType:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/NFType'

nfInstanceId:

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

nfSetId:

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

nfStatus:

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

nfCpuUsage:

type: integer

nfMemoryUsage:

type: integer

nfStorageUsage:

type: integer

nfLoadLevelAverage:

type: integer

nfLoadLevelpeak:

type: integer

nfLoadAvgInAoi:

type: integer

snssai:

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

confidence:

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

allOf:

- required: [nfType]

- required: [nfInstanceId]

- anyOf:

- required: [nfStatus]

- required: [nfCpuUsage]

- required: [nfMemoryUsage]

- required: [nfStorageUsage]

- required: [nfLoadLevelAverage]

- required: [nfLoadLevelPeak]

NfStatus:

description: Contains the percentage of time spent on various NF states.

type: object

properties:

statusRegistered:

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

statusUnregistered:

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

statusUndiscoverable:

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

anyOf:

- required: [statusRegistered]

- required: [statusUnregistered]

- required: [statusUndiscoverable]

AnySlice:

type: boolean

description: >

"false" represents not applicable for all slices. "true" represents applicable for all slices.

LoadLevelInformation:

type: integer

description: >

Load level information of the network slice and the optionally associated network slice

instance.

AbnormalBehaviour:

description: Represents the abnormal behaviour information.

type: object

properties:

supis:

type: array

items:

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

minItems: 1

excep:

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

dnn:

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

snssai:

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

ratio:

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

confidence:

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

addtMeasInfo:

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

required:

- excep

Exception:

description: Represents the Exception information.

type: object

properties:

excepId:

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

excepLevel:

type: integer

excepTrend:

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

required:

- excepId

AdditionalMeasurement:

description: Represents additional measurement information.

type: object

properties:

unexpLoc:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

unexpFlowTeps:

type: array

items:

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

minItems: 1

unexpWakes:

type: array

items:

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

minItems: 1

ddosAttack:

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

wrgDest:

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

circums:

type: array

items:

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

minItems: 1

IpEthFlowDescription:

description: Contains the description of an Uplink and/or Downlink Ethernet flow.

type: object

properties:

ipTrafficFilter:

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

ethTrafficFilter:

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

oneOf:

- required: [ipTrafficFilter]

- required: [ethTrafficFilter]

AddressList:

description: Represents a list of IPv4 and/or IPv6 addresses.

type: object

properties:

ipv4Addrs:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv4Addr'

minItems: 1

ipv6Addrs:

type: array

items:

$ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv6Addr'

minItems: 1

CircumstanceDescription:

description: Contains the description of a circumstance.

type: object

properties:

freq:

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

tm:

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

locArea:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

vol:

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

RetainabilityThreshold:

description: Represents a QoS flow retainability threshold.

type: object

properties:

relFlowNum:

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

relTimeUnit:

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

relFlowRatio:

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

oneOf:

- allOf:

- required: [relFlowNum]

- required: [relTimeUnit]

- required: [relFlowRatio]

NetworkPerfRequirement:

description: Represents a network performance requirement.

type: object

properties:

nwPerfType:

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

relativeRatio:

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

absoluteNum:

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

required:

- nwPerfType

NetworkPerfInfo:

description: Represents the network performance information.

type: object

properties:

networkArea:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

nwPerfType:

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

relativeRatio:

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

absoluteNum:

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

confidence:

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

allOf:

- required: [networkArea]

- required: [nwPerfType]

- oneOf:

- required: [relativeRatio]

- required: [absoluteNum]

FailureEventInfo:

description: Contains information on the event for which the subscription is not successful.

type: object

properties:

event:

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

failureCode:

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

required:

- event

- failureCode

AnalyticsMetadataIndication:

description: >

Contains analytics metadata information requested to be used during analytics generation.

type: object

properties:

dataWindow:

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

dataStatProps:

type: array

items:

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

minItems: 1

strategy:

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

aggrNwdafIds:

type: array

items:

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

minItems: 1

AnalyticsMetadataInfo:

description: Contains analytics metadata information required for analytics aggregation.

type: object

properties:

numSamples:

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

dataWindow:

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

dataStatProps:

type: array

items:

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

minItems: 1

strategy:

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

accuracy:

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

NumberAverage:

description: Represents average and variance information.

type: object

properties:

number:

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

variance:

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

skewness:

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

required:

- number

- variance

AnalyticsSubscriptionsTransfer:

description: Contains information about a request to transfer analytics subscriptions.

type: object

properties:

subsTransInfos:

type: array

items:

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

minItems: 1

required:

- subsTransInfos

SubscriptionTransferInfo:

description: Contains information about subscriptions that are requested to be transferred.

type: object

properties:

transReqType:

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

nwdafEvSub:

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

consumerId:

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

contextId:

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

sourceNfIds:

type: array

items:

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

minItems: 1

sourceSetIds:

type: array

items:

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

minItems: 1

modelInfo:

type: array

items:

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

minItems: 1

required:

- transReqType

- nwdafEvSub

- consumerId

ModelInfo:

description: Contains information about an ML model.

type: object

properties:

analyticsId:

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

mlModelInfos:

type: array

items:

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

minItems: 1

required:

- analyticsId

- mlModelInfos

MLModelInfo:

description: Contains information about an ML models.

type: object

properties:

mlFileAddrs:

type: array

items:

$ref: 'TS29520\_Nnwdaf\_MLModelProvision.yaml#/components/schemas/MLModelAddr'

minItems: 1

modelProvId:

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

modelProvSetId:

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

oneOf:

- required: [modelProvId]

- required: [modelProvSetId]

AnalyticsContextIdentifier:

description: Contains information about available analytics contexts.

type: object

properties:

subscriptionId:

type: string

description: The identifier of a subscription.

nfAnaCtxts:

type: array

items:

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

minItems: 1

description: >

List of analytics types for which NF related analytics contexts can be retrieved.

ueAnaCtxts:

type: array

items:

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

minItems: 1

description: >

List of objects that indicate for which SUPI and analytics types combinations analytics

context can be retrieved.

allOf:

- anyOf:

- required: [nfAnaCtxts]

- required: [ueAnaCtxts]

- required: [subscriptionId]

UeAnalyticsContextDescriptor:

description: Contains information about available UE related analytics contexts.

type: object

properties:

supi:

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

anaTypes:

type: array

items:

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

minItems: 1

description: >

List of analytics types for which UE related analytics contexts can be retrieved.

required:

- supi

- anaTypes

DnPerfInfo:

description: Represents DN performance information.

type: object

properties:

appId:

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

dnn:

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

snssai:

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

dnPerf:

type: array

items:

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

minItems: 1

confidence:

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

required:

- dnPerf

DnPerf:

description: Represents DN performance for the application.

type: object

properties:

appServerInsAddr:

$ref: 'TS29517\_Naf\_EventExposure.yaml#/components/schemas/AddrFqdn'

upfInfo:

$ref: 'TS29508\_Nsmf\_EventExposure.yaml#/components/schemas/UpfInformation'

dnai:

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

perfData:

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

spatialValidCon:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

temporalValidCon:

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

required:

- perfData

PerfData:

description: Represents DN performance data.

type: object

properties:

avgTrafficRate:

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

maxTrafficRate:

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

avePacketDelay:

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

maxPacketDelay:

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

avgPacketLossRate:

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

DispersionRequirement:

description: Represents the dispersion analytics requirements.

type: object

properties:

disperType:

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

classCriters:

type: array

items:

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

minItems: 1

rankCriters:

type: array

items:

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

minItems: 1

dispOrderCriter:

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

order:

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

required:

- disperType

ClassCriterion:

description: >

Indicates the dispersion class criterion for fixed, camper and/or traveller UE, and/or the

top-heavy UE dispersion class criterion.

type: object

properties:

disperClass:

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

classThreshold:

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

thresMatch:

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

required:

- disperClass

- classThreshold

- thresMatch

RankingCriterion:

description: Indicates the usage ranking criterion between the high, medium and low usage UE.

type: object

properties:

highBase:

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

lowBase:

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

required:

- highBase

- lowBase

DispersionInfo:

description: >

Represents the Dispersion information. When subscribed event is "DISPERSION", the

"disperInfos" attribute shall be included.

type: object

properties:

tsStart:

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

tsDuration:

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

disperCollects:

type: array

items:

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

minItems: 1

disperType:

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

required:

- tsStart

- tsDuration

- disperCollects

- disperType

DispersionCollection:

description: Dispersion collection per UE location or per slice.

type: object

properties:

ueLoc:

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

snssai:

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

supis:

type: array

items:

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

minItems: 1

gpsis:

type: array

items:

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

minItems: 1

appVolumes:

type: array

items:

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

minItems: 1

disperAmount:

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

disperClass:

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

usageRank:

type: integer

description: Integer where the allowed values correspond to 1, 2, 3 only.

minimum: 1

maximum: 3

percentileRank:

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

ueRatio:

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

confidence:

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

allOf:

- oneOf:

- required: [ueLoc]

- required: [snssai]

- anyOf:

- required: [disperAmount]

- required: [disperClass]

- required: [usageRank]

- required: [percentileRank]

ApplicationVolume:

description: Application data volume per Application Id.

type: object

properties:

appId:

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

appVolume:

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

required:

- appId

- appVolume

RedundantTransmissionExpReq:

description: Represents other redundant transmission experience analytics requirements.

type: object

properties:

redTOrderCriter:

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

order:

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

RedundantTransmissionExpInfo:

description: >

The redundant transmission experience related information. When subscribed event is

"RED\_TRANS\_EXP", the "redTransInfos" attribute shall be included.

type: object

properties:

spatialValidCon:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

dnn:

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

redTransExps:

type: array

items:

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

minItems: 1

required:

- redTransExps

RedundantTransmissionExpPerTS:

description: The redundant transmission experience per Time Slot.

type: object

properties:

tsStart:

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

tsDuration:

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

obsvRedTransExp:

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

redTransStatus:

type: boolean

description: >

Redundant Transmission Status. Set to "true" if redundant transmission was activated,

otherwise set to "false". Default value is "false" if omitted.

ueRatio:

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

confidence:

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

required:

- tsStart

- tsDuration

- obsvRedTransExp

ObservedRedundantTransExp:

description: Represents the observed redundant transmission experience related information.

type: object

properties:

avgPktDropRateUl:

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

varPktDropRateUl:

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

avgPktDropRateDl:

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

varPktDropRateDl:

