**3GPP TSG-SA2 Meeting #165 S2-2410130r01**

**14 – 18 October, 2024, Hyderabad, IN *revision of S2-2409138 was 9089 was 7754***

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **23.288** | **CR** | **1132** | **rev** | **3** | **Current version:** | 19.0.0 |  |
|  | | | | | | | | |
| *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:*** | Support of QoS and policy assistance analytics | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung, China Mobile, Ericsson, ETRI, ICS, InterDigital Inc., MediaTek Inc, NTT DOCOMO, OPPO, SK Telecom, Tencent, Tencent Cloud, vivo | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AIML\_CN | | | | |  | ***Date:*** | | | 2024-10-04 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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 can be 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:*** | | As it has been agreed in clause 8.3 of TR 23.700-84:  Conclude Principle 1:  *- The PCF may send a analytics request or subscription to NWDAF for QoS and policy assistance information analytics. The PCF may include an analytics ID, Filter Information, one or multiple sets of QoS parameters, the candidate value list(s) for each QoS parameter, requesting expected service experience (e.g. QoE), etc.*  *- Based on the PCF request, the QoS and policy assistance information analytics provided by NWDAF may include: expected QoE can be achieved by the candidate QoS parameters (the values of the QoS parameters are within the candidate value list provided by the PCF).*  Conclude Principle 2:  *- The PCF may request one or more analytics from the NWDAF that are used within the same analytics target period, i.e. Observed service experience, QoS sustainability, Network Performance analytics, analytics of the duration and usage of the established QoS Flows.*  In order to support the above concluded Principle 1 for FS\_AIML\_CN KI#3, a new NWDAF-based analytics is introduced in this CR. Therefore, the NWDAF is able to provide the QoE and optionally the associated candidate QoS to the PCF based on information in PCF request, to support QoS and Policy enhancement. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduce a new NWDAF-based QoS and Policy Assistance Analytics ID to support QoS and policy enhancement based on concluded Principle 1 for KI#3. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The Concluded Principle 1 in the conclusions for FS\_AIML\_CN KI#3 cannot be supported by R19 specifications. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.x (new), 6.x.1 (new), 6.x.2 (new), 6.x.3 (new), 6.x.4 (new), 7.1, 7.2.2, 7.3.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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's revision history:*** | |  | | | | | | | | |

\* \* \*Start of Changes (new text) \* \* \*

## 6.x QoS and Policy Assistance Analytics

Editor’s Note: the title of the clause is FFS.

### 6.x.1 General

Clause 6.x describes how NWDAF can provide the QoS and policy assistance analytics, in the form of statistics or predictions, based on the consumer request. The consumer can either subscribe to analytics notifications (i.e. a Subscribe-Notify model) or request a single notification (i.e. a Request-Response model).

The QoS and policy assistance analytic provides the statistics and/or predictions of one or more expected QoE and the associated candidate QoS to the consumer (i.e. PCF). For example, the PCF may require the NWDAF to provide the service experience (i.e. QoE) of a service flow as the QoS and policy assistance information. In order to allow the NWDAF to derive the QoS and policy assistance analytics, the consumer shall at least provide the following information to NWDAF:

* A list of target QoS parameter set(s) and the associated QoS parameter set ID,
* Optional, the target service experience (i.e. QoE) of the service flow, and
* Optional, the allowed/candidate value list(s) of individual parameters in the target QoS parameter set(s).

Editor’s Note: whether the target QoE is provided by PCF is FFS.

Using the list of target QoS parameter set(s) and optionally the allowed values of individual parameters provided by the consumer, the NWDAF generates the achievable expected QoE of different candidate QoS parameter set(s). Then, the NWDAF informs the consumer about the achievable expected QoE of the candidate QoS parameter set(s).

The QoS parameter set(s) include:

* QoS parameters (as defined in clause 5.7.2 of TS 23.501): 5QI (standardized or pre-configured), ARP, RQA, and optional GFBR, MFBR and Packet Loss Rate for GBR flows, and the corresponding value of each individual QoS parameter;
* QoS Characteristics attributes (as defined in clause 5.7.3 of TS 23.501): Resource Type, Priority Level, PDB, PER, Averaging Window, Maximum Data Burst Volume, and the corresponding value of each individual QoS Characteristics attributes.

