**TSG-CT WG3 Meeting #108-e *C3-201378***

**E-Meeting, 19th – 28th February 2020 (Revision of C3-201282)**

|  |
| --- |
| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **29.520** | **CR** | **0131** | **rev** | **1** | **Current version:** | **16.2.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
|  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

|  |
| --- |
|  |
| ***Title:***  | Nnwdaf\_EventsSubscription API, Support of abnormal behaviour |
|  |  |
| ***Source to WG:*** | Huawei, Spirent, Orange |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | eNA |  | ***Date:*** | 2020-02-17 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | The abnormal behaviour analytics type is incompleted defined for Nnwdaf\_EventsSubscription API. |
|  |  |
| ***Summary of change:*** | Define abnormal behaviour analytics type according to TS 23.288 subclause 6.7.5. |
|  |  |
| ***Consequences if not approved:*** | Unsupported abnormal behaviour analytics type. |
|  |  |
| ***Clauses affected:*** | 2; 4.2.2.2.2; 5.1.6.1; 5.1.6.2.3; 5.1.6.2.15; 5.1.6.2.16; 5.1.6.2.y (new); 5.1.6.2.z (new); 5.1.6.2.a (new); 5.1.6.2.b (new); 5.1.6.3.6; 5.1.6.3.x (new); A.2;  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | TS/TR 23.288 CR 0126 |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | This CR intriduces backward compatible feature to the OpenAPI file for Nnwdaf\_EventsSubscription API. |
|  |  |
| ***This CR's revision history:*** |  |

**Additional discussion(if needed):**

**…**

**Proposed changes:**

\*\*\* 1st Change \*\*\*

# 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 3.0.0 Specification", <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/3.0.0.md>.

[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".

[TS29503] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

\*\*\* 1st Change \*\*\*

##### 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/v1/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;

- list of supported features by the service consumer as "supportedFeatures" attribute; and

- a description of the subscribed events as "eventSubscriptions" attribute that for each event shall include

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

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

and may include:

- event reporting requirement information as "evtReq" attribute, which applies for all events in a subscription and may contain the following attributes:

1) event notification method (periodic, one time, on event detection) 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) group reporting guard time for aggregating the reports for a group of UEs in the "grpRepTime" attribute;

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

9) preferred level of accuracy of the analytics in the "accuracy" attribute.

NOTE: The event reporting information provided in NnwdafEventsSubscription data type, if present, supersedes the event notification method and repetition period in the EventSubscription data type.

For different event types:

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

1) if the event notification method "THRESHOLD" on specific event level load level threshold in the "loadLevelThreshold" attribute; 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 "NfLoad" is supported and the event is "NF\_LOAD", it shall provide:

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

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; and

3) maximum number of analytics entries expected for an analytics report in the "maxAnaEntry" attribute;

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

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

Editor's note: Whether identification of application is mandatory is FFS. Whether the event subscription can be applied to all applications is FFS.

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

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

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

and may include

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

Editor's note: Inclusion of Media/application bandwidth is FFS.

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

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

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

3) maximum number of analytics entries expected for an analytics report in the "maxAnaEntry" attribute;

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

1) identification of the application in the "applicationIds" attribute; and

2) identification of target UE(s) to which the subscription applies by "supi" or "intGroupId" attribute in the "tgtUe" attribute; and

 and may provide:

1) maximum number of analytics entries expected for an analytics report in the "maxAnaEntry" attribute.

Editor's note: It is FFS whether any UE can apply for "UE\_MOBILITY" and "UE\_COMM" events.

- if the feature "QoSSustainability" is supported and the event is "QOS\_SUSTAINABILITY", it 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 by the "qosFlowRetainThresholds" attribute for the 5QI of GBR resource type or RAN UE throughout threshold by the "ranUeThroughputThresholds" attribute for the 5QI of non-GBR resource type.

 and may include:

1) 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 subscription applies by "supi", "intGroupId" 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.

 and may provide:

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

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

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

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

5) expected UE behaviour via "exptUeBehav" attribute.

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

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

2) identification of a specific UE via "supi" attribute;

and may include:

3) congestion threshold by the "congThresholds" attribute.