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

avgPktDelayUl:

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

varPktDelayUl:

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

avgPktDelayDl:

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

varPktDelayDl:

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

WlanPerformanceReq:

description: Represents other WLAN performance analytics requirements.

type: object

properties:

ssIds:

type: array

items:

type: string

minItems: 1

bssIds:

type: array

items:

type: string

minItems: 1

wlanOrderCriter:

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

order:

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

WlanPerformanceInfo:

description: The WLAN performance related information.

type: object

properties:

networkArea:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

wlanPerSsidInfos:

type: array

items:

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

minItems: 1

required:

- wlanPerSsidInfos

WlanPerSsIdPerformanceInfo:

description: The WLAN performance per SSID.

type: object

properties:

ssId:

type: string

wlanPerTsInfos:

type: array

items:

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

minItems: 1

required:

- ssId

- wlanPerTsInfos

WlanPerTsPerformanceInfo:

description: WLAN performance information per Time Slot during the analytics target period.

type: object

properties:

tsStart:

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

tsDuration:

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

rssi:

type: integer

rtt:

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

trafficInfo:

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

numberOfUes:

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

confidence:

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

required:

- tsStart

- tsDuration

anyOf:

- required: [rssi]

- required: [rtt]

- required: [trafficInfo]

- required: [numberOfUes]

TrafficInformation:

description: Traffic information including UL/DL data rate and/or Traffic volume.

type: object

properties:

uplinkRate:

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

downlinkRate:

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

uplinkVolume:

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

downlinkVolume:

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

totalVolume:

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

anyOf:

- required: [uplinkRate]

- required: [downlinkRate]

- required: [uplinkVolume]

- required: [downlinkVolume]

- required: [totalVolume]

AppListForUeComm:

description: Represents the analytics of the application list used by UE.

type: object

properties:

appId:

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

startTime:

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

appDur:

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

occurRatio:

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

spatialValidity:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

required:

- appId

SessInactTimerForUeComm:

description: Represents the N4 Session inactivity timer.

type: object

properties:

n4SessId:

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

sessInactiveTimer:

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

required:

- n4SessId

- sessInactiveTimer

DnPerformanceReq:

description: Represents other DN performance analytics requirements.

type: object

properties:

dnPerfOrderCriter:

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

order:

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

reportThresholds:

type: array

items:

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

minItems: 1

RatFreqInformation:

description: Represents the RAT type and/or Frequency information.

type: object

properties:

allFreq:

type: boolean

description: >

Set to "true" to indicate to handle all the frequencies the NWDAF received, otherwise

set to "false" or omit. The "allFreq" attribute and the "freq" attribute are mutually

exclusive.

allRat:

type: boolean

description: >

Set to "true" to indicate to handle all the RAT Types the NWDAF received, otherwise

set to "false" or omit. The "allRat" attribute and the "ratType" attribute are mutually

exclusive.

freq:

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

ratType:

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

svcExpThreshold:

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

matchingDir:

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

PrevSubInfo:

description: Information of the previous subscription.

type: object

properties:

producerId:

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

producerSetId:

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

subscriptionId:

type: string

description: The identifier of a subscription.

nfAnaEvents:

type: array

items:

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

minItems: 1

ueAnaEvents:

type: array

items:

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

minItems: 1

required:

- subscriptionId

oneOf:

- required: [producerId]

- required: [producerSetId]

ResourceUsage:

description: >

The current usage of the virtual resources assigned to the NF instances belonging to a

particular network slice instance.

type: object

properties:

cpuUsage:

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

memoryUsage:

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

storageUsage:

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

ConsumerNfInformation:

description: Represents the analytics consumer NF Information.

type: object

properties:

nfId:

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

nfSetId:

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

taiList:

type: array

items:

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

minItems: 1

oneOf:

- oneOf:

- required: [nfId]

- required: [nfSetId]

- required: [taiList]

#

# ENUMERATIONS DATA TYPES

#

NotificationMethod:

anyOf:

- type: string

enum:

- PERIODIC

- THRESHOLD

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- PERIODIC: The subscribe of NWDAF Event is periodically. The periodic of the notification is identified by repetitionPeriod defined in clause 5.1.6.2.3.

- THRESHOLD: The subscribe of NWDAF Event is upon threshold exceeded.

NwdafEvent:

anyOf:

- type: string

enum:

- SLICE\_LOAD\_LEVEL

- NETWORK\_PERFORMANCE

- NF\_LOAD

- SERVICE\_EXPERIENCE

- UE\_MOBILITY

- UE\_COMMUNICATION

- QOS\_SUSTAINABILITY

- ABNORMAL\_BEHAVIOUR

- USER\_DATA\_CONGESTION

- NSI\_LOAD\_LEVEL

- DN\_PERFORMANCE

- DISPERSION

- RED\_TRANS\_EXP

- WLAN\_PERFORMANCE

- SM\_CONGESTION

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- SLICE\_LOAD\_LEVEL: Indicates that the event subscribed is load level information of Network Slice

- NETWORK\_PERFORMANCE: Indicates that the event subscribed is network performance information.

- NF\_LOAD: Indicates that the event subscribed is load level and status of one or several Network Functions.

- SERVICE\_EXPERIENCE: Indicates that the event subscribed is service experience.

- UE\_MOBILITY: Indicates that the event subscribed is UE mobility information.

- UE\_COMMUNICATION: Indicates that the event subscribed is UE communication information.

- QOS\_SUSTAINABILITY: Indicates that the event subscribed is QoS sustainability.

- ABNORMAL\_BEHAVIOUR: Indicates that the event subscribed is abnormal behaviour.

- USER\_DATA\_CONGESTION: Indicates that the event subscribed is user data congestion information.

- NSI\_LOAD\_LEVEL: Indicates that the event subscribed is load level information of Network Slice and the optionally associated Network Slice Instance

- DN\_PERFORMANCE: Indicates that the event subscribed is DN performance information.

- DISPERSION: Indicates that the event subscribed is dispersion information.

- RED\_TRANS\_EXP: Indicates that the event subscribed is redundant transmission experience.

- WLAN\_PERFORMANCE: Indicates that the event subscribed is WLAN performance.

- SM\_CONGESTION: Indicates the Session Management Congestion Control Experience information for specific DNN and/or S-NSSAI.

Accuracy:

anyOf:

- type: string

enum:

- LOW

- HIGH

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- LOW: Low accuracy.

- HIGH: High accuracy.

CongestionType:

anyOf:

- type: string

enum:

- USER\_PLANE

- CONTROL\_PLANE

- USER\_AND\_CONTROL\_PLANE

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- USER\_PLANE: The congestion analytics type is User Plane.

- CONTROL\_PLANE: The congestion analytics type is Control Plane.

- USER\_AND\_CONTROL\_PLANE: The congestion analytics type is User Plane and Control Plane.

ExceptionId:

anyOf:

- type: string

enum:

- UNEXPECTED\_UE\_LOCATION

- UNEXPECTED\_LONG\_LIVE\_FLOW

- UNEXPECTED\_LARGE\_RATE\_FLOW

- UNEXPECTED\_WAKEUP

- SUSPICION\_OF\_DDOS\_ATTACK

- WRONG\_DESTINATION\_ADDRESS

- TOO\_FREQUENT\_SERVICE\_ACCESS

- UNEXPECTED\_RADIO\_LINK\_FAILURES

- PING\_PONG\_ACROSS\_CELLS

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- UNEXPECTED\_UE\_LOCATION: Unexpected UE location

- UNEXPECTED\_LONG\_LIVE\_FLOW: Unexpected long-live rate flows

- UNEXPECTED\_LARGE\_RATE\_FLOW: Unexpected large rate flows

- UNEXPECTED\_WAKEUP: Unexpected wakeup

- SUSPICION\_OF\_DDOS\_ATTACK: Suspicion of DDoS attack

- WRONG\_DESTINATION\_ADDRESS: Wrong destination address

- TOO\_FREQUENT\_SERVICE\_ACCESS: Too frequent Service Access

- UNEXPECTED\_RADIO\_LINK\_FAILURES: Unexpected radio link failures

- PING\_PONG\_ACROSS\_CELLS: Ping-ponging across neighbouring cells

ExceptionTrend:

anyOf:

- type: string

enum:

- UP

- DOWN

- UNKNOW

- STABLE

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- UP: Up trend of the exception level.

- DOWN: Down trend of the exception level.

- UNKNOW: Unknown trend of the exception level.

- STABLE: Stable trend of the exception level.

TimeUnit:

anyOf:

- type: string

enum:

- MINUTE

- HOUR

- DAY

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- MINUTE: Time unit is per minute.

- HOUR: Time unit is per hour.

- DAY: Time unit is per day.

NetworkPerfType:

anyOf:

- type: string

enum:

- GNB\_ACTIVE\_RATIO

- GNB\_COMPUTING\_USAGE

- GNB\_MEMORY\_USAGE

- GNB\_DISK\_USAGE

- NUM\_OF\_UE

- SESS\_SUCC\_RATIO

- HO\_SUCC\_RATIO

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- GNB\_ACTIVE\_RATIO: Indicates that the network performance requirement is gNodeB active (i.e. up and running) rate. Indicates the ratio of gNB active (i.e. up and running) number to the total number of gNB

- GNB\_COMPUTING\_USAGE: Indicates gNodeB computing resource usage.

- GNB\_MEMORY\_USAGE: Indicates gNodeB memory usage.

- GNB\_DISK\_USAGE: Indicates gNodeB disk usage.

- NUM\_OF\_UE: Indicates number of UEs.

- SESS\_SUCC\_RATIO: Indicates ratio of successful setup of PDU sessions to total PDU session setup attempts.

- HO\_SUCC\_RATIO: Indicates Ratio of successful handovers to the total handover attempts.

ExpectedAnalyticsType:

anyOf:

- type: string

enum:

- MOBILITY

- COMMUN

- MOBILITY\_AND\_COMMUN

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- MOBILITY: Mobility related abnormal behaviour analytics is expected by the consumer.

- COMMUN: Communication related abnormal behaviour analytics is expected by the consumer.

- MOBILITY\_AND\_COMMUN: Both mobility and communication related abnormal behaviour analytics is expected by the consumer.

MatchingDirection:

anyOf:

- type: string

enum:

- ASCENDING

- DESCENDING

- CROSSED

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- ASCENDING: Threshold is crossed in ascending direction.