Each QoS parameters set is associated with a QoS parameter set ID.

NOTE: The values of the parameters in the list of candidate QoS parameter set(s) generated by NWDAF are indicated in the target QoS parameter set(s) and the allowed values provided by the consumer (e.g. PCF).

The QoS and policy assistance analytic may be provided for individual UE or group of UEs (e.g. the QoE is for the application ID(s) associated to one or more QoS flow(s) of the UE), or for per application (e.g. the QoE is for the service flow of the application ID).

The service consumer may be an NF (e.g. PCF).

The consumer of these analytics indicates the following information in the request or subscription:

- Analytics ID = " QoS and Policy Assistance".

- Target of Analytics Reporting as defined in clause 6.1.3.

- A list of one or more target QoS parameter set(s).

- Optional, the allowed/candidate value list of the individual parameter in each target QoS parameter set(s).

- Optional, the target QoE.

Editor’s Note: whether the target QoE is provided by PCF is FFS.

- Analytics Filter Information optionally includes:

- DNN;

- Application ID;

- Area of Interest (AOI(s));

- A list of analytics subsets that are requested (see clause 6.x.3), e.g. QoS requirements (e.g. 5QI, QoE).

- An Analytics target period indicates the time period over which the analytics are requested.

- In a subscription, the Notification Correlation Id and the Notification Target Address are included.

- Optionally, preferred order of results for the list of QoE associated to candidate QoS parameter sets:

- ordering criterion: "QoE" (i.e. QoE that is associated to candidate QoS parameter set) or "usage duration" or "number of usages" of a QoS flow,

- order: ascending or descending.

- Optionally, Reporting Thresholds, which apply only for subscriptions and indicate conditions on the levels to be reached for the respective analytics subsets (see clause 6.x.3).

Editor’s Note: the details of Reporting Thresholds is FFS.

### 6.x.2 Input Data

The NWDAF supporting QoS and policy assistance analytics shall be able to collect information from OAM and 5GC NFs.

The input data collect from AF defined for Observed Service Experience related network data analytics in Table 6.4.2-1 and Table 6.4.2-1a is reused by QoS and policy assistance analytics.

In addition, more information collected by the NWDAF from relevant 5GC NFs (i.e. UPF, SMF, AMF, PCF) is defined in Table 6.x.2-1.

Table 6.x.2-1: Input data from 5GC NF related to QoS and policy assistance information

|  |  |  |
| --- | --- | --- |
| Information | Source | Description |
| QoS Flows Information (1..max) | SMF | One or more list(s) of QoS flow information |
| > Used QoS parameter set(s) | SMF | The QoS parameter set(s) that have been already applied by SMF.  As detailed in clause 6.x.1, the QoS parameter set includes QoS parameters and QoS characteristics attributes (as defined in TS 23.501 [2]). |
| > Used QoS profile | SMF | The QoS profile associated to the used QoS parameter set(s). |
| > Event type | SMF | The type of QFI change, i.e., QoS Flow establishment (i.e., QFI Change) or QoS Flow termination (i.e., QFI deallocation) or Traffic binding of QoS Flow event |
| > QFI | SMF | QoS Flow identifier |
| > Traffic descriptor | SMF | One of Application Identifier or IP Packet Filter Set or Ethernet Packet Filter Set |
| > PDU Session ID | SMF | PDU session ID containing the QoS Flow |
| UE identifier | SMF, AMF | The identifier of UE, e.g. SUPI, UE IP address, etc. |
| UE Location | AMF | The UE location information, e.g. cell ID or TAI. |
| Time stamp | SMF, AMF | The time stamp associated to the collected data. |

### 6.x.3 Output Analytics

The NWDAF supporting QoS and Policy Assistance analytics is able to provide statistics and prediction to consumer NFs, e.g. PCF, as defined in Table 6.x.3-1.

