**3GPP TSG-SA2 Meeting #164 *S2-2408408r2***

**Maastricht, Netherlands, 19th Aug 2024 - 23rd Aug 2024 (revised from S2-2407534)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **23.288** | **CR** | **1104** | **rev** | **1** | **Current version:** | **18.6.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
|  | | | | | | | | |

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

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | New analytics ID to support Signalling storm Mitigation and Prevention caused by NFs | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | SK Telecom, AT&T, China Mobile, ETRI, KDDI, KPN N.V., LG Uplus, OPPO, Rakuten Mobile, Samsung, vivo, ZTE | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AIML\_CN | | | | |  | ***Date:*** | | | 2024-08-08 |
|  |  | | | |  | |  | | |  |
| ***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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | TR 23.700-84 v1.0.0 has documented the conclusion for key issue#4 “NWDAF enhancements to support network abnormal behaviours (i.e. signalling storm) mitigation and prevention”. To solve the issue, the following conclusions are reached:  “- By means of statistics and predictions, NWDAF supports assistance to signalling storm mitigation and prevention by statistically learning the expected normal level of signalling and identifying a significant deviation indicating a signalling storm caused by massive signalling of UEs and/or caused by NFs signalling.  - A new Analytics ID to support Signalling storm Mitigation and Prevention caused by NFs signalling will be defined.  - It will be determined in the normative phase whether to define a new Analytics ID or enhance an existing Analytics ID to support Signalling storm Mitigation and Prevention caused by massive signalling of UEs.  - Analytics Filter includes information to assist the NWDAF for the signalling storm as defined above.  NOTE 1: The consumers of the analytics ID and the parameters of the analytics request/subscribe (determined by the consumer) are to be specified in normative work.”  This contribution provides the analytics detail of the prevent network abnormal behaviour use case based on the new NF’s information. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduce a new Analytics ID for the prevention of abnormal NF behaviour causing signalling storm and mitigation of its impact in the network use case in the TS 23.288. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | It is not specified that the procedure for the “Analytics-assisted prevention of abnormal NF behaviour”. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.x (new), 6.x.1 (new), 6.x.2 (new), 6.x.3 (new), 6.x.4 (new), 7.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

\* \* \* \* First change (all new )\* \* \* \*

## 6.x NF Signalling Storm Analytics

### 6.x.1 General

This clause specifies how NWDAF support network abnormal behaviours (i.e. signalling storm) mitigation and prevention.

The signalling storm analytics provides analytics information (statistics or predictions) regarding the expected normal level of signalling and significant deviations indicating a signalling storm. The analytics of signalling storm requires the identification of whether the signalling storm is due to signalling from a NF or massive signalling from UE based on the requested analytics ID.

The NWDAF provides statistics and/or prediction analytics to consumer NFs.

The consumer of these analytics may indicate in the request or subscription:

- Analytics ID = "NF signalling storm";

- Target of Analytics Reporting: a list of NFs;

- Analytics Filter Information:

- an individual and/or groups of NF's sudden increase/decrease (bursts) of TPS (Transaction per second) and/or CPS (Connection per second) from various NF interfaces (e.g. SBIs and non-SBIs).

- an individual and/or groups of NF's information involved in procedure of a UE or a session such as Connection, Registration, Mobility and Session Managements procedure.

- an individual and/or groups of NF's information contains information about UE or session context enabling the NWDAF to determine the cause of a signalling storm.

- An Analytics target period indicates the time period over which the statistics or predictions are requested;

- Optionally, preferred level of accuracy of the analytics;

### 6.x.2 Input data

The NWDAF collects the signalling feature data, NF context, AF data and MDAF data from the sources listed in Table 6.x.2-1, 6.x.2-2, 6.x.2-3, 6.x.2-4.

The NWDAF also collects UE behavioural information per group as specified in clause 6.7.5.2.

The NWDAF may use output of abnormal UE behaviour analytics and UE dispersion analytics as specified in clause 6.7.5 and 6.10.3 as input data of NF signalling storm analytics.

In order to reduce signalling overhead, offline bulk data report as specified in clause 6.2.6.1 may be used.