- DESCENDING: Threshold is crossed in descending direction.

- CROSSED: Threshold is crossed either in ascending or descending direction.

NwdafFailureCode:

anyOf:

- type: string

enum:

- UNAVAILABLE\_DATA

- BOTH\_STAT\_PRED\_NOT\_ALLOWED

- UNSATISFIED\_REQUESTED\_ANALYTICS\_TIME

- OTHER

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- UNAVAILABLE\_DATA: Indicates the requested statistics information for the event is rejected since necessary data to perform the service is unavailable.

- BOTH\_STAT\_PRED\_NOT\_ALLOWED: Indicates the requested analysis information for the event is rejected since the start time is in the past and the end time is in the future, which means the NF service consumer requested both statistics and prediction for the analytics.

- UNSATISFIED\_REQUESTED\_ANALYTICS\_TIME: Indicates that the requested event is rejected since the analytics information is not ready when the time indicated by the "timeAnaNeeded" attribute (as provided during the creation or modification of subscription) is reached.

- OTHER: Indicates the requested analysis information for the event is rejected due to other reasons.

AnalyticsMetadata:

anyOf:

- type: string

enum:

- NUM\_OF\_SAMPLES

- DATA\_WINDOW

- DATA\_STAT\_PROPS

- STRATEGY

- ACCURACY

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- NUM\_OF\_SAMPLES: Number of data samples used for the generation of the output analytics.

- DATA\_WINDOW: Data time window of the data samples.

- DATA\_STAT\_PROPS: Dataset statistical properties of the data used to generate the analytics.

- STRATEGY: Output strategy used for the reporting of the analytics.

- ACCURACY: Level of accuracy reached for the analytics.

DatasetStatisticalProperty:

anyOf:

- type: string

enum:

- UNIFORM\_DIST\_DATA

- NO\_OUTLIERS

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- UNIFORM\_DIST\_DATA: Indicates the use of data samples that are uniformly distributed according to the different aspects of the requested analytics.

- NO\_OUTLIERS: Indicates that the data samples shall disregard data samples that are at the extreme boundaries of the value range.

OutputStrategy:

anyOf:

- type: string

enum:

- BINARY

- GRADIENT

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- BINARY: Indicates that the analytics shall only be reported when the requested level of accuracy is reached within a cycle of periodic notification.

- GRADIENT: Indicates that the analytics shall be reported according with the periodicity irrespective of whether the requested level of accuracy has been reached or not.

TransferRequestType:

anyOf:

- type: string

enum:

- PREPARE

- TRANSFER

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- PREPARE: Indicates that the request is for analytics subscription transfer preparation.

- TRANSFER: Indicates that the request is for analytics subscription transfer execution.

AnalyticsSubset:

anyOf:

- type: string

enum:

- NUM\_OF\_UE\_REG

- NUM\_OF\_PDU\_SESS\_ESTBL

- RES\_USAGE

- NUM\_OF\_EXCEED\_RES\_USAGE\_LOAD\_LEVEL\_THR

- PERIOD\_OF\_EXCEED\_RES\_USAGE\_LOAD\_LEVEL\_THR

- EXCEED\_LOAD\_LEVEL\_THR\_IND

- LIST\_OF\_TOP\_APP\_UL

- LIST\_OF\_TOP\_APP\_DL

- NF\_STATUS

- NF\_RESOURCE\_USAGE

- NF\_LOAD

- NF\_PEAK\_LOAD

- NF\_LOAD\_AVG\_IN\_AOI

- DISPER\_AMOUNT

- DISPER\_CLASS

- RANKING

- PERCENTILE\_RANKING

- RSSI

- RTT

- TRAFFIC\_INFO

- NUMBER\_OF\_UES

- APP\_LIST\_FOR\_UE\_COMM

- N4\_SESS\_INACT\_TIMER\_FOR\_UE\_COMM

- AVG\_TRAFFIC\_RATE

- MAX\_TRAFFIC\_RATE

- AVG\_PACKET\_DELAY

- MAX\_PACKET\_DELAY

- AVG\_PACKET\_LOSS\_RATE

- UE\_LOCATION

- LIST\_OF\_HIGH\_EXP\_UE

- LIST\_OF\_MEDIUM\_EXP\_UE

- LIST\_OF\_LOW\_EXP\_UE

- AVG\_UL\_PKT\_DROP\_RATE

- VAR\_UL\_PKT\_DROP\_RATE

- AVG\_DL\_PKT\_DROP\_RATE

- VAR\_DL\_PKT\_DROP\_RATE

- AVG\_UL\_PKT\_DELAY

- VAR\_UL\_PKT\_DELAY

- AVG\_DL\_PKT\_DELAY

- VAR\_DL\_PKT\_DELAY

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- NUM\_OF\_UE\_REG: The number of UE registered. This value is only applicable to NSI\_LOAD\_LEVEL event.

- NUM\_OF\_PDU\_SESS\_ESTBL: The number of PDU sessions established. This value is only applicable to NSI\_LOAD\_LEVEL event.

- RES\_USAGE: The current usage of the virtual resources assigned to the NF instances belonging to a particular network slice instance. This value is only applicable to NSI\_LOAD\_LEVEL event.

- NUM\_OF\_EXCEED\_RES\_USAGE\_LOAD\_LEVEL\_THR: The number of times the resource usage threshold of the network slice instance is reached or exceeded if a threshold value is provided by the consumer. This value is only applicable to NSI\_LOAD\_LEVEL event.

- PERIOD\_OF\_EXCEED\_RES\_USAGE\_LOAD\_LEVEL\_THR: The time interval between each time the threshold being met or exceeded on the network slice (instance). This value is only applicable to NSI\_LOAD\_LEVEL event.

- EXCEED\_LOAD\_LEVEL\_THR\_IND: Whether the Load Level Threshold is met or exceeded by the statistics value. This value is only applicable to NSI\_LOAD\_LEVEL event.

- LIST\_OF\_TOP\_APP\_UL: The list of applications that contribute the most to the traffic in the UL direction. This value is only applicable to USER\_DATA\_CONGESTION event.

- LIST\_OF\_TOP\_APP\_DL: The list of applications that contribute the most to the traffic in the DL direction. This value is only applicable to USER\_DATA\_CONGESTION event.

- NF\_STATUS: The availability status of the NF on the Analytics target period, expressed as a percentage of time per status value (registered, suspended, undiscoverable). This value is only applicable to NF\_LOAD event.

- NF\_RESOURCE\_USAGE: The average usage of assigned resources (CPU, memory, storage). This value is only applicable to NF\_LOAD event.

- NF\_LOAD: The average load of the NF instance over the Analytics target period. This value is only applicable to NF\_LOAD event.

- NF\_PEAK\_LOAD: The maximum load of the NF instance over the Analytics target period. This value is only applicable to NF\_LOAD event.

- NF\_LOAD\_AVG\_IN\_AOI: The average load of the NF instances over the area of interest. This value is only applicable to NF\_LOAD event.

- DISPER\_AMOUNT: Indicates the dispersion amount of the reported data volume or transaction dispersion type. This value is only applicable to DISPERSION event.

- DISPER\_CLASS: Indicates the dispersion mobility class: fixed, camper, traveller upon set its usage threshold, and/or the top-heavy class upon set its percentile rating threshold. This value is only applicable to DISPERSION event.

- RANKING: Data/transaction usage ranking high (i.e.value 1), medium (2) or low (3). This value is only applicable to DISPERSION event.

- PERCENTILE\_RANKING: Percentile ranking of the target UE in the Cumulative Distribution Function of data usage for the population of all UEs. This value is only applicable to DISPERSION event.

- RSSI: Indicated the RSSI in the unit of dBm. This value is only applicable to WLAN\_PERFORMANCE event.

- RTT: Indicates the RTT in the unit of millisecond. This value is only applicable to WLAN\_PERFORMANCE event.

- TRAFFIC\_INFO: Traffic information including UL/DL data rate and/or Traffic volume. This value is only applicable to WLAN\_PERFORMANCE event.

- NUMBER\_OF\_UES: Number of UEs observed for the SSID. This value is only applicable to WLAN\_PERFORMANCE event.

- APP\_LIST\_FOR\_UE\_COMM: The analytics of the application list used by UE. This value is only applicable to UE\_COMM event.

- N4\_SESS\_INACT\_TIMER\_FOR\_UE\_COMM: The N4 Session inactivity timer. This value is only applicable to UE\_COMM event.

- AVG\_TRAFFIC\_RATE: Indicates average traffic rate. This value is only applicable to DN\_PERFORMANCE event.

- MAX\_TRAFFIC\_RATE: Indicates maximum traffic rate. This value is only applicable to DN\_PERFORMANCE event.

- AVG\_PACKET\_DELAY: Indicates average Packet Delay. This value is only applicable to DN\_PERFORMANCE event.

- MAX\_PACKET\_DELAY: Indicates maximum Packet Delay. This value is only applicable to DN\_PERFORMANCE event.

- AVG\_PACKET\_LOSS\_RATE: Indicates average Loss Rate. This value is only applicable to DN\_PERFORMANCE event.

- UE\_LOCATION: Indicates UE location information. This value is only applicable to SERVICE\_EXPERIENCE event.

- LIST\_OF\_HIGH\_EXP\_UE: Indicates list of high experienced UE. This value is only applicable to SM\_CONGESTION event.

- LIST\_OF\_MEDIUM\_EXP\_UE: Indicates list of medium experienced UE. This value is only applicable to SM\_CONGESTION event.

- LIST\_OF\_LOW\_EXP\_UE: Indicates list of low experienced UE. This value is only applicable to SM\_CONGESTION event.

- AVG\_UL\_PKT\_DROP\_RATE: Indicates average uplink packet drop rate on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event.

- VAR\_UL\_PKT\_DROP\_RATE: Indicates variance of uplink packet drop rate on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event.

- AVG\_DL\_PKT\_DROP\_RATE: Indicates average downlink packet drop rate on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event.

- VAR\_DL\_PKT\_DROP\_RATE: Indicates variance of downlink packet drop rate on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event.

- AVG\_UL\_PKT\_DELAY: Indicates average uplink packet delay round trip on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event.

- VAR\_UL\_PKT\_DELAY: Indicates variance uplink packet delay round trip on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event.

- AVG\_DL\_PKT\_DELAY: Indicates average downlink packet delay round trip on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event.