Table 6.x.3-1: QoS and Policy Assistance statistics

|  |  |
| --- | --- |
| Information | Description |
| UE ID or list of UE IDs (1..SUPImax) | Identifies the UE(s) for which the statistic applies by a list of SUPIs. |
| Time slot entry (1..max) | List of time slots during the Analytics target period. |
| > Time slot start | Time slot start within the Analytics target period. |
| > Duration | Duration of the time slot. |
| > QoS and Policy Assistance information (1…max) (NOTE 1) | List of QoS and Policy Assistance information.  Max. is the number of the candidate QoS parameter set(s), if applicable. |
| >> QoS parameter set identifier | Identifies the QoS set for which the entry applies |
| >> DNN | DNN for the PDU Session which contains the QoS flow. |
| >> UE location | Indicate the UE location information when the service is delivered. |
| >> Application ID(s) | Identifies the application(s) that associated to the PCC rule or QoS. |
| >> QoE | The QoE or the service experience (e.g. QoE, MOS) of the corresponding QoS parameter set (e.g. average, maximum, minimum). |
| >> Candidate QoS parameter set (NOTE 5) | The candidate QoS parameter set that is associated to the QoE.  The parameters in the QoS parameter set of each set and the corresponding values. |
| >>> 5QI | The reference to 5G QoS characteristics and QoS parameters. |
| >>> ARP | The QoS parameter ARP contains information about the priority level, the pre-emption capability and the pre-emption vulnerability, as defined in TS 23.501 [2]. |
| >>> RQA (NOTE 4) | Reflective QoS Attribute (RQA) only applies to Reflective QoS.  The Reflective QoS Attribute (RQA) is an optional parameter which indicates that certain traffic (not necessarily all) carried on this QoS Flow is subject to Reflective QoS, as defined in TS 23.501 [2]. |
|  |  |
| >>> Resource type | The resource type of the corresponding QoS flow, e.g. GBR QoS flow, non-GBR QoS flow, delay-critical QoS flow. |
| >>> Packet Delay Budget | Packet Delay Budget (PDB) indicates the upper bound for the time that a packet may be delayed between the UE and the N6 termination point at the UPF, as defined in TS 23.501 [2]. |
| >>> Packet Error Rate | Packet Error Rate (PER) defines an upper bound for a rate of non-congestion related packet losses, as defined in TS 23.501 [2]. |
| >>> Flow Bit Rates (NOTE 2) | The flow bit rates only applies to GBR QoS Flow. |
| >>>> GFBR | Guaranteed Flow Bit Rate (GFBR) for UL and/or DL. |
| >>>> MFBR | Maximum Flow Bit Rate (MFBR) for UL and/or DL. |
| >>> Packet Loss Rate (NOTE 2) | The Maximum Packet Loss Rate (UL, DL) indicates the maximum rate for lost packets of the QoS Flow that can be tolerated in the uplink and downlink direction.  This is provided to the QoS Flow if it is compliant to the GFBR |
| >>> Averaging Window (NOTE 2) | The Averaging window is applied when the resource type is GBR QoS.  The Averaging window represents the duration over which the GFBR and MFBR shall be calculated (e.g. in the (R)AN, UPF, UE), as defined in TS 23.501 [2]. |
| >>> Maximum Data Burst Volume (NOTE 3) | The Maximum Data Burst Volume (MDBV) applies to GBR QoS Flow with Delay-critical resource type.  The MDBV denotes the largest amount of data that the 5G-AN is required to serve within a period of 5G-AN PDB, as defined in TS 23.501 [2]. |
| >> Applicable duration of QoS and Policy Assistance information | The applicable duration/ time window of the QoS and Policy Assistance information. |
| >> Validity period | The validity period within the time slot for the analytics on service experience associated to QoS in clause 6.1.3. |
| >> Spatial validity | Area where the analytics on service experience associated to QoS applies. |
| >> Traffic descriptor | One of Application Identifier or IP Packet Filter Set or Ethernet Packet Filter Set |
| >> Usage Duration information (NOTE 6) | Maximum/Minimum/Average usage duration of QoS Flows associated to Candidate QoS parameter set and characteristics. |
| >> Number of usage (NOTE 6) | The number of times that the QoS Flows associated to Candidate QoS parameter set were used. |
| NOTE 1: Analytics subset that can be used in "list of analytics subsets that are requested", and "Reporting Thresholds".  NOTE 2: The output analytics only applies to GBR QoS Flow.  NOTE 3: The output analytics only applies to GBR QoS Flow with Delay-critical resource type.  NOTE 4: The output analytics only applies to Reflective QoS.  NOTE 5: The subset of the output is mandatory to be provided by NWDAF if the consumer includes candidate values of individual parameters in the QoS parameter set(s) in the request.  NOTE 6: The usage duration and number of usage of QoS Flow is determined by NWDAF using the SMF Events QoS Flow establishment (i.e., QFI Change) or QoS Flow termination (i.e., QFI deallocation) or Traffic binding of QoS Flow events. For example, the duration equals to the time period between the timestamp of QoS Flow establishment and QoS Flow termination events. | |