Upon the reception of an HTTP POST request with: "{apiRoot}/nnwdaf-eventssubscription/v1/subscriptions" as Resource URI and NnwdafEventsSubscription data structure as request body, the NWDAF shall:

- create a new subscription;

- assign an event subscriptionId;

- store the subscription.

If the NWDAF created an "Individual NWDAF Event Subscription" resource, the NWDAF shall respond with "201 Created" with the message body containing a representation of the created subscription, as shown in figure 4.2.2.2.2-1, 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-eventssubscription/v1/subscriptions/{subscriptionId}".

If the feature "AbnormalBehaviour" is supported and the expected analytics type via "exptAnaType" attribute is received in figure 4.2.2.2.2-1, step 1, the NWDAF shall derive the corresponding Exception Ids from the expected analytics type as follows:

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

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

- 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.

\*\*\* Next Change \*\*\*

#### 5.1.6.1 General

This subclause 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 |
| Accuracy | 5.1.6.3.5 | Represents the preferred level of accuracy of the analytics. |  |
| AnySlice | 5.1.6.3.2 | Represents the any slices. |  |
| Communication | 5.1.6.2.13 |  |  |
| CongestionInfo | 5.1.6.2.18 |  |  |
| 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. |  |
| ExpectedAnalyticsType | 5.1.6.3.x |  | AbnormalBehaviour |
| LoadLevelInformation | 5.1.6.3.2 | Represents load level information of the network slice instance |  |
| LocationInfo | 5.1.6.2.11 |  |  |
| NfLoadLevelInformation | FFS | Represents the NFs and their load level information. | NfLoad |
| NwdafEvent | 5.1.6.3.4 | Describes the NWDAF Events. |  |
| 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. |  |
| NotificationMethod | 5.1.6.3.3 | Represents the notification methods that can be subscribed. |  |
| QosRequirement | 5.1.6.2.20 |  |  |
| QosSustainabilityInfo | 5.1.6.2.19 | Represents the QoS Sustainability information. | QoSSustainability |
| ServiceExperienceInfo | FFS | Represents the service experience information. | ServiceExperience |
| SliceLoadLevelInformation | 5.1.6.2.6 | Represents the slices and the load level information. |  |
| TargetUeInformation | 5.1.6.2.8 | Identifies the target UE information. |  |
| TrafficCharacterization | 5.1.6.2.14 |  |  |
| UeCommunication | 5.1.6.2.12 |  |  |
| UeMobility | 5.1.6.2.9 |  |  |
| UeTrajectory | 5.1.6.2.10 |  |  |
| UserDataCongestionInfo | 5.1.6.2.17 | Represents the user data congestion information | UserDataCongestion |
| AbnormalBehaviour | 5.1.6.2.15 | Represents the abnormal behaviour information. |  |
| Exception | 5.1.6.2.16 | Describes the Exception information. |  |
| ExceptionId | 5.1.6.3.6 | Describes the Exception Id. |  |
| ExceptionTrend | 5.1.6.3.7 | Describes the Exception Trend. |  |

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 | QoSSustainablity |
| ApplicationId | 3GPP TS 29.571 [8] | Identifies the application identifier. | ServiceExperience |
| 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 |
| Dnn | 3GPP TS 29.571 [8] | Identifies the DNN. | ServiceExperience, AbnormalBehaviour |
| DurationSec | 3GPP TS 29.571 [8] |  |  |
| EthFlowDescription | 3GPP TS 29.514 [21] |  | UeCommunication |
| ExpectedUeBehaviourData | 3GPP TS 29.503 [TS29503] |  | AbnormalBehaviour |
| FlowDescription | 3GPP TS 29.514 [21] |  | UeCommunication |
| GroupId | 3GPP TS 29.571 [8] | Identifies a group of UEs. |  |
| Ipv4Addr | 3GPP TS 29.571 [8] |  |  |
| Ipv6Addr | 3GPP TS 29.571 [8] |  |  |
| NetworkAreaInfo | 3GPP TS 29.554 [18] | Identifies the network area. | ServiceExperienceQoSSustainability, AbnormalBehaviour |
| PacketDelBudget | 3GPP TS 29.571 [8] |  | QoSSustainablity |
| PacketErrRate | 3GPP TS 29.571 [8] |  | QoSSustainablity |
| ProblemDetails | 3GPP TS 29.571 [8] | Used in error responses to provide more detailed information about an error. |  |
| ReportingInformation | 3GPP TS 29.523 [20] | Represents the type of reporting the subscription requires. |  |
| ScheduledCommunicationTime | 3GPP TS 29.122 [19] |  | UeMobility UeCommunication |
| 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. |  |
| SupportedFeatures | 3GPP TS 29.571 [8] | Used to negotiate the applicability of the optional features defined in table 5.1.8-1. |  |
| TimeWindow | 3GPP TS 29.122 [19] |  |  |
| Uri | 3GPP TS 29.571 [8] |  |  |
| UserLocation | 3GPP TS 29.571 [8] |  | UeMobility |
| Volume | 3GPP TS 29.122 [19] |  | UeCommunication |