- VAR\_DL\_PKT\_DELAY: Indicates variance downlink packet delay round trip on GTP-U path on N3. This value is only applicable to RED\_TRANS\_EXP event.

DispersionType:

oneOf:

- type: string

enum:

- DVDA

- TDA

- DVDA\_AND\_TDA

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- DVDA: Data Volume Dispersion Analytics.

- TDA: Transactions Dispersion Analytics.

- DVDA\_AND\_TDA: Data Volume Dispersion Analytics and Transactions Dispersion Analytics.

DispersionClass:

oneOf:

- type: string

enum:

- FIXED

- CAMPER

- TRAVELLER

- TOP\_HEAVY

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- FIXED: Dispersion class as fixed UE its data or transaction usage at a location or a slice, is higher than its class threshold set for its all data or transaction usage.

- CAMPER: Dispersion class as camper UE, its data or transaction usage at a location or a slice, is higher than its class threshold and lower than the fixed class threshold set for its all data or transaction usage..

- TRAVELLER: Dispersion class as traveller UE, its data or transaction usage at a location or a slice, is lower than the camper class threshold set for its all data or transaction usage.

- TOP\_HEAVY: Dispersion class as Top\_Heavy UE, who's dispersion percentile rating at a location or a slice, is higher than its class threshold.

DispersionOrderingCriterion:

anyOf:

- type: string

enum:

- TIME\_SLOT\_START

- DISPERSION

- CLASSIFICATION

- RANKING

- PERCENTILE\_RANKING

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- TIME\_SLOT\_START: Indicates the order of time slot start.

- DISPERSION: Indicates the order of data/transaction dispersion.

- CLASSIFICATION: Indicates the order of data/transaction classification.

- RANKING: Indicates the order of data/transaction ranking.

- PERCENTILE\_RANKING: Indicates the order of data/transaction percentile ranking.

RedTransExpOrderingCriterion:

anyOf:

- type: string

enum:

- TIME\_SLOT\_START

- RED\_TRANS\_EXP

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- TIME\_SLOT\_START: Indicates the order of time slot start.

- RED\_TRANS\_EXP: Indicates the order of Redundant Transmission Experience.

WlanOrderingCriterion:

anyOf:

- type: string

enum:

- TIME\_SLOT\_START

- NUMBER\_OF\_UES

- RSSI

- RTT

- TRAFFIC\_INFO

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- TIME\_SLOT\_START: Indicates the order of time slot start.

- NUMBER\_OF\_UES: Indicates the order of number of UEs.

- RSSI: Indicates the order of RSSI.

- RTT: Indicates the order of RTT.

- TRAFFIC\_INFO: Indicates the order of Traffic information.

ServiceExperienceType:

anyOf:

- type: string

enum:

- VOICE

- VIDEO

- OTHER

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but is not used to encode content defined in the present version of this API.

description: |

Possible values are:

- VOICE: Indicates that the service experience analytics is for voice service.

- VIDEO: Indicates that the service experience analytics is for video service.

- OTHER: Indicates that the service experience analytics is for other service.

DnPerfOrderingCriterion:

anyOf:

- type: string

enum:

- AVERAGE\_TRAFFIC\_RATE

- MAXIMUM\_TRAFFIC\_RATE

- AVERAGE\_PACKET\_DELAY

- MAXIMUM\_PACKET\_DELAY

- AVERAGE\_PACKET\_LOSS\_RATE

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but

is not used to encode content defined in the present version of this API.

description: |

Possible values are:

- AVERAGE\_TRAFFIC\_RATE: Indicates the average traffic rate.

- MAXIMUM\_TRAFFIC\_RATE: Indicates the maximum traffic rate.

- AVERAGE\_PACKET\_DELAY: Indicates the average packet delay.

- MAXIMUM\_PACKET\_DELAY: Indicates the maximum packet delay.

- AVERAGE\_PACKET\_LOSS\_RATE: Indicates the average packet loss rate.

# A.3 Nnwdaf\_AnalyticsInfo API

openapi: 3.0.0

info:

version: 1.2.3

title: Nnwdaf\_AnalyticsInfo

description: |

Nnwdaf\_AnalyticsInfo Service API.

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externalDocs:

description: 3GPP TS 29.520 V17.14.0; 5G System; Network Data Analytics Services.

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.520/'

security:

- {}

- oAuth2ClientCredentials:

- nnwdaf-analyticsinfo

servers:

- url: '{apiRoot}/nnwdaf-analyticsinfo/v1'

variables:

apiRoot:

default: https://example.com

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

paths:

/analytics:

get:

summary: Read a NWDAF Analytics

operationId: GetNWDAFAnalytics

tags:

- NWDAF Analytics (Document)

parameters:

- name: event-id

in: query

description: Identify the analytics.

required: true

schema:

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

- name: ana-req

in: query

description: Identifies the analytics reporting requirement information.

required: false

content:

application/json:

schema:

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

- name: event-filter

in: query

description: Identify the analytics.

required: false

content:

application/json:

schema:

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

- name: supported-features

in: query

description: To filter irrelevant responses related to unsupported features.

schema:

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

- name: tgt-ue

in: query

description: Identify the target UE information.

required: false

content:

application/json:

schema:

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

responses:

'200':

description: >

Containing the analytics with parameters as relevant for the requesting NF service

consumer.

content:

application/json:

schema:

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

'204':

description: No Content. The requested NWDAF Analytics data does not exist.

'400':

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

'401':

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

'403':

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

'404':

description: Indicates that the NWDAF Analytics resource does not exist.

content:

application/problem+json:

schema:

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

'406':

$ref: 'TS29571\_CommonData.yaml#/components/responses/406'

'414':

$ref: 'TS29571\_CommonData.yaml#/components/responses/414'

'429':

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

'500':

description: >

The request is rejected by the NWDAF and more details (not only the ProblemDetails) are

returned.

content:

application/problem+json:

schema:

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

/context:

get:

summary: Get context information related to analytics subscriptions.

operationId: GetNwdafContext

tags:

- NWDAF Context (Document)

parameters:

- name: context-ids

in: query

description: Identifies specific context information related to analytics subscriptions.

required: true

content:

application/json:

schema:

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

- name: req-context

in: query

description: >

Identfies the type(s) of the analytics context information the consumer wishes to receive.

required: false

content:

application/json:

schema:

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

- name: supported-features

in: query

description: The features supported by the NF service consumer.

schema:

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

required: false

responses:

'200':

description: >

Contains context information related to analytics subscriptions corresponding with one or

more context identifiers.

content:

application/json:

schema:

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

'204':

description: >

No Content. (\No context information could be retrieved for the requested context

Identifiers.

'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'

'414':

$ref: 'TS29571\_CommonData.yaml#/components/responses/414'

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nnwdaf-analyticsinfo: Access to the Nnwdaf\_AnalyticsInfo API

schemas:

AnalyticsData:

description: >

Represents the description of analytics with parameters as relevant for the requesting NF

service consumer.

type: object

properties:

start:

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

expiry:

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

timeStampGen:

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

anaMetaInfo:

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

sliceLoadLevelInfos:

type: array

items:

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

minItems: 1

description: The slices and their load level information.

nsiLoadLevelInfos:

type: array

items:

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

minItems: 1

nfLoadLevelInfos:

type: array

items:

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

minItems: 1

nwPerfs:

type: array

items:

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

minItems: 1

svcExps:

type: array

items:

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

minItems: 1

qosSustainInfos:

type: array

items:

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

minItems: 1

ueMobs:

type: array

items:

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

minItems: 1

ueComms:

type: array

items:

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

minItems: 1

userDataCongInfos:

type: array

items:

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

minItems: 1

abnorBehavrs:

type: array

items:

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

minItems: 1

smccExps:

type: array

items:

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

minItems: 1

disperInfos:

type: array

items:

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

minItems: 1

redTransInfos:

type: array

items:

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

minItems: 1

wlanInfos:

type: array

items:

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

minItems: 1

dnPerfInfos:

type: array

items:

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

minItems: 1

suppFeat:

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

EventFilter:

description: Represents the event filters used to identify the requested analytics.

type: object

properties:

anySlice:

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

snssais:

type: array

items:

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

minItems: 1

description: Identification(s) of network slice.

appIds:

type: array

items:

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

minItems: 1

dnns:

type: array

items:

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

minItems: 1

dnais:

type: array

items:

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

minItems: 1

ladnDnns:

type: array

items:

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

minItems: 1

description: Identification(s) of LADN DNN to indicate the LADN service area as the AOI.

networkArea:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

visitedAreas:

type: array

items:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

minItems: 1

maxTopAppUlNbr:

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

maxTopAppDlNbr:

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

nfInstanceIds:

type: array

items:

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

minItems: 1

nfSetIds:

type: array

items:

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

minItems: 1

nfTypes:

type: array

items:

$ref: 'TS29510\_Nnrf\_NFManagement.yaml#/components/schemas/NFType'

minItems: 1

nsiIdInfos:

type: array

items:

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

minItems: 1

qosRequ:

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

nwPerfTypes:

type: array

items:

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

minItems: 1

bwRequs:

type: array

items:

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

minItems: 1

excepIds:

type: array

items:

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

minItems: 1

exptAnaType:

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

exptUeBehav:

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

ratFreqs:

type: array

items:

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

minItems: 1

disperReqs:

type: array

items:

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

minItems: 1

redTransReqs:

type: array

items:

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

minItems: 1

wlanReqs:

type: array

items:

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

minItems: 1

listOfAnaSubsets:

type: array

items:

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

minItems: 1

upfInfo:

$ref: 'TS29508\_Nsmf\_EventExposure.yaml#/components/schemas/UpfInformation'

appServerAddrs:

type: array

items:

$ref: 'TS29517\_Naf\_EventExposure.yaml#/components/schemas/AddrFqdn'

minItems: 1

dnPerfReqs:

type: array

items:

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

minItems: 1

not:

required: [anySlice, snssais]

ProblemDetailsAnalyticsInfoRequest:

description: >

Extends ProblemDetails to indicate more details why the analytics request is rejected.

allOf:

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

- $ref: '#/components/schemas/AdditionInfoAnalyticsInfoRequest'

AdditionInfoAnalyticsInfoRequest:

description: Indicates additional information why the analytics request is rejected.

type: object

properties:

rvWaitTime:

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

ContextData:

description: >

Contains context information related to analytics subscriptions corresponding with one or

more context identifiers.