Table 6.x.3-2: QoS and Policy Assistance predictions

|  |  |
| --- | --- |
| Information | Description |
| UE ID or list of UE IDs (1..SUPImax) | Identifies the UE(s) for which the statistic applies by a list of SUPIs. |
| Time slot entry (1..max) | List of time slots during the Analytics target period. |
| > Time slot start | Time slot start within the Analytics target period. |
| > Duration | Duration of the time slot. |
| > QoS and Policy Assistance information (1…max) (NOTE 1) | List of QoS and Policy Assistance information.  Max. is the number of the candidate QoS parameter set(s), if applicable. |
| >> QoS parameter set identifier | Identifies the QoS set for which the entry applies |
| >> DNN | DNN for the PDU Session which contains the QoS flow. |
| >> UE location | Indicate the UE location information when the service is delivered. |
| >> Application ID(s) | Identifies the application(s) that associated to the PCC rule or QoS. |
| >> QoE | The QoE or the service experience (e.g. QoE, MOS) of the corresponding QoS parameter set (e.g. average, maximum, minimum). |
| >> Candidate QoS parameter set (NOTE 5) | The candidate QoS parameter set that is associated to the QoE.  The parameters in the QoS parameter set of each set and the corresponding values. |
| >>> 5QI | The reference to 5G QoS characteristics and QoS parameters. |
| >>> ARP | The QoS parameter ARP contains information about the priority level, the pre-emption capability and the pre-emption vulnerability, as defined in TS 23.501 [2]. |
| >>> RQA (NOTE 4) | Reflective QoS Attribute (RQA) only applies to Reflective QoS.  The Reflective QoS Attribute (RQA) is an optional parameter which indicates that certain traffic (not necessarily all) carried on this QoS Flow is subject to Reflective QoS, as defined in TS 23.501 [2]. |
|  |  |
| >>> Resource type | The resource type of the corresponding QoS flow, e.g. GBR QoS flow, non-GBR QoS flow, delay-critical QoS flow. |
| >>> Packet Delay Budget | Packet Delay Budget (PDB) indicates the upper bound for the time that a packet may be delayed between the UE and the N6 termination point at the UPF, as defined in TS 23.501 [2]. |
| >>> Packet Error Rate | Packet Error Rate (PER) defines an upper bound for a rate of non-congestion related packet losses, as defined in TS 23.501 [2]. |
| >>> Flow Bit Rates (NOTE 2) | The flow bit rates only applies to GBR QoS Flow. |
| >>>> GFBR | Guaranteed Flow Bit Rate (GFBR) for UL and/or DL. |
| >>>> MFBR | Maximum Flow Bit Rate (MFBR) for UL and/or DL. |
| >>> Packet Loss Rate (NOTE 2) | The Maximum Packet Loss Rate (UL, DL) indicates the maximum rate for lost packets of the QoS Flow that can be tolerated in the uplink and downlink direction.  This is provided to the QoS Flow if it is compliant to the GFBR |
| >>> Averaging Window (NOTE 2) | The Averaging window is applied when the resource type is GBR QoS.  The Averaging window represents the duration over which the GFBR and MFBR shall be calculated (e.g. in the (R)AN, UPF, UE), as defined in TS 23.501 [2]. |
| >>> Maximum Data Burst Volume (NOTE 3) | The Maximum Data Burst Volume (MDBV) applies to GBR QoS Flow with Delay-critical resource type.  The MDBV denotes the largest amount of data that the 5G-AN is required to serve within a period of 5G-AN PDB, as defined in TS 23.501 [2]. |
| >> Applicable duration of QoS and Policy Assistance information | The applicable duration/ time window of the QoS and Policy Assistance information. |
| >> Validity period | The validity period within the time slot for the analytics on service experience associated to QoS in clause 6.1.3. |
| >> Spatial validity | Area where the analytics on service experience associated to QoS applies. |
| >> Traffic descriptor | One of Application Identifier or IP Packet Filter Set or Ethernet Packet Filter Set |
| >> Usage Duration information (NOTE 6) | Maximum/Minimum/Average usage duration of QoS Flows associated to Candidate QoS parameter set. |
| >> Number of usage (NOTE 6) | The number of times that the QoS Flows associated to Candidate QoS parameter set to be used. |
| > Confidence | Confidence of this prediction. |
| NOTE 1: Analytics subset that can be used in "list of analytics subsets that are requested", and "Reporting Thresholds".  NOTE 2: The output analytics only applies to GBR QoS Flow.  NOTE 3: The output analytics only applies to GBR QoS Flow with Delay-critical resource type.  NOTE 4: The output analytics only applies to Reflective QoS.  NOTE 5: The subset of the output is mandatory to be provided by NWDAF if the consumer includes candidate values of individual parameters in the QoS parameter set(s) in the request.  NOTE 6: The usage duration and number of usage of QoS Flow is determined by NWDAF using the SMF Events QoS Flow establishment (i.e., QFI Change) or QoS Flow termination (i.e., QFI deallocation) or Traffic binding of QoS Flow events. For example, the duration equals to the time period between the timestamp of QoS Flow establishment and QoS Flow termination events. | |

