**3GPP TSG-CT WG3 Meeting #118e C3-215125**

**E-Meeting, 11th – 15th October 2021 (Revision of C3-21xxxx)**

|  |
| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **29.520** | **CR** | **0325** | **rev** | **-** | **Current version:** | **17.4.0** |  |
|  |
| *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)*.* |
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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| --- |
|  |
| ***Title:***  | Updates to User Data Congestion Extension in Nnwdaf\_EventsSubscription API |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | CT3 |
|  |  |
| ***Work item code:*** | eNA\_Ph2 |  | ***Date:*** | 2021-09-20 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** |  Rel-17 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | TS 23.288 Table 6.8.3-1 define List of top applications in UL (0..Nu) and List of top applications in DL (0..Nd) which allow different maximum number of top applications in Uplink and Downlink.Hence the requested maximum number of top applications in Uplink and/or Downlink need to be defined in this specification, which can be directly taken as the indication of requesting list of top applications, and the initial "topAppListUlInd" and "topAppListDlInd" attributes with data type boolean are not needed. |
|  |  |
| ***Summary of change:*** | Add "maxTopAppUlNbr" and "maxTopAppDlNbr" attributes, and remove "topAppListUlInd" and "topAppListDlInd" attributes in data type EventsSubscription, also update in data type CongestionInfo and the OpenAPI file. |
|  |  |
| ***Consequences if not approved:*** | Not align with stage 2, cannot suport to request maximum number of top applications in Uplink and Downlink. |
|  |  |
| ***Clauses affected:*** | 4.2.2.2.2, 5.1.6.2.3, 5.1.6.2.18, A.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** | This CR introduces backward compatible feature into the OpenAPI file applicable to Nnwdaf\_EventsSubscription API. |
|  |  |
| ***This CR's revision history:*** |  |

**Additional discussion(if needed):**

**Proposed changes:**

\*\*\* 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; 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; and/or

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.

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; and/or

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

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.

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;

NOTE 2: 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;

- 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

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; and/or

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

- 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 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;

- 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;

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 3: 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; and

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

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

- 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;

and may provide:

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

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

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

- 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;

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";

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 by "networkArea" attribute and identification of network slice(s) by "snssais" attribute should be provided;

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 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.

- 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 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; and/or

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.

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. 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/v1/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.

\*\*\* 2nd 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) |  |
| appIds | array(ApplicationId) | C | 1..N | Identification(s) of application to which the subscription applies. The absence of appIds means subscription to all applications. (NOTE 8) | ServiceExperienceUeCommunication AbnormalBehaviour |
| dnns | array(Dnn) | C | 1..N | Identification(s) of DNN 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, AbnormalBehaviourUeCommunication |
| 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. |  |
| extraReportReq | EventReportingRequirement | O | 0..1 | The extra event reporting requirement information.  |  |
| 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". |  |
| 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  |
| 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 UeMobilityUeCommunicationQoSSustainabilityAbnormalBehaviourUserDataCongestionNetworkPerformance NsiLoadExt |
|  |  |  |  |  |  |
| maxTopAppUlNbr | Uinteger | O | 0..1 | Indicates the requested maximum number of top applications that contribute the most to the traffic in Uplink direction. If this attribute is present with value zero or undefined, means the maximum number is not limited. | UserDataCongestionExt |
|  |  |  |  |  |  |
| maxTopAppDlNbr | Uinteger | O | 0..1 | Indicates the requested maximum number of top applications that contribute the most to the traffic in Downlink direction. If this attribute is present with value zero or undefined, means the maximum number is not limited. | UserDataCongestionExt |
| nfInstanceIds | array(NfInstanceId) | O | 1..N | Identification(s) of NF instances. | NfLoad |
| nfSetIds | array(NfSetId) | O | 1..N | Identification(s) of NF instance sets. | NfLoad |
| nfTypes | array(NFType) | O | 1..N | Identification(s) of NF types. | NfLoad |
| 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" or "SERVICE\_EXPERIENCE".(NOTE 1) | ServiceExperience NsiLoad NsiLoadExt |
| 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) | NsiLoad NsiLoadExt |
| 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 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 eventis "NETWORK\_PERFORMANCE". | NetworkPerformance |
| bwRequs | array(BwRequirement) | O | 1..N | Represents the bandwidth requirement for each application. | 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) | AbnormalBehaviour |
| exptAnaType | ExpectedAnalyticsType | C | 0..1 | Represents expected UE analytics type.It shall not be present if the "excepRequs" attribute is provided. (NOTE 6) | AbnormalBehaviour |
| exptUeBehav | ExpectedUeBehaviourData | O | 0..1 | Represents expected UE behaviour. | AbnormalBehaviour |
| 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" or "USER\_DATA\_CONGESTION", the identifications of network slices identified by "snssais" is optional. When subscribed event is "NSI\_LOAD\_LEVEL" or "SERVICE\_EXPERIENCE", 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" or "USER\_DATA\_CONGESTION" 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: Care shall be taken to avoid excessive signalling.