type: object

properties:

contextElems:

type: array

items:

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

minItems: 1

description: >

List of items that contain context information corresponding with a context identifier.

suppFeat:

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

required:

- contextElems

ContextElement:

description: Contains context information corresponding with a specific context identifier.

type: object

properties:

contextId:

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

pendAnalytics:

type: array

items:

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

minItems: 1

description: >

Output analytics for the analytics subscription which have not yet been sent to the

analytics consumer.

histAnalytics:

type: array

items:

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

minItems: 1

description: Historical output analytics.

lastOutputTime:

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

aggrSubs:

type: array

items:

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

minItems: 1

description: >

Information about analytics subscriptions that the NWDAF has with other NWDAFs to perform

aggregation.

histData:

type: array

items:

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

minItems: 1

description: Historical data related to the analytics subscription.

adrfId:

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

adrfDataTypes:

type: array

items:

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

minItems: 1

description: Type(s) of data stored in the ADRF by the NWDAF.

aggrNwdafIds:

type: array

items:

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

minItems: 1

description: >

NWDAF identifiers of NWDAF instances used by the NWDAF service consumer when aggregating

multiple analytics subscriptions.

modelInfo:

type: array

items:

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

minItems: 1

description: >

Contains information identifying the ML model(s) that the consumer NWDAF is currently

subscribing for the analytics.

required:

- contextId

ContextIdList:

description: >

Contains a list of context identifiers of context information of analytics subscriptions.

type: object

properties:

contextIds:

type: array

items:

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

minItems: 1

required:

- contextIds

HistoricalData:

description: Contains historical data related to an analytics subscription.

type: object

properties:

startTime:

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

endTime:

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

subsWithSources:

type: array

items:

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

minItems: 1

description: Information about subscriptions with the data sources.

data:

type: array

items:

$ref: 'TS29575\_Nadrf\_DataManagement.yaml#/components/schemas/DataNotification'

minItems: 1

description: Historical data related to the analytics.

required:

- data

SpecificAnalyticsSubscription:

description: >

Represents an existing subscription for a specific type of analytics to a specific NWDAF.

type: object

properties:

subscriptionId:

type: string

producerId:

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

producerSetId:

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

nwdafEvSub:

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

allOf:

- oneOf:

- required: [producerId]

- required: [producerSetId]

- required: [subscriptionId]

- required: [nwdafEvSub]

RequestedContext:

description: Contains types of analytics context information.

type: object

properties:

contexts:

type: array

items:

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

minItems: 1

description: List of analytics context types.

required:

- contexts

SmcceInfo:

description: Represents the Session Management congestion control experience information.

type: object

properties:

dnn:

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

snssai:

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

smcceUeList:

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

required:

- smcceUeList

SmcceUeList:

description: >

Represents the List of UEs classified based on experience level of Session Management

congestion control.

type: object

properties:

highLevel:

type: array

items:

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

minItems: 1

mediumLevel:

type: array

items:

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

minItems: 1

lowLevel:

type: array

items:

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

minItems: 1

anyOf:

- required: [highLevel]

- required: [mediumLevel]

- required: [lowLevel]

SpecificDataSubscription:

description: >

Represents an existing subscription for data collection to a specific data source NF.

type: object

properties:

subscriptionId:

type: string

producerId:

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

producerSetId:

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

dataSub:

$ref: 'TS29575\_Nadrf\_DataManagement.yaml#/components/schemas/DataSubscription'

allOf:

- oneOf:

- required: [producerId]

- required: [producerSetId]

- required: [subscriptionId]

- required: [dataSub]

EventId:

anyOf:

- type: string

enum:

- LOAD\_LEVEL\_INFORMATION

- NETWORK\_PERFORMANCE

- NF\_LOAD

- SERVICE\_EXPERIENCE

- UE\_MOBILITY

- UE\_COMMUNICATION

- QOS\_SUSTAINABILITY

- ABNORMAL\_BEHAVIOUR

- USER\_DATA\_CONGESTION

- NSI\_LOAD\_LEVEL

- SM\_CONGESTION

- DISPERSION

- RED\_TRANS\_EXP

- WLAN\_PERFORMANCE

- DN\_PERFORMANCE

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- LOAD\_LEVEL\_INFORMATION: Represent the analytics of load level information of corresponding network slice.

- NETWORK\_PERFORMANCE: Represent the analytics of network performance information.

- NF\_LOAD: Indicates that the event subscribed is NF Load.

- SERVICE\_EXPERIENCE: Represent the analytics of service experience information of the specific applications.

- UE\_MOBILITY: Represent the analytics of UE mobility.

- UE\_COMMUNICATION: Represent the analytics of UE communication.

- QOS\_SUSTAINABILITY: Represent the analytics of QoS sustainability information in the certain area.

- ABNORMAL\_BEHAVIOUR: Indicates that the event subscribed is abnormal behaviour information.

- USER\_DATA\_CONGESTION: Represent the analytics of the user data congestion in the certain area.

- NSI\_LOAD\_LEVEL: Represent the analytics of Network Slice and the optionally associated Network Slice Instance.

- SM\_CONGESTION: Represent the analytics of Session Management congestion control experience information for specific DNN and/or S-NSSAI.

- DISPERSION: Represents the analytics of dispersion.

- RED\_TRANS\_EXP: Represents the analytics of Redundant Transmission Experience.

- WLAN\_PERFORMANCE: Represents the analytics of WLAN performance.

- DN\_PERFORMANCE: Represents the analytics of DN performance.

ContextType:

anyOf:

- type: string

enum:

- PENDING\_ANALYTICS

- HISTORICAL\_ANALYTICS

- AGGR\_SUBS

- DATA

- AGGR\_INFO

- ML\_MODELS

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- PENDING\_ANALYTICS: Represents context information that relates to pending output analytics.

- HISTORICAL\_ANALYTICS: Represents context information that relates to historical output analytics.

- AGGR\_SUBS: Represents context information about the analytics subscriptions that an NWDAF has with other NWDAFs that collectively serve an analytics subscription.

- DATA: Represents context information about historical data that is available.

- AGGR\_INFO: Represents context information that is related to aggregation of analytics from multiple NWDAF subscriptions.

- ML\_MODELS: Represents context information about used ML models.

AdrfDataType:

anyOf:

- type: string

enum:

- HISTORICAL\_ANALYTICS

- HISTORICAL\_DATA

- type: string

description: >

This string provides forward-compatibility with future

extensions to the enumeration but is not used to encode

content defined in the present version of this API.

description: |

Possible values are:

- HISTORICAL\_ANALYTICS: Indicates that historical analytics are stored in the ADRF.

- HISTORICAL\_DATA: Indicates that historical data are stored in the ADRF.

# A.4 Nnwdaf\_DataManagement API

openapi: 3.0.0

info:

title: Nnwdaf\_DataManagement

version: 1.0.3

description: |

Nnwdaf\_DataManagement API Service.

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externalDocs:

description: 3GPP TS 29.520 V17.14.0; 5G System; Network Data Analytics Services.

url: 'https://www.3gpp.org/ftp/Specs/archive/29\_series/29.520/'

servers:

- url: '{apiRoot}/nnwdaf-datamanagement/v1'

variables:

apiRoot:

default: https://example.com

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

security:

- {}

- oAuth2ClientCredentials:

- nnwdaf-datamanagement

paths:

/subscriptions:

post:

summary: subscribe to notifications

operationId: CreateIndividualSubcription

tags:

- Subscriptions (Collection)

requestBody:

required: true

content:

application/json:

schema:

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

responses:

'201':

description: Success

content:

application/json:

schema:

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

headers:

Location:

description: >

Contains the URI of the newly created resource, according to the structure

{apiRoot}/nnwdaf-datamanagement/<apiVersion>/subscriptions/{subscriptionId}.

required: true

schema:

type: string

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

callbacks:

myNotification:

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

post:

requestBody:

required: true

content:

application/json:

schema:

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

responses:

'204':

description: No Content, Notification was succesfull

'307':

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

'308':

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

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

callbacks:

Fetch:

'{request.body#/fetchInstruct/fetchUri}':

post:

requestBody:

required: true

content:

application/json:

schema:

type: array

items:

type: string

minItems: 1

description: Indicate the fetch correlation identifier.

responses:

'200':

description: Expected response to a valid request

content:

application/json:

schema:

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

'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'

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

/subscriptions/{subscriptionId}:

put:

summary: Update an existing Individual NWDAF Data Subscription.

operationId: UpdateNWDAFDataSubscription

tags:

- Individual NWDAF Data Management Subscription (Document)

requestBody:

required: true

content:

application/json:

schema:

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

parameters:

- name: subscriptionId

in: path

description: Event Subscription ID

required: true

schema:

type: string

responses:

'200':

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

content:

application/json:

schema:

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

'204':

description: No Content. Resource was succesfully modified

'307':

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

'308':

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

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

delete:

summary: unsubscribe from notifications

operationId: DeleteNWDAFDataSubscription

tags:

- Individual NWDAF Data Management Subscription (Document)

parameters:

- name: subscriptionId

in: path

description: Event Subscription ID

required: true

schema:

type: string

responses:

'204':

description: No Content. Resource was succesfully deleted

'307':

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

'308':

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

'400':

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

'401':

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

'403':

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

'404':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nnwdaf-datamanagement: Access to the Nnwdaf\_DataManagement API

schemas:

NnwdafDataManagementSubsc:

description: Represents an Individual NWDAF Data Management Subscription resource.

type: object

properties:

adrfId:

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

adrfSetId:

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

anaSub:

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

dataCollectPurposes:

type: array

items:

$ref: 'TS29574\_Ndccf\_DataManagement.yaml#/components/schemas/DataCollectionPurpose'

minItems: 1

description: >

The purposes of data collection. This attribute may only be provided if user consent

is reqiured depending on local policy and regulations and the consumer has

not checked user consent.

dataSub:

$ref: 'TS29575\_Nadrf\_DataManagement.yaml#/components/schemas/DataSubscription'

formatInstruct:

$ref: 'TS29574\_Ndccf\_DataManagement.yaml#/components/schemas/FormattingInstruction'

notifCorrId:

type: string

notificURI:

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

procInstruct:

$ref: 'TS29574\_Ndccf\_DataManagement.yaml#/components/schemas/ProcessingInstruction'

suppFeat:

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

targetNfId:

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

targetNfSetId:

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

timePeriod:

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

required:

- notifCorrId

- notificURI

oneOf:

- required: [anaSub]

- required: [dataSub]

NnwdafDataManagementNotif:

description: Represents an Individual Notification.

type: object

properties:

dataNotification:

$ref: 'TS29575\_Nadrf\_DataManagement.yaml#/components/schemas/DataNotification'

dataReports:

type: array

items:

$ref: 'TS29574\_Ndccf\_DataManagement.yaml#/components/schemas/NotifSummaryReport'

minItems: 1

description: List of summary reports of processed notifications.

notifCorrId:

type: string

description: Notification correlation identifier.

terminationReq:

type: string

description: >

It indicates that the termination of the data management subscription

is requested by the NWDAF.

fetchInstruct:

$ref: 'TS29576\_Nmfaf\_3caDataManagement.yaml#/components/schemas/FetchInstruction'

notifTimestamp:

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

required:

- notifCorrId

- notifTimestamp

oneOf:

- required: [dataNotification]

- required: [dataReports]

- required: [fetchInstruct]

# A.5 Nnwdaf\_MLModelProvision API

openapi: 3.0.0

info:

title: Nnwdaf\_MLModelProvision

version: 1.0.0

description: |

Nnwdaf\_MLModelProvision API Service.