### 6.x.4 Procedures

Figure 6.x.4 shows the procedure for the NWDAF to derive and provide the QoS and policy assistance analytics to a consumer 5GC NF (e.g. PCF).

Editor’s Note: the procedure will align to the details in clause 6.x.1, 6.x.2 and 6.x.3.



Figure 6.x.4-1: Procedure for QoS and Policy Assistance Analytics

1. The Consumer NF, e.g. PCF , requests or subscribes to QoS and policy assistance analytics from NWDAF (possibly via NEF in case the consumer NF is an untrusted AF) and provides the input information as specified in clause 6.x.1 to NWDAF.

2a. The NWDAF may subscribe to the service data from AMF as defined in Table 6.x.2-2 using Namf\_EventExposure\_Subscribe service operation for collecting UE location(s) for a UE or a group of UEs, or any UE.

If the required UE location information is finer granularity than TA/cell level, then NWDAF collects the location data from GMLC instead of AMF by invoking the Ngmlc\_Location service as defined in TS 23.273 [39] and TS 29.515 [48].

2b. The NWDAF may subscribe to service data from SMF as defined in Table 6.x.2-2 by invoking Nsmf\_EventExposure\_Subscribe service operation (Event ID, parameters in QoS parameter set, QoS profile ID, SUPI(s) or Application ID).

2c. The NWDAF may subscribe to the service data from as defined AF in the Table 6.x-2-1 by invoking Nnef\_EventExposure\_Subscribe or Naf\_EventExposure\_Subscribe (Event ID = QoS and Policy Assistance, Application ID, Event Filter information, Target of Event Reporting = UE ID(s)) service as defined in TS 23.502 [3].

3. The NWDAF derives the requested analytics on QoS and Policy Assistance based on NWDAF internal logic, e.g. the NWDAF derives the analytics directly based on the inputs, or the NWDAF may derive the analytics by consuming the Observed Service Experience and using input parameters in Table 6.x.2-1.

4. The NWDAF provides the requested QoS and Policy Assistance to the consumer NF, using either Nnwdaf\_AnalyticsInfo\_Request response or Nnwdaf\_AnalyticsSubscription\_Notify, depending on the service used in step 1.