Table 6.x.2-1: UE related Context Data collection by NWDAF

|  |  |  |
| --- | --- | --- |
| Information | Source | Description |
| NF ID | AMF, SMF, NRF | NF instance ID of the service producer or consumer. |
| UE type ID | AMF, SMF, NRF | Identifies a group of UEs, e.g. internal group ID, slice ID, or a list of UE IDs. |
| Signalling feature data |  | NF procedures containing signalling exchange information related to a particular UE or session from the Connection, Registration, Mobility and Session Managements procedures. |
| > Type of requests from UE/RAN | AMF | Request type for N1 or N2 interface, such as received Initial Registration Request, Mobility and Periodic Registration Request, Service Request, etc. |
| > Number of requests from UE/RAN | AMF | Number of requests for N1 or N2 interface, such received Initial Registration Request, Mobility and Periodic Registration Request, Service Request, etc. |
| > Time duration from receiving request from UE/RAN to response to UE/RAN | AMF | Time duration between the request from UE/RAN and response to UE/RAN. |
| > Number of successful responses of UE/RAN | AMF | Number of successful responses associated to their initial requests, such as Registration Response, etc. |
| > Number of failed responses of UE/RAN | AMF | Number of failed responses associated to their initial requests, such as Registration Reject, Service Reject, etc. |
| > Reason of failed responses of UE/RAN | AMF | Reasons of failed responses associated to their initial requests, e.g. reject, no-response, etc. |
| > A posterior Type of requests of UE/RAN (0..max) | AMF | A posterior Request types triggered from UE/RAN, for NF Service request, or request to UE/RAN. |
| > > A posterior Type of responses of UE/RAN (0..max) | AMF | A posterior Response types triggered from UE/RAN, for NF Service response, or response to UE/RAN. |
| > Type of requests from NF | AMF | Request type received from NF, e.g. Namf\_N1N2Trans, Namf\_comm, etc. |
| > Number of requests from NF | AMF | Number of requests received from NF, e.g. Namf\_N1N2Trans, Namf\_comm, etc. |
| > Time duration from receiving request from NF to response to NF | AMF | Time duration between the request from NF and response to NF. |
| > Number of successful responses of NF | AMF | Number of successful responses associated to their initial requests. |
| > Number of failed responses of NF | AMF | Number of failed responses associated to their initial requests. |
| > Reason of failed responses of NF | AMF | Reasons of failed responses associated to their initial requests, e.g. reject, no-response, etc. |
| > Number of redundant signalling of NF | AMF | Number of received redundant signalling. The redundant signalling means the signalling which is transmitted in multiple times. |
| > Number of unhandled signalling of NF | AMF | Number of received unhandled signalling. The unhandled signalling means the signalling which is not processed, e.g. because the value of IEs in the signaling is abnormal. |
| > A posterior Type of requests of NF (0..max) | AMF | A posterior Request types triggered from NF, for NF Service request. |
| > > A posterior Type of responses of NF (0..max) | AMF | A posterior Response types triggered from NF, for NF Service response. |
| > Public Warning information | AMF | Public Warning information such as WRITE-REPLACE WARNING REQUEST, etc. |
| > Number of UE AM Policy Updates | AMF | Number of policy requests from PCF such as URSP, Restriction Area, etc. |
| > Type of requests from NF | SMF | Request type received such as PDU Session Establishment, Modification, Release Request, etc. |
| > Number of requests from NF | SMF | Number of requests received such as PDU Session Establishment, Modification, Release Request, etc. |
| > Time duration from receiving request from NF to response to NF | SMF | Time duration between the request from NF and response to NF. |
| > Number of successful responses of NF | SMF | Number of successful responses associated to their initial requests, such as PDU Session Establishment, Modification, Release Response, etc. |
| > Number of failed responses of NF | SMF | Number of failed responses associated to their initial requests, such as PDU Session Establishment, Modification, Release Reject, etc. |
| > Reason of failed responses of NF | SMF | Reasons of failed responses associated to their initial requests, e.g. reject, no-response, etc. |
| > Number of redundant signalling of NF | SMF | Number of received redundant signalling. The redundant signalling means the signalling which is transmitted in multiple times. |
| > Number of unhandled signalling of NF | SMF | Number of received unhandled signalling. The unhandled signalling means the signalling which is not processed, e.g. because the value of IEs in the signaling is abnormal. |
| > A posterior Type of requests of NF (0..max) | SMF | A posterior Request types triggered from NF, for NF Service request. |
| > A posterior Type of responses of NF (0..max) | SMF | A posterior Response types triggered from NF, for NF Service response. |
| > Number of requests for UE SM Policy Update | SMF | Number of requests from PCF to update UE SM Policy per PDU Session, such as QoS, PCC Rules, etc. |
|  |  |  |
| > Number of receiving Session Report from UPFs | SMF | Number of receive Session Report from UPF triggered by DL packet in case of PDU Session is in 5GCM-idle state. |
|  |  |  |
|  |  |  |
|  |  |  |
| NF Context information |  | NF context information related to a particular UE/Session/NF context. |
| UE Context | AMF, SMF | The UE MM or SM context in the NF. |
| >State transition information | AMF, SMF | UE related state transition information such as transition type, frequency of CM state changes etc.  State transition identifier:  - "Access Type change to 3GPP access";  - "Access Type change to non-3GPP access";  - "RM state change to RM-DEREGISTERED";  - "RM state change to RM-REGISTERED ";  - "CM state change to CM-IDLE";  - "CM state change to CM-CONNECTED";  - "Handover"; or  - "Mobility Registration Update".  Or, PDU Session related state transition information such as transition type, frequency SM state changes, etc.  State transition identifier:  - "PDU Session Establishment";  - "PDU Session Release";  - "Communication failure"; or  - "PLMN change". |
| > timer information | AMF | UE/PDU Session related timer information such as timer type, duration, etc. |