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externalDocs:

description: 3GPP TS 29.520 V17.7.0; 5G System; Network Data Analytics Services.

url: https://www.3gpp.org/ftp/Specs/archive/29\_series/29.520/

servers:

- url: '{apiRoot}/nnwdaf-mlmodelprovision/v1'

variables:

apiRoot:

default: https://example.com

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

security:

- {}

- oAuth2ClientCredentials:

- nnwdaf-mlmodelprovision

paths:

/subscriptions:

post:

summary: Create a new Individual NWDAF ML Model Provision Subscription resource.

operationId: CreateNWDAFMLModelProvisionSubcription

tags:

- Subscriptions (Collection)

requestBody:

required: true

content:

application/json:

schema:

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

responses:

'201':

description: Create a new Individual NWDAF ML Model Provision Subscription resource.

content:

application/json:

schema:

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

headers:

Location:

description: >

Contains the URI of the newly created resource, according to the structure

{apiRoot}/nnwdaf-mlmodelprovision/v1/subscriptions/{subscriptionId}.

required: true

schema:

type: string

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

callbacks:

myNotification:

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

post:

requestBody:

required: true

content:

application/json:

schema:

type: array

items:

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

minItems: 1

responses:

'204':

description: No Content, Notification was succesfull

'307':

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

'308':

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

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

/subscriptions/{subscriptionId}:

put:

summary: update an existing Individual NWDAF ML Model Provision Subscription

operationId: UpdateNWDAFMLModelProvisionSubcription

tags:

- Individual NWDAF ML Model Provision Subscription (Document)

requestBody:

required: true

content:

application/json:

schema:

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

parameters:

- name: subscriptionId

in: path

description: String identifying a subscription to the Nnwdaf\_MLModelProvision Service.

required: true

schema:

type: string

responses:

'200':

description: >

The Individual NWDAF ML Model Provision Subscription resource was modified successfully

and a representation of that resource is returned.

content:

application/json:

schema:

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

'204':

description: >

The Individual NWDAF ML Model Provision Subscription resource was modified successfully.

'307':

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

'308':

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

'400':

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

'401':

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

'403':

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

'404':

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

'411':

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

'413':

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

'415':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

delete:

summary: Delete an existing Individual NWDAF ML Model Provision Subscription.

operationId: DeleteNWDAFMLModelProvisionSubcription

tags:

- Individual NWDAF ML Model Provision Subscription (Document)

parameters:

- name: subscriptionId

in: path

description: String identifying a subscription to the Nnwdaf\_MLModelProvision Service.

required: true

schema:

type: string

responses:

'204':

description: >

No Content. The Individual NWDAF ML Model Provision Subscription matching the

subscriptionId was deleted.

'307':

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

'308':

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

'400':

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

'401':

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

'403':

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

'404':

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

'429':

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

'500':

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

'503':

$ref: 'TS29571\_CommonData.yaml#/components/responses/503'

default:

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

components:

securitySchemes:

oAuth2ClientCredentials:

type: oauth2

flows:

clientCredentials:

tokenUrl: '{nrfApiRoot}/oauth2/token'

scopes:

nnwdaf-mlmodelprovision: Access to the Nnwdaf\_MLModelProvision API

schemas:

NwdafMLModelProvSubsc:

description: Represents NWDAF Event Subscription resources.

type: object

properties:

mLEventSubscs:

type: array

items:

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

minItems: 1

description: Subscribed events

notifUri:

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

mLEventNotifs:

type: array

items:

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

minItems: 1

suppFeats:

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

notifCorreId:

type: string

eventReq:

$ref: 'TS29523\_Npcf\_EventExposure.yaml#/components/schemas/ReportingInformation'

failEventReports:

type: array

items:

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

minItems: 1

required:

- mLEventSubscs

- notifUri

MLEventSubscription:

description: Represents a subscription to a single event.

type: object

properties:

mLEvent:

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

mLEventFilter:

$ref: 'TS29520\_Nnwdaf\_AnalyticsInfo.yaml#/components/schemas/EventFilter'

tgtUe:

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

mLTargetPeriod:

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

expiryTime:

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

required:

- mLEvent

- mLEventFilter

NwdafMLModelProvNotif:

description: Represents notifications on events that occurred.

type: object

properties:

eventNotifs:

type: array

items:

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

minItems: 1

description: Notifications about Individual Events.

subscriptionId:

type: string

description: String identifying a subscription to the Nnwdaf\_MLModelProvision Service.

required:

- eventNotifs

- subscriptionId

MLEventNotif:

description: Represents a notification related to a single event that occurred.

type: object

properties:

event:

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

notifCorreId:

type: string

mLFileAddr:

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

validityPeriod:

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

spatialValidity:

$ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

required:

- event

- mLFileAddr

FailureEventInfoForMLModel:

description: >

Represents the event(s) that the subscription is not successful including the failure

reason(s).

type: object

properties:

event:

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

failureCode:

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

required:

- event

- failureCode

MLModelAddr:

description: Addresses of ML model files.

type: object

properties:

mLModelUrl:

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

mlFileFqdn:

type: string

description: The FQDN of the ML Model file.

oneOf:

- required: [mLModelUrl]

- required: [mlFileFqdn]

#

# ENUMERATIONS DATA TYPES

#

FailureCode:

anyOf:

- type: string

enum:

- UNAVAILABLE\_ML\_MODEL

- type: string

description: >

This string provides forward-compatibility with future extensions to the enumeration but

is not used to encode content defined in the present version of this API.

description: >

Possible values are

- UNAVAILABLE\_ML\_MODEL: Indicates the requested ML model for the event is unavailable.