5-7. If the consumer NF subscribed to QoS and Policy Assistance in step 1, once the NWDAF generates new analytics for Service Experience Associated to QoS, it provides a notification using Nnwdaf\_AnalyticsSubscription\_Notify to the Consumer NF.

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

## 7.1 General

Table 7.1-1 illustrates the NWDAF Services.

Table 7.1-1: NF services provided by NWDAF

|  |  |  |  |
| --- | --- | --- | --- |
| Service Name | Service Operations | Operation  Semantics | Example Consumer(s) |
| Nnwdaf\_AnalyticsSubscription | Subscribe | Subscribe / Notify | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF, LMF |
|  | Unsubscribe |  | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF, LMF |
|  | Notify |  | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF, MFAF, LMF |
|  | Transfer | Request / Response | NWDAF |
| Nnwdaf\_AnalyticsInfo | Request | Request / Response | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF, LMF |
|  | ContextTransfer | Request / Response | NWDAF |
| Nnwdaf\_DataManagement | Subscribe | Subscribe / Notify | NWDAF, DCCF |
|  | Notify |  | NWDAF, DCCF, MFAF, ADRF |
|  | Fetch | Request / Response | NWDAF, DCCF, MFAF, ADRF |
| Nnwdaf\_MLModelProvision | Subscribe | Subscribe / Notify | NWDAF |
|  | Unsubscribe |  | NWDAF |
|  | Notify |  | NWDAF |
| Nnwdaf\_MLModelInfo | Request | Request / Response | NWDAF |
| Nnwdaf\_MLModelMonitor | Subscribe | Subscribe / Notify | NWDAF |
|  | Unsubscribe |  | NWDAF |
|  | Notify |  | NWDAF |
|  | Register | Request / Response | NWDAF |
|  | Request |  | NWDAF |
| Nnwdaf\_MLModelTraining | Subscribe | Subscribe / Notify | NWDAF |
|  | Unsubscribe |  | NWDAF |
|  | Notify |  | NWDAF |
| Nnwdaf\_MLModelTrainingInfo | Request | Request / Response | NWDAF |
| Nnwdaf\_RoamingAnalytics | Subscribe | Subscribe / Notify | H-RE-NWDAF, V-RE-NWDAF |
|  | Unsubscribe |  | H-RE-NWDAF, V-RE-NWDAF |
|  | Notify |  | H-RE-NWDAF, V-RE-NWDAF |
|  | Request | Request / Response | H-RE-NWDAF, V-RE-NWDAF |
| Nnwdaf\_RoamingData | Subscribe | Subscribe / Notify | H-RE-NWDAF, V-RE-NWDAF |
|  | Unsubscribe |  | H-RE-NWDAF, V-RE-NWDAF |
|  | Notify |  | H-RE-NWDAF, V-RE-NWDAF |
| NOTE 1: How OAM consumes Nnwdaf services and which Analytics information is relevant is defined in TS 28.550 [7] Annex H and out of the scope of this TS.  NOTE 2: How CEF consumes Nnwdaf services and which Analytics information is relevant is defined in TS 28.201 [21] and out of the scope of this TS.  NOTE 3: The Nnwdaf\_MLModelProvision service and the Nnwdaf\_MLModelInfo service are provided by an NWDAF containing MTLF and consumed by an NWDAF containing AnLF or provided by an NWDAF containing MTLF supporting FL as a server and consumed by an NWDAF containing MTLF. | | | |

Table 7.1-2 shows the analytics information provided by NWDAF service.