Editor's note: Whether NetworkAreaInfo defined in 3GPP TS 29.554 can cover the requirement is FFS.

\*\*\* Next Change \*\*\*

##### 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) |  |
| applicationIds | array(ApplicationId) | C | 1..N | Identification(s) of application to which the subscription applies. The absence of applicationIds means subscription to all applications.For event "UE\_COMM”, one and only one application id shall be included. | ServiceExperienceUeCommunicationAbnormalBehaviour |
| dnns | array(Dnn) | C | 1..N | Identification(s) of DNN to which the subscription applies. The absence of dnns means subscription to all DNNs  | ServiceExperience, AbnormalBehaviour |
| dnais | array(Dnai) | C | 1..N | Identification(s) of user plane access to DN(s) which the subscription applies. | ServiceExperience |
| event | NwdafEvent | M | 1 | Event that is subscribed. |  |
| loadLevelThreshold | integer | C | 0..1 | Shall be supplied for notification method "THRESHOLD". on event subscription level or "ON\_EVENT\_DETECTION" on all events level, if the event is "SLICE\_LOAD\_LEVEL".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 instance identified by snssai is reached. |  |
| networkArea | NetworkAreaInfo | C | 0..1 | Identification of network area to which the subscription applies. The absence of networkAreas means subscription to all network areas. | ServiceExperience, UeMobility, QoSSustainability, AbnormalBehaviour, UserDataCongestion |
| nfInstanceIds | FFS | O | 1..N | Identification(s) of NF instances. | NfLoad |
| nfSetIds | FFS | O | 1..N | Identification(s) of NF instance sets. | NfLoad |
| nfTypes | FFS | O | 1..N | Identification(s) of NF types. | NfLoad |
| notificationMethod | NotificationMethod | O | 0..1 | Indicate the notification method. (NOTE 2) |  |
| qosRequ | QosRequirement | C | 0..1 | Indicates the QoS requirements. It shall be included when subscribed event is "QOS\_SUSTAINABILITY". | QoSSustainability |
| qosFlowRetainThresholds | array(ThresholdLevel) | C | 1..N | Shall be supplied for the 5QI of GBR resource type.  | QoSSustainablity |
| ranUeThroughputThresholds | array(ThresholdLevel) | C | 1..N | Shall be supplied for the 5Qi of non-GBR resource type. | QoSSustainability |
| repetitionPeriod | DurationSec | C | 0..1 | Shall be supplied for notification Method "PERIODIC". |  |
| snssais | array(Snssai) | C | 1..N | Identification(s) of network slice to which the subscription applies. (NOTE 1) |  |
| maxAnaEntry | Uinteger | O | 0..1 | Identifies the maximum number of analytics entries expected per Analytics reporting, e.g. For UE Mobility analytics, a list of UE trajectory information may be provided in the order of time, this attribute limits the maximum time slots that can be provided by the NWDAF. | UeMobilityUeCommunicationNfLoad |
| tgtUe | TargetUeInformation | O | 0..1 | Identifies target UE information | (NOTE 3) |
| congThresholds | array(ThresholdLevel) | O | 1..N | Represents the congestion threshold levels. (NOTE 4) | UserDataCongestion |
| excepRequs | array(Exception) | O | 1..N | Represents a list of Exception Ids with associated thresholds.(NOTE x, NOTE y) | AbnormalBehaviour |
| exptAnaType | ExpectedAnalyticsType | O | 0..1 | Represents expected UE analytics type.It shall not be present if the "excepRequs" attribute is provided. (NOTE y) | AbnormalBehaviour |
| exptUeBehav | ExpectedUeBehaviourData | O | 0..1 | Represents expected UE behaviour. | AbnormalBehaviour |
| NOTE 1: When subscribed event is "SLICE\_LOAD\_LEVEL", "NF\_LOAD" or "SERVICE\_EXPERIENCE", either information about slice(s) identified by snssais, or anySlice set to "TRUE" shall be included. When subscribed is "QOS\_SUSTAINABILITY", the identifications of network slices is optional.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: Once "congThresholds" is supplied, the notificationMethod shall be "THRESHOLD".NOTE x: Only "excepId" and "excepLevel" within the Exception data type apply to the "excepRequs" attribute within EventSubscription data type.NOTE y: Either "excepRequs" or "exptUeBehav" shall be provided if subscribed event is "ABNORMAL\_BEHAVIOUR". |