Editor’s Note: It’s FFS whether the "nfTypes", "nfSetIds", "nfInstanceIds" or "nfLoadLvlThds" attirbutes are applicable for the NsiLoadExt feature.

\*\*\* 3rd Change \*\*\*

##### 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 a start time and a stop time requested for the congestion information. |  |
| 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 the "maxTopAppUlNbr" attribute is included in the event subscription or analytics request with the value of maximum number of the array instances. | UserDataCongestionExt |
| topAppListDl | array(TopApplication) | C | 1..N | List of top applications in Downlink. Shall be present if the "maxTopAppDlNbr" attribute is included and set to true in the event subscription or analytics request with the value of the maximum number of the array instances. | 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. |

\*\*\* 4th Change \*\*\*

# A.2 Nnwdaf\_EventsSubscription API

openapi: 3.0.0

info:

 version: 1.2.0-alpha.5

 title: Nnwdaf\_EventsSubscription

 description: |

 Nnwdaf\_EventsSubscription Service API.

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externalDocs:

 description: 3GPP TS 29.520 V17.4.0; 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:

 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/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.

 '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':

 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:

 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':

 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:

 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'

 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

 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'

 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'

 maxTopAppUlNbr:

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

 description: Indicates the requested maximum number of top applications that contribute the most to the traffic in Uplink direction.

 maxTopAppDlNbr:

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

 description: Indicates the requested maximum number of top applications that contribute the most to the traffic in Downlink direction.

 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'

 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

 required:

 - eventNotifications

 - subscriptionId

 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

 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'

 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'

 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'

 networkArea:

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

 timePeriod:

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

 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'

 startTs:

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

 endTs:

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

 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'

 TargetUeInformation:

 description: Identifies the target UE information.

 type: object

 properties:

 anyUe:

 type: boolean

 supis:

 type: array

 items:

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

 gpsis:

 type: array

 items:

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

 intGroupIds:

 type: array

 items:

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

 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

 required:

 - duration

 - locInfos

 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'

 confidence:

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

 required:

 - commDur

 - trafChar

 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'

 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'

 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'

 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'

 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'

 ThresholdLevel:

 description: Represents a threshold level.

 type: object

 properties:

 congLevel:

 type: integer

 nfLoadLevel:

 type: integer

 nfCpuUsage:

 type: integer

 nfMemoryUsage:

 type: integer

 nfStorageUsage:

 type: integer

 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

 snssai:

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

 confidence:

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

 required:

 - nfType

 - nfInstanceId

 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'

 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'

 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'

 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'

 required:

 - networkArea

 - nwPerfType

 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:

 type: integer

 variance:

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

 required:

 - number

 - variance

 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 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

 - NETWORK\_PERFORMANCE

 - NF\_LOAD

 - SERVICE\_EXPERIENCE

 - UE\_MOBILITY

 - UE\_COMMUNICATION

 - QOS\_SUSTAINABILITY

 - ABNORMAL\_BEHAVIOUR

 - USER\_DATA\_CONGESTION

 - NSI\_LOAD\_LEVEL

 - 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

 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.

 - SESS\_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.

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