Table 6.x.2-2: NF Context Data collection by NWDAF

|  |  |  |
| --- | --- | --- |
| Information | Source | Description |
| NF ID | AMF, SMF, NRF | NF instance ID of the service producer or consumer. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| > Usage information of UE IP address resources | SMF, OAM | Usage information of UE IP address resources (dynamic and static, V4, V6, etc.) for CP or UP allocation, such as number, usage, number of UE IPs, which prohibit allocation during certain time interval, etc. |
| > Load information of connected UPFs | SMF, OAM | Load information of connected UPFs such as using PFCP Load Control Information. |
| > Type of requests from NRF | NRF, OAM | Request type received such as NF registration and discovery, etc. |
| > Number of requests from NF | NRF, OAM | Number of NF requests received such as NF registration and discovery, etc. |
| > Time duration from receiving request from NRF to response to NF | NRF, OAM | Time duration between the request from NRF and response to NF. |
| > NF profile | NRF, OAM | NF Profile information such as allowed NF information per NF and NF Service. |
| > NF load information of registered NFs and NF Services | NRF, OAM | Load information indicates the current load of NFs and NF Services, e.g. CPU, memory, and/or percentage of load information. |
| > Capability and priority information of NFs and Services | NRF, OAM | Capability and priority information of registered NFs and NF Services. |
| > NF heart-beat related information | NRF, OAM | NF heart-beat related information such as responding time, Number of retransmissions, heart-beat intervals, etc. |
| > Success and failure trend | NRF, OAM | Number Requests/response related trend such as within a certain time interval, ratio, cause/error code, etc. |

Table 6.x.2-3: Application activation time information collected by NWDAF

|  |  |  |
| --- | --- | --- |
| **Information** | **Source** | **Description** |
| Application ID | AF | Identifies the application providing this information. |
| User activation time information (1…max) | AF | Information of activation time for the users (e.g. IoT users) per application. |
| > Active Time | AF | The time stamp of the users per application switch to active, or the start and end time of the users activity per application. |
| > Inactive Time | AF | The time stamp of the users per application switch to inactive, or the start and end time of the users inactivity per application, if applicable. |
| > UE type ID | AF | Identifies a group of UEs, e.g. external group ID, or a list of UE IDs. |

Table 6.x.2-4: Data collection from MDAS/MDAF of control plane congestion analysis

|  |  |  |
| --- | --- | --- |
| Information | Source | Description |
| affectedObject | MDAF | Indication of 5GC NFs where congestion issues occurred or potentially may occur. |
| cPCongestionIssueID | MDAF | This field holds the ID of the control plane congestion issue which is reported. |

### 6.x.3 Output analytics

The output analytics of signalling storm provided by NWDAF is defined in Table 6.x.3-1, and Table 6.x.3-2. The Table 6.x.3-3 gives examples of NF actions for solving each risk. The final mitigation or prevention operations are based on operator's policy/configuration and NF implementation.

Table 6.x.3-1: Signalling storm statistics

|  |  |
| --- | --- |
| Information | Description |
| Report (1..max) | List of observed signalling storm. |
| > Target NF ID | A list of target NFs signalling storm detected by NWDAF. |
| > Cause of the signalling storm | The potential cause of NF Abnormality (e.g. massive signalling from UE, NF abnormal signalling, etc.). |
| > Source UE/NF | group of the UE(s) identified as slice ID or internal group ID or NF(s) identified as NF list which cause the signalling storm. |

Table 6.x.3-2: Signalling storm predictions

|  |  |
| --- | --- |
| Information | Description |
| Report (1..max) | List of observed signalling storm. |
| > Target NF ID | A list of target NFs signalling storm predicted by NWDAF. |
| > Cause of the signalling storm | The potential cause of NF Abnormality (e.g. massive signalling from UE, NF abnormal signalling, etc.). |
| > Source UE/NF | group of the UE(s) identified as slice ID or internal group ID or NF(s) identified as NF list which cause the signalling storm. |
| > Confidence | Confidence of this prediction. |

NOTE 1: The statistics and predictions are provided with a Validity Period, as defined in clause 6.1.3.

Table 6.x.3-3: Example mechanisms to mitigate and prevent the signalling storm

|  |  |
| --- | --- |
| Cause of the signalling storm | Actions of NFs |
| massive signalling from UE | AMF sets MM NAS related timer (e.g. back-off, T3512) with suggested time range for a selected set of UEs. |