Editor’s Note: The definition of ThresholdLevel is FFS.

\*\*\* Next Change \*\*\*

##### 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 | 0..N | Each element identifies a UE which is affected with the Exception.Shall be present if the subscription request applies to more than one UE. |  |
| excep | Exception | M | 1 | Contains the exception information. |  |
| ratio | SamplingRatio | C | 0..1 | If the analytics result applies for a group of UEs or any UE, this attribute contains the percentage of UEs. The sum of all ratios on a given abnorBehavrs (which is of AbnormalBehaviour data type) is equal or less than 100%. |  |
| confidence | Uinteger | C | 0..1 | If the analytics result is a prediction, it indicates the confidence of the prediction. |  |
| addtMeasInfo | AdditionalMeasurement | O | 0..1 | Additional measurement. |  |

\*\*\* Next Change \*\*\*

##### 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  |  |
|  |  |  |  |  |  |

\*\*\* Next Change \*\*\*

##### 5.1.6.2.y Type AdditionalMeasurement

Table 5.1.6.2.y-1: Definition of type AdditionalMeasurement

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| unexpLoc | NetworkAreaInfo | C | 0..1 | The unexpected location which the UE stays.It may only be present when the "excepId" within the Exception data sets to "UNEXPECTED\_UE\_LOCATION" |  |
| unexpFlowTep | FlowDescription | O | 0..1 | Unexpected flow template.It may only be present when the "excepId" within the Exception data sets to "UNEXPECTED\_LONG\_LIVE\_FLOW" or "UNEXPECTED\_LARGE\_RATE\_FLOW". |  |
| unexpWake | DateTime | C | 0..1 | Unexpected wake up time.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". |  |
| pipoCircums | 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", "ABNORMAL\_TRAFFIC\_VOLUME", "UNEXPECTED\_RADIO\_LINK\_FAILURES" or "PING\_PONG\_ACROSS\_CELLS". |  |

\*\*\* Next Change \*\*\*

##### 5.1.6.2.z Type FlowDescription

Table 5.1.6.2.z-1: Definition of type FlowDescription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ipTrafficFilter | FlowInfo | O | 0..1 | Identifies IP packet filter.(NOTE) |  |
| ethTrafficFilter | EthFlowDescription | O | 0..1 | Identifies Ethernet packet filter.(NOTE) |  |
| NOTE: Either "ipTrafficFilter" or "ethTrafficFilter" shall be provided. |

\*\*\* Next Change \*\*\*

##### 5.1.6.2.a Type AddressList

Table 5.1.6.2.a-1: Definition of type AddressList

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| ipv4Addrs | array(Ipv4Addr) | O | 0..N | Each element identifies an IPv4 address. |  |
| ipv6Addrs | array(Ipv6Addr) | O | 0..N | Each element identifies an IPv6 address. |  |
| NOTE: At least one of "ipv4Addrs" or "ipv6Addrs" shall be provided. |