Table 7.1-2: Analytics information provided by NWDAF

|  |  |  |
| --- | --- | --- |
| Analytics Information | Request Description | Response Description |
| Slice Load level information | Analytics ID: load level information | Load level provided as number of UE registrations and number of PDU sessions for a Network Slice and Network Slice instances as well as resource utilization for Network Slice instances. |
| Observed Service experience information | Analytics ID: Service Experience | Observed Service experience statistics or predictions may be provided for a Network Slice or an Application. They may be derived from an individual UE, a group of UEs or any UE. For slice service experience, they may be derived from an Application, a set of Applications or all Applications on the Network Slice. |
| NF Load information | Analytics ID: NF load information | Load statistics or predictions information for specific NF(s). |
| Network Performance information | Analytics ID: Network Performance | Statistics or predictions on the load in an Area of Interest; in addition, statistics or predictions on the number of UEs that are located in that Area of Interest. |
| UE mobility information | Analytics ID: UE Mobility | Statistics or predictions on UE mobility. When visited AOI(s) is included in the Analytics Filter information, only statistics on UE mobility can be provided. |
| UE Communication information | Analytics ID: UE Communication | Statistics or predictions on UE communication. |
| Expected UE behavioural parameters | Analytics ID: UE Mobility and/or UE Communication | Analytics on UE Mobility and/or UE Communication. |
| UE Abnormal behaviour information | Analytics ID: Abnormal behaviour | List of observed or expected exceptions, with Exception ID, Exception Level and other information, depending on the observed or expected exceptions. |
| End-to-end data volume transfer time | Analytics ID: E2E data volume transfer time | Analytics on E2E data volume transfer time. |
| User Data Congestion information | Analytics ID: User Data Congestion | Statistics or predictions on the user data congestion for transfer over the user plane, for transfer over the control plane, or for both. |
| QoS Sustainability | Analytics ID: QoS Sustainability | For statistics, the information on the location and the time for the QoS change and the threshold(s) that were crossed; or, for predictions, the information on the location and the time when a potential QoS change may occur and what threshold(s) may be crossed. |
| Session Management Congestion Control Experience | Analytics ID: Session Management Congestion Control Experience | Statistics on session management congestion control experience for specific DNN and/or S-NSSAI. |
| Redundant Transmission Experience | Analytics ID: Redundant Transmission Experience | Statistics or predictions aimed at supporting redundant transmission decisions for URLLC services. |
| WLAN performance | Analytics ID: WLAN performance | Statistics or predictions on WLAN performance of UE. |
| Dispersion | Analytics ID: UE Dispersion | Statistics or predictions that identify the location (i.e. areas of interest) or network slice(s) where a UE, or a group of UEs disperse their data volume, or disperse mobility or session management transactions or both. |
| DN Performance | Analytics ID: DN Performance | Statistics or predictions on user plane performance for a specific Edge Computing application. |
| PFD Determination | Analytics ID: PFD Determination | Statistics on PFD information for a known application identifier(s). |
| Movement Behaviour | Analytics ID: Movement Behaviour | Statistics or predictions on movement behaviour for an applicable area. |
| Location Accuracy | Analytics ID: Location Accuracy | Predictions on Location Accuracy. |
| Relative Proximity | Analytics ID: Relative Proximity | Statistics or predictions on Relative Proximity among UEs. |
| PDU Session traffic | Analytics ID: PDU Session traffic | Statistics on whether traffic of UEs via one or multiple PDU sessions is according to the information provided by the service consumer. |
| QoS and Policy Assistance | Analytics ID: QoS and Policy Assistance | Analytics on candidate QoS parameter set(s) and the associated QoE(s). |

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

### 7.2.2 Nnwdaf\_AnalyticsSubscription\_Subscribe service operation

**Service operation name:** Nnwdaf\_AnalyticsSubscription\_Subscribe

**Description:** Subscribes to NWDAF analytics and optionally Analytics Accuracy Information with specific parameters.

**Inputs, Required:**

- (Set of) Analytics ID(s) as defined in Table 7.1-2;

- Target of Analytics Reporting;

- Notification Target Address (+ Notification Correlation ID);

- Analytics Reporting Parameters (including Analytics target period, etc.).

NOTE 1: Target of Analytics Reporting can be provided per individual Analytics ID.