Annex B (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2017-10 |  |  |  |  |  | TS skeleton of Network Data Analytics Services. | 0.0.0 |
| 2017-11 | CT3#92 |  |  |  |  | Inclusion of documents agreed in CT3#92 C3-175356. | 0.1.0 |
| 2017-12 | CT3#93 |  |  |  |  | Inclusion of documents agreed in CT3#93 C3-176166, C3-176260, C3-176324, C3-176325, C3-176326, and C3-176327. | 0.2.0 |
| 2018-01 | CT3#94 |  |  |  |  | Inclusion of documents agreed in CT3#94 C3-180252, C3-180253, C3-180254, C3-180255, C3-180256, C3-180257, C3-180344, C3-180345, C3-180346, C3-180323 and C3-180347. | 0.3.0 |
| 2018-03 | CT3#95 |  |  |  |  | Inclusion of documents agreed in CT3#95 C3-181253, C3-181255, C3-181256, C3-181257, C3-181260, C3-181312, C3-181342 and C3-181343. | 0.4.0 |
| 2018-03 | CT3#96 |  |  |  |  | Inclusion of documents agreed in CT3#96 C3-182379 and C3-182380. | 0.5.0 |
| 2018-05 | CT3#97 |  |  |  |  | Inclusion of documents agreed in CT3#97 C3-183285, C3-183532, C3-183533, C3-183534 and C3-183535. | 0.6.0 |
| 2018-06 | CT#80 | CP-181032 |  |  |  | TS sent to plenary for approval | 1.0.0 |
| 2018-06 | CT#80 | CP-181032 |  |  |  | TS approved by plenary | 15.0.0 |
| 2018-09 | CT#81 | CP-182015 | 0001 | 3 | F | Clarification on mandatory HTTP error status codes | 15.1.0 |
| 2018-09 | CT#81 | CP-182209 | 0002 | 4 | B | OpenAPI for TS 29.520 | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0003 | 1 | F | Description of Structured data types | 15.1.0 |
| 2018-09 | CT#81 | CP-182015 | 0004 | 1 | F | Resource structure presentation | 15.1.0 |
| 2018-12 | CT#82 | CP-183205 | 0006 |  | F | Default value for apiRoot | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0007 | 2 | F | Correct Nnwdaf service | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0008 | 1 | F | Cardinality | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0009 |  | F | API version | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0010 |  | F | ExternalDocs OpenAPI field | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0011 | 1 | F | Security | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0012 | 1 | F | Supported content types | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0013 | 2 | F | HTTP Error responses | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0014 | 2 | F | Correct NWDAF resource | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0016 | 1 | F | Adding HTTP status code "204 No Content" | 15.2.0 |
| 2018-12 | CT#82 | CP-183205 | 0019 |  | F | Location header field in OpenAPI | 15.2.0 |
| 2019-03 | CT#83 | CP-190113 | 0020 |  | F | Support of NSSF as the service consumer | 15.3.0 |
| 2019-03 | CT#83 | CP-190113 | 0021 | 1 | F | Formatting of structured data types in query | 15.3.0 |
| 2019-03 | CT#83 | CP-190113 | 0022 |  | F | OpenAPI info version update | 15.3.0 |
| 2019-03 | CT#83 | CP-190213 | 0023 | 1 | F | Correction of Location header in Nnwdaf\_EventsSubscription OPenAPI | 15.3.0 |
| 2019-06 | CT#84 | CP-191078 | 0024 | 1 | F | Correction of Nnwdaf\_EventsSubscription OpenAPI | 15.4.0 |
| 2019-06 | CT#84 | CP-191078 | 0029 | 7 | F | Corrections on TS 29.520 | 15.4.0 |
| 2019-06 | CT#84 | CP-191078 | 0035 | 1 | F | Precedence of OpenAPI file | 15.4.0 |
| 2019-06 | CT#84 | CP-191078 | 0037 | 1 | F | Copyright Note in YAML files | 15.4.0 |
| 2019-06 | CT#84 | CP-191090 | 0025 | 1 | B | Reference update and service representation | 16.0.0 |
| 2019-06 | CT#84 | CP-191090 | 0027 | 3 | B | Support of more consumers | 16.0.0 |
| 2019-06 | CT#84 | CP-191090 | 0028 | 1 | B | Support of more analytic events | 16.0.0 |
| 2019-06 | CT#84 | CP-191225 | 0031 | 9 | B | Subscribing of service experience for the application | 16.0.0 |
| 2019-06 | CT#84 | CP-191090 | 0033 | 2 | B | Delete the subscription of service experience for the application | 16.0.0 |
| 2019-06 | CT#84 | CP-191090 | 0034 | 5 | B | Notification of service experience for the application | 16.0.0 |
| 2019-06 | CT#84 | CP-191090 | 0039 | 2 | F | Copyright Note in YAML files | 16.0.0 |
| 2019-09 | CT#85 | CP-192146 | 0041 | 2 | F | Correct cardinality in NnwdafEventsSubscription | 16.1.0 |
| 2019-09 | CT#85 | CP-192157 | 0042 | 4 | B | UE mobility and communication analytics | 16.1.0 |
| 2019-09 | CT#85 | CP-192157 | 0043 | 2 | B | Support of network performance analytics in Nnwdaf\_AnalyticsInfo\_Request | 16.1.0 |
| 2019-09 | CT#85 | CP-192157 | 0047 | 1 | B | OAM as service consumer | 16.1.0 |
| 2019-09 | CT#85 | CP-192157 | 0048 | 1 | B | Update Nnwdaf\_EventSubscription service for service experience | 16.1.0 |
| 2019-09 | CT#85 | CP-192261 | 0049 | 1 | B | Enhance the Nnwdaf\_AnalyticsInfo service to support service experience | 16.1.0 |
| 2019-09 | CT#85 | CP-192177 | 0050 | 2 | B | Enhance the Nnwdaf\_EventsSubscription service to support QoS sustainability | 16.1.0 |
| 2019-09 | CT#85 | CP-192177 | 0051 | 2 | B | Enhance the Nnwdaf\_AnalyticsInfo service to support QoS sustainability | 16.1.0 |
| 2019-09 | CT#85 | CP-192173 | 0054 | 2 | F | OpenAPI version update TS 29.520 Rel-16 | 16.1.0 |
| 2019-12 | CT#86 | CP-193198 | 0055 | 3 | B | Abnormal behaviour analytics | 16.2.0 |
| 2019-12 | CT#86 | CP-193198 | 0056 | 4 | B | Enhance the Nnwdaf\_EventsSubscription service to support User Data Congestion | 16.2.0 |
| 2019-12 | CT#86 | CP-193198 | 0057 | 2 | B | Enhance the Nnwdaf\_AnalyticsInfo service to support user data congestion | 16.2.0 |
| 2019-12 | CT#86 | CP-193198 | 0058 | 1 | B | Definination of QoS sustainability information | 16.2.0 |
| 2019-12 | CT#86 | CP-193198 | 0059 | 4 | B | Inclusion of QoS requirements and thresholds for QoS Sustainability | 16.2.0 |
| 2019-12 | CT#86 | CP-193198 | 0062 | 2 | F | Clarify references to QoS sustainability analytics | 16.2.0 |
| 2019-12 | CT#86 | CP-193198 | 0063 | 2 | F | Clarifications on NWDAF generalities | 16.2.0 |
| 2019-12 | CT#86 | CP-193267 | 0102 | 3 | B | OpenAPI file Update for Nnwdaf\_EventsSubscription API | 16.2.0 |
| 2019-12 | CT#86 | CP-193198 | 0103 |  | B | OpenAPI file Update for Nnwdaf\_AnalyticsInfo API | 16.2.0 |
| 2019-12 | CT#86 | CP-193198 | 0104 | 1 | B | Slice identification for all analytics types | 16.2.0 |
| 2019-12 | CT#86 | CP-193234 | 0106 | 2 | B | NF Load analytics generalities | 16.2.0 |
| 2019-12 | CT#86 | CP-193212 | 0107 | 1 | F | Update of API version and TS version in OpenAPI file | 16.2.0 |
| 2020-03 | CT#87e | CP-200208 | 0109 | 1 | B | Definition of QoS Requirement | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0110 | 1 | B | Description of consumer functionalities | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0111 | 1 | B | Update the types of analytics events | 16.3.0 |
| 2020-03 | CT#87e | CP-200207 | 0114 |  | B | DNN Clarification | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0115 | 1 | F | Update Feature applicability for Rel-16 new data types | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0118 | 2 | D | Corrections in TS29.520 | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0120 | 1 | F | Clarify start time and end time | 16.3.0 |
| 2020-03 | CT#87e | CP-200182 | 0121 | 2 | F | Correct QoS sustainability | 16.3.0 |
| 2020-03 | CT#87e | CP-200232 | 0122 | 1 | F | Correct UE mobility and communication | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0123 | 1 | B | Support network performance analytics | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0124 | 1 | F | Correcting QoS sustainability information | 16.3.0 |
| 2020-03 | CT#87e | CP-200214 | 0125 |  | F | OpenAPI: usage of the "tags" keyword | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0126 | 1 | F | Corrections on resource name | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0127 | 1 | F | Data used for area of interest | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0128 | 1 | F | Any UE possibility for UE mobility and UE communication | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0129 | 1 | B | Nnwdaf\_EventsSubscription API, Support of Service experience | 16.3.0 |
| 2020-03 | CT#87e | CP-200208 | 0130 | 1 | B | Nnwdaf\_EventsSubscription API, Support of Service experience | 16.3.0 |
| 2020-03 | CT#87e | CP-200236 | 0131 | 2 | B | Nnwdaf\_EventsSubscription API, Support of abnormal behaviour | 16.3.0 |
| 2020-03 | CT#87e | CP-200224 | 0132 | 1 | B | Nnwdaf\_AnalyticsInfo API, Support of abnormal behaviour | 16.3.0 |
| 2020-03 | CT#87e | CP-200228 | 0136 | 2 | B | Support of NF Load analytics | 16.3.0 |
| 2020-03 | CT#87e | CP-200216 | 0140 |  | F | Update of OpenAPI version and TS version in externalDocs field | 16.3.0 |
| 2020-06 | CT#88e | CP-201234 | 0142 | 1 | F | Condition description for threshold related attributes | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0143 | 1 | F | Some corrections to Nnwdaf\_AnalyticsInfo Service | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0144 | 1 | F | Clarification on applicability for network slice information | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0145 | 1 | F | Analyticis result per DNN | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0146 | 3 | F | Maximum number of SUPIs | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0147 | 1 | F | Correction on FlowDescription | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0149 | 3 | F | Support of Abnormal Behaviour | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0150 | 2 | F | Confidence for User Data Congestion Information. | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0151 | 1 | F | Data types used for NWDAF services | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0153 | 2 | F | Adding maxObjectNbr attribute in related feature of NWDAF analytics service | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0154 | 1 | F | Adding UDM as consumer of services provided by NWDAF | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0155 |  | F | Corrections on descriptions of NF service consumers offered by NWDAF | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0157 | 1 | D | Updates to Abbreviations | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0158 | 2 | B | Support NSI ID | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0163 | 3 | B | Support Service Experience Variance | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0165 | 1 | F | Correction to Service Description | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0166 | 1 | F | Correction to description of consumer functionalities | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0167 | 1 | F | Correction to variance of Start time in UE Communication | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0169 | 1 | B | Correct supported feature in AnalyticsData | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0170 | 1 | F | Clarify service experience data | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0171 |  | F | Correct threshold | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0172 | 1 | F | Resource type in QoS requirement | 16.4.0 |
| 2020-06 | CT#88e | CP-201244 | 0173 | 1 | F | Storage of YAML files in ETSI Forge | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0176 | 2 | F | Analytics result per S-NSSAI | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0177 | 1 | F | Corrections on confidence for other NWDAF events | 16.4.0 |
| 2020-06 | CT#88e | CP-201256 | 0179 | 1 | F | URI of the Nnwdaf services | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0180 | 1 | F | Default value for matching direction | 16.4.0 |
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| 2020-06 | CT#88e | CP-201244 | 0182 | 1 | F | Optionality of ProblemDetails | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0183 | 1 | F | Correction to abnormal traffic volume | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0186 | 2 | F | Corrections on ratio of UEs in NWDAF event reports | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0187 | 1 | F | Corrections to TargetUeInformation | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0188 |  | F | Corrections on AbnormalBehaviour | 16.4.0 |
| 2020-06 | CT#88e | CP-201234 | 0189 |  | F | Plural of NF load level information related attribute | 16.4.0 |
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| 2020-06 | CT#88e | CP-201255 | 0193 |  | F | Update of OpenAPI version and TS version in externalDocs field | 16.4.0 |