\*\*\* Next Change \*\*\*

##### 5.1.6.2.b Type CircumstanceDescription

Table 5.1.6.2.b-1: Definition of type CircumstanceDescription

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Attribute name | Data type | P | Cardinality | Description | Applicability |
| freq | Float | M | 1 | Communication frequency of the UE in units of MHz. |  |
| tm | DateTime | M | 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 "ABNORMAL\_TRAFFIC\_VOLUME". |  |

\*\*\* Next Change \*\*\*

##### 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 |  |
| ABNORMAL\_TRAFFIC\_VOLUME | Abnormal traffic volume |  |
| UNEXPECTED\_RADIO\_LINK\_FAILURES | Unexpected radio link failures |  |
| PING\_PONG\_ACROSS\_CELLS | Ping-ponging across neighbouring cells |  |

\*\*\* Next Change \*\*\*

##### 5.1.6.3.x Enumeration: ExpectedAnalyticsType

Table 5.1.6.3.x-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 |  |

\*\*\* Next Change \*\*\*

# A.2 Nnwdaf\_EventsSubscription API

openapi: 3.0.0

info:

 version: 1.1.0.alpha-3

 title: Nnwdaf\_EventsSubscription

 description: |

 Nnwdaf\_EventsSubscription Service API.

 © 2019, 3GPP Organizational Partners (ARIB, ATIS, CCSA, ETSI, TSDSI, TTA, TTC).

 All rights reserved.

externalDocs:

 description: 3GPP TS 29.520 V16.2.0; 5G System; Network Data Analytics Services.

 url: 'http://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 subclause 4.4 of 3GPP TS 29.501.

paths:

 /subscriptions:

 post:

 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/v1/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.

 '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:

 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.

 '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: The Individual NWDAF Event Subscription resource does not exist.

 content:

 application/problem+json:

 schema:

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

 '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:

 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.

 '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: The Individual NWDAF Event Subscription resource does not exist.

 content:

 application/problem+json:

 schema:

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

 '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:

 type: object

 properties:

 eventSubscriptions:

 type: array

 items:

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

 minItems: 1

 description: Subscribed events

 evtReq:

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

 notificationURI:

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

 supportedFeatures:

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

 required:

 - eventSubscriptions

 EventSubscription:

 type: object

 properties:

 anySlice:

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

 applicationIds:

 type: array

 items:

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

 minItems: 1

 description: Identification(s) of application to which the subscription applies. When subscribed event is "SERVICE\_EXPERIENCE", the absence of applicationIds means subscription to all applications.

 dnns:

 type: array

 items:

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

 minItems: 1

 description: Identification(s) of DNN to which the subscription applies. When subscribed event is "SERVICE\_EXPERIENCE", the absence of dnns means subscription to all DNNs.

 dnais:

 type: array

 items:

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

 minItems: 1

 event:

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

 loadLevelThreshold:

 type: integer

 description: Shall be supplied for notification method "THRESHOLD". 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 instance identified by snssai is reached.

 notificationMethod:

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

 networkArea:

 $ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

 qosRequ:

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

 qosFlowRetainThresholds:

 type: array

 items:

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

 minItems: 1

 ranUeThroughputThresholds:

 type: array

 items:

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

 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. When subscribed event is "SLICE\_LOAD\_LEVEL", either information about slice(s) identified by snssai, or anySlice set to "TRUE" shall be included. It corresponds to snssais in the data model definition of 3GPP TS 29.520. When subscribed is “QOS\_SUSTAINABILITY”, the identifications of network slices is optional.

 maxAnaEntry:

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

 tgtUe:

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

 congThresholds:

 type: array

 items:

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

 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'

 required:

 - event

 NnwdafEventsSubscriptionNotification:

 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

 required:

 - eventNotifications

 - subscriptionId

 EventNotification:

 type: object

 properties:

 event:

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

 expiry:

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

 sliceLoadLevelInfo:

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

 svcExpInfo:

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

 qosSustainInfo:

 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

 required:

 - event

#

# Editor's note: The data type ServiceExperienceInformation is FFS.

#

 ServiceExperienceInfo:

 type: string

 SliceLoadLevelInformation:

 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.

 required:

 - loadLevelInformation

 - snssais

 EventReportingRequirement:

 type: object

 properties:

 accuracy:

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

 startTs:

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

 endTs:

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

 TargetUeInformation:

 type: object

 properties:

 anyUe:

 type: boolean

 supi:

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

 intGroupId:

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

 UeMobility:

 type: object

 properties:

 supi:

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

 ueTraj:

 type: array

 items:

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

 minItems: 1

 required:

 - ueTraj

 UeTrajectory:

 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'

 locInfo:

 type: array

 items:

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

 minItems: 1

 required:

 - duration

 - locInfo

 LocationInfo:

 type: object

 properties:

 loc:

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

 ratio:

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

 confidence:

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

 required:

 - loc

 UeCommunication:

 type: object

 properties:

 supi:

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

 comm:

 type: array

 items:

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

 minItems: 1

 Communication:

 type: object

 properties:

 commDur:

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

 perioTime:

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

 ts:

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

 recurringTime:

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

 trafChar:

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

 ratio:

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

 confidence:

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

 required:

 - commDur

 TrafficCharacterization:

 type: object

 properties:

 dnn:

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

 snssai:

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

 ethfDescs:

 type: array

 items:

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

 minItems: 1

 fDescs:

 type: array

 items:

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

 minItems: 1

 ulVol:

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

 dlVol:

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

 UserDataCongestionInfo:

 type: object

 properties:

 networkArea:

 $ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

 congestionInfo:

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

 CongestionInfo:

 type: object

 properties:

 congType:

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

 timeIntev:

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

 nsi:

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

 required:

 - congType

 - timeIntev

 - nsi

 QosSustainabilityInfo:

 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'

 crossedQosFlowRetainThresholds:

 type: array

 items:

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

 minItems: 1

 crossedRanUeThroughputThresholds:

 type: array

 items:

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

 minItems: 1

 confidence:

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

 QosRequirement:

 type: object

 properties:

 5qi:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/5Qi'

 pdb:

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

 per:

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

 required:

 - 5qi

 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 instance.

 ThresholdLevel:

 type: integer

#

# Editor's note: The data type ThresholdLevel is FFS.

#

 AbnormalBehaviour:

 type: object

 properties:

 supis:

 type: array

 items:

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

 excep:

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

 ratio:

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

 confidence:

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

 addtMeasInfo:

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

 required:

 - excep

 Exception:

 type: object

 properties:

 excepId:

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

 excepLevel:

 type: integer

 excepTrend:

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

 required:

 - excepId

 AdditionalMeasurement:

 type: object

 properties:

 unexpLoc:

 $ref: 'TS29554\_Npcf\_BDTPolicyControl.yaml#/components/schemas/NetworkAreaInfo'

 unexpFlowTep:

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

 unexpWake:

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

 ddosAttack:

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

 wrgDest:

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

 pipoCircums:

 type: array

 items:

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

 FlowDescription:

 type: object

 properties:

 ipTrafficFilter:

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

 ethTrafficFilter:

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

 AddressList:

 type: object

 properties:

 ipv4Addrs:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv4Addr'

 ipv6Addrs:

 type: array

 items:

 $ref: 'TS29571\_CommonData.yaml#/components/schemas/Ipv6Addr'

 CircumstanceDescription:

 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'

 required:

 - freq

 - tm

 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 peridodicly. The periodic of the notification is identified by repetitionPeriod defined in subclause 5.1.6.2.3.

 - THRESHOLD: The subscribe of NWDAF Event is upon threshold exceeded. The threshold of the notification is identified by loadLevelThreshold defined in subclause 5.1.6.2.3.

 NwdafEvent:

 anyOf:

 - type: string

 enum:

 - SLICE\_LOAD\_LEVEL

 - SERVICE\_EXPERIENCE

 - QOS\_SUSTAINABILITY

 - ABNORMAL\_BEHAVIOUR

 - USER\_DATA\_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 instance

 - SERVICE\_EXPERIENCE: Indicates that the event subscribed is service experience.

 - 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.

 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

 - ABNORMAL\_TRAFFIC\_VOLUME

 - 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

 - ABNORMAL\_TRAFFIC\_VOLUME: Abnormal traffic volume

 - 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.

 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.

***(… text not shown for clarity …)***

\*\*\* End of Changes \*\*\*