**Inputs, Optional:**

- Analytics Filter Information;

- Time window for historical analytics;

- Subscription Correlation ID (in the case of modification of the analytics subscription);

- Preferred level of accuracy of the analytics;

- Preferred level of accuracy per analytics subset;

- Reporting Thresholds;

- Maximum number of objects requested (max);

- Preferred order of results;

- Maximum number of SUPIs requested (SUPImax);

- Time when analytics information is needed;

- Analytics Metadata Request;

- (Set of) NWDAF identifiers used by the NWDAF service consumer when aggregating multiple analytic subscriptions;

- Dataset Statistical Properties;

- Output strategy;

- Data time window;

- Consumer NF's serving area or NF ID;

- Information of previous analytics subscription, i.e. NWDAF identifier (i.e. Instance ID or Set ID), Analytics ID(s) (including SUPIs and Analytics Filter Information for UE-related Analytics) and Subscription Correlation ID;

- Use case context.

- Analytics Accuracy Request information.

- Analytics Feedback Information.

NOTE 2: Analytics Filter Information, Reporting Thresholds, maximum number of objects requested (max), maximum number of SUPIs requested (SUPImax), Analytics Metadata Request, Dataset Statistical Properties, Output strategy, Data time window and time when analytics information is needed can be provided per individual Analytics ID.

NOTE 3: Analytics Feedback Information only can be included in modification request for the existing analytics subscription.

NOTE 4: Other input parameters specific for different analytics ID can be also needed, as specified in the corresponding clause for each analytics ID.

- Target QoS parameter set(s), optional the allowed values of individual parameters in target QoS parameter set(s).

**Outputs Required:** When the subscription is accepted: Subscription Correlation ID (required for management of this subscription). When the subscription is not accepted, an error response.

**Outputs, Optional:** First corresponding Analytics report is included, if available and if analytics consumer requested immediate reporting (see clause 4.15.1 of TS 23.502 [3]).

NOTE 5: When the Target of Analytics Reporting is a SUPI or a GPSI then the subscription may not be accepted, e.g. user consent is not granted and an error is sent to the consumer. When the Target of Analytics Reporting is an Internal Group Id, or a list of SUPIs/GPSIs or any UE, no error is sent, but a SUPI or GPSI is skipped if user consent is not granted.

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

### 7.3.2 Nnwdaf\_AnalyticsInfo\_Request service operation

**Service operation name:** Nnwdaf\_AnalyticsInfo\_Request

**Description:** The consumer requests NWDAF operator specific analytics and optionally Analytics Accuracy Information.

**Inputs, Required:** (Set of) Analytics ID(s) as defined in Table 7.1-2, Target of Analytics Reporting, Analytics Reporting Parameters (including Analytics target period, etc.).

NOTE 1: Target of Analytics Reporting can be provided per individual Analytics ID.

**Inputs, Optional:** Analytics Filter Information, preferred level of accuracy of the analytics, preferred level of accuracy per analytics subset, time when analytics information is needed, maximum number of objects requested (max), preferred order of results, maximum number of SUPIs requested (SUPImax), Analytics Metadata Request, Dataset Statistical Properties, Output strategy, Data time window, Use case context, Time window for historical analytics and Analytics Accuracy Request information, target QoS parameter set(s), optional the allowed values of individual parameters in target QoS parameter set(s).

NOTE 2: Analytics Filter Information, Maximum number of objects requested (max), Maximum number of SUPIs requested (SUPImax), Analytics Metadata Request, Dataset Statistical Properties, Output strategy, Data time window and time when analytics information is needed can be provided per individual Analytics ID.

**Outputs, Required:** If the request is accepted, then set of the tuple (Analytics ID, Analytics specific parameters). When the request is not accepted, an error response.

**Outputs, Optional:** Timestamp of analytics generation (required when ADRF is deployed), validity period, confidence, revised waiting time, Analytics Metadata Information, Analytics Accuracy Information. See clause 6.1.3.

NOTE 3: Validity period can also be provided as part of Analytics specific parameters for some NWDAF output analytics.

NOTE 4: When the Target of Analytics Reporting is a SUPI or a GPSI then the request may not be accepted, e.g. user consent is not granted and an error is sent to the consumer. When the Target of Analytics Reporting is an Internal Group Id, or a list of SUPIs/GPSIs or any UE, no error is sent, but a SUPI or GPSI is skipped if user consent is not granted.

NOTE 5: Other input or output parameters specific for different analytics ID can be also needed, as specified in the corresponding clause of each analytics

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