| 2020-09 | CT#89e | CP-202066 | 0196 | 1 | F | Description for NWDAF services | 16.5.0 |
| 2020-09 | CT#89e | CP-202066 | 0197 | 1 | F | Zero confidence | 16.5.0 |
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| 2020-09 | CT#89e | CP-202066 | 0201 | 1 | F | Timestamp of analytics generation | 16.5.0 |
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| 2020-09 | CT#89e | CP-202066 | 0209 | 1 | F | Confidence for UE mobility | 16.5.0 |
| 2020-09 | CT#89e | CP-202066 | 0210 |  | F | Supported feature in Nnwdaf\_AnalyticsInfo API | 16.5.0 |
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| 2020-09 | CT#89e | CP-202066 | 0214 |  | F | Corrections on appIds and dnns | 16.5.0 |
| 2020-09 | CT#89e | CP-202066 | 0215 | 1 | F | Corrections to networkArea with anyUE | 16.5.0 |
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| 2020-09 | CT#89e | CP-202085 | 0220 | 1 | F | Update of OpenAPI version and TS version in externalDocs field | 17.0.0 |
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| 2020-12 | CT#90e | CP-203130 | 0242 | 1 | F | Corrections to Validity Period | 17.1.0 |
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| 2021-03 | CT#91e | CP-210191 | 0248 | 1 | F | Support of stateless NFs | 17.2.0 |
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| 2021-03 | CT#91e | CP-210206 | 0253 | 1 | A | Correction to S-NSSAI applicability | 17.2.0 |
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| 2021-03 | CT#91e | CP-210219 | 0256 |  | F | Adding some missing description fields to data type definitions in OpenAPI specification files | 17.2.0 |
| 2021-03 | CT#91e | CP-210219 | 0257 |  | F | Removal of the NwdafFailureCode data type from the Nnwdaf\_AnalyticsInfo API | 17.2.0 |
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| 2021-03 | CT#91e | CP-210230 | 0259 |  | F | Wrong description of the EventFilter data type in the Nnwdaf\_AnalyticsInfo specific Data Types table | 17.2.0 |
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| 2021-06 | CT#92e | CP-211221 | 0270 | 4 | B | Adding time when analytics needed and revised time to analytics subscriptions | 17.3.0 |
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| 2021-06 | CT#92e | CP-211221 | 0292 | 1 | B | Service operations for Nnwdaf\_MLModelProvision service | 17.3.0 |
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| 2021-06 | CT#92e | CP-211251 | 0298 | 1 | F | analytics for a specific time | 17.3.0 |
| 2021-06 | CT#92e | CP-211221 | 0299 | 1 | B | Service operations of Nnwdaf\_MLModelProvision service | 17.3.0 |
| 2021-06 | CT#92e | CP-211221 | 0300 | 1 | B | Service description of Nnwdaf\_MLModelProvision service | 17.3.0 |
| 2021-06 | CT#92e | CP-211275 | 0301 | 1 | B | Extension to User Data Congestion Analytics with GPSI | 17.3.0 |
| 2021-06 | CT#92e | CP-211221 | 0302 | 1 | F | Correction of the description of the snssaia attribute | 17.3.0 |
| 2021-06 | CT#92e | CP-211265 | 0305 |  | F | Update of OpenAPI version and TS version in externalDocs field | 17.3.0 |
| 2021-09 | CT#93e | CP-212203 | 0306 | 1 | B | Aggregation support in analytics requests | 17.4.0 |
| 2021-09 | CT#93e | CP-212203 | 0307 | 1 | B | Aggregation support in analytics subscriptions | 17.4.0 |
| 2021-09 | CT#93e | CP-212203 | 0310 |  | F | Small corrections in NWDAF APIs | 17.4.0 |
| 2021-09 | CT#93e | CP-212232 | 0311 | 1 | B | Extensions of Slice load level related network data analytics | 17.4.0 |
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| 2021-09 | CT#93e | CP-212203 | 0313 |  | B | Redirection handling for Nnwdaf\_MLModelProvision Service | 17.4.0 |
| 2021-09 | CT#93e | CP-212203 | 0314 | 2 | B | Extension to User Data Congestion Analytics in Nnwdaf\_EventsSubscription API | 17.4.0 |
| 2021-09 | CT#93e | CP-212203 | 0315 | 1 | B | Extension to User Data Congestion Analytics in Nnwdaf\_AnalyticsInfo API | 17.4.0 |
| 2021-09 | CT#93e | CP-212202 | 0317 |  | A | Removal of NSI ID from PCF as consumer of NWDAF | 17.4.0 |
| 2021-09 | CT#93e | CP-212223 | 0318 |  | F | Update of OpenAPI version and TS version in externalDocs field | 17.4.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0322 | 3 | F | Extension to Observed Service Experience in Nnwdaf\_EventsSubscription Service API | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0323 | 3 | F | Extension to Observed Service Experience in Nnwdaf\_AnalyticsInfo Service API | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0324 | 1 | B | Addition of network analytics for the PCF | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0325 | 2 | B | Updates to User Data Congestion Extension in Nnwdaf\_EventsSubscription API | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0326 | 1 | B | Updates to User Data Congestion Extension in Nnwdaf\_AnalyticsInfo API | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0327 | 1 | B | Analytics info context transfer operation descriptions | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0328 | 2 | B | Analytics info context transfer operation data model and OpenAPI | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0329 | 1 | B | Analytics info context transfer operation overview | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0330 | 1 | B | Analytics info context transfer operation resources | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0331 | 1 | B | Analytics subscription transfer operation descriptions | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0332 | 2 | B | Analytics subscription transfer operation data model and OpenAPI | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0333 |  | B | Analytics subscription transfer operation overview | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0334 | 1 | B | Analytics subscription transfer operation resources | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0335 | 1 | B | Extending analytics subscription to enable context transfer | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0336 | 1 | B | Subscription modification procedure of Nnwdaf\_MLModelProvision service | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0337 | 1 | B | Support of Nnwdaf\_MLModelInfo Service | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0338 |  | B | The OpenAPI file for Nnwdaf\_MLModelProvision | 17.5.0 |
| 2021-12 | CT#94e | [CP-213227](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213227) | 0339 | 1 | B | Update of procedures and data type definition for Nnwdaf\_MLModelProvision | 17.5.0 |
| 2021-12 | CT#94e | [CP-213239](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213239) | 0340 | 1 | F | Aligning API URI with SBI template | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0341 | 3 | B | Support of SM congestion control experience analytics by Nnwdaf\_AnalyticsInfo service | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0342 |  | B | Adding DCCF as NWDAF events subscription NF service consumer | 17.5.0 |
| 2021-12 | CT#94e | [CP-213226](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213226) | 0344 |  | A | Remove QoS sustainability as analytics for PCF | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0347 | 1 | B | Support of DN performance analytics | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0348 | 1 | B | Define the list of analytics subsets in the request | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0349 | 1 | B | Add load level related information for NSI\_LOAD\_LEVEL event | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0350 |  | B | Add load level related information for LOAD\_LEVEL\_INFORMATION event | 17.5.0 |
| 2021-12 | CT#94e | [CP-213244](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213244) | 0352 | 1 | F | Corrections to EventReportingRequirement | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0353 | 1 | B | Add consumer NF information in Subscription | 17.5.0 |
| 2021-12 | CT#94e | [CP-213228](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213228) | 0354 |  | B | Updates geenrak description to analytics subscription transfer operation | 17.5.0 |
| 2021-12 | CT#94e | [CP-213246](https://portal.3gpp.org/ngppapp/CreateTdoc.aspx?mode=view&contributionUid=CP-213246) | 0355 |  | F | Update of OpenAPI version and TS version in externalDocs field | 17.5.0 |
| 2022-03 | CT#95e | CP-220190 | 0357 | 1 | B | Resolve Editor's Note on Slice load level related network data analytics | 17.6.0 |
| 2022-03 | CT#95e | CP-220190 | 0358 | 1 | F | Clarification about conditional descriptions for Slice load level related network data analytics | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0359 |  | F | Correction of DN performance analytics | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0360 |  | F | Update the Nnwdaf\_AnalyticsInfo Service API specific data types table | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0362 |  | F | Editorial correction of offsetPeriod attribute for Nnwdaf\_EventsSubscription API | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0365 | 1 | B | NF Load analytics extensions in Nnwdaf\_EventsSubscription API | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0366 | 1 | B | NF Load analytics extensions in Nnwdaf\_AnalyticsInfo API | 17.6.0 |
| 2022-03 | CT#95e | CP-220191 | 0367 | 3 | B | Support Dispersion Analytics in Nnwdaf\_EventsSubscription API | 17.6.0 |
| 2022-03 | CT#95e | CP-220190 | 0368 | 2 | B | Support Dispersion Analytics in Nnwdaf\_AnalyticsInfo API | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0369 | 1 | B | Support Redundant Transmission Experience Analytics in Nnwdaf\_EventsSubscription API | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0370 |  | B | Support Redundant Transmission Experience Analytics in Nnwdaf\_AnalyticsInfo API | 17.6.0 |
| 2022-03 | CT#95e | CP-220191 | 0371 | 2 | B | Support WLAN performance analytics in Nnwdaf\_EventsSubscription API | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0372 | 1 | B | Support WLAN performance analytics in Nnwdaf\_AnalyticsInfo API | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0373 |  | F | Corrections to DN Performance Events | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0374 | 1 | B | Update extended features description and analytics events applicability | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0375 | 1 | F | Corrections to Nnwdaf\_AnalyticsInfo Service | 17.6.0 |
| 2022-03 | CT#95e | CP-220190 | 0376 | 1 | F | Clarification on GPSI for UserDataCongestionExt | 17.6.0 |
| 2022-03 | CT#95e | CP-220190 | 0377 | 1 | F | Features in the applicability section | 17.6.0 |
| 2022-03 | CT#95e | CP-220190 | 0378 | 1 | F | Update of 5.1.6.1 | 17.6.0 |
| 2022-03 | CT#95e | CP-220190 | 0379 | 1 | F | Adding ADRF as a consumer of Nnwdaf\_DataManagement Service | 17.6.0 |
| 2022-03 | CT#95e | CP-220176 | 0381 | 2 | A | Alignment of "Application Errors" clauses with SBI TS template | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0382 |  | B | Adding DCCF as Nnwdaf\_AnalyticsInfo service consumer | 17.6.0 |
| 2022-03 | CT#95e | CP-220190 | 0383 | 1 | B | Service Description of Nnwdaf\_DataManagement Service | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0384 |  | F | Clarification on NF consumer of Nnwdaf\_MLModelProvision Service | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0385 |  | F | Corrections to Nnwdaf\_MLModelProvision Service | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0386 | 1 | B | Support reporting the analytics of the application list used by UE in the UE communication analytics | 17.6.0 |
| 2022-03 | CT#95e | CP-220190 | 0387 | 1 | B | Support reporting N4 session inactivity timer in the UE communication analytics | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0388 | 1 | B | Support list of analytics subsets for Nnwdaf\_AnalyticsInfo Service | 17.6.0 |
| 2022-03 | CT#95e | CP-220189 | 0389 |  | B | Resolve the Editor's Note for partial failure events handling in ML model subscription procedure | 17.6.0 |
| 2022-03 | CT#95e | CP-220191 | 0390 | 2 | B | Resolve the Editor's Note for ML model filter information | 17.6.0 |
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| 2022-03 | CT#95e | CP-220192 | 0392 | 2 | B | Add UPF ID to analytics filter for Service Experience analytics | 17.6.0 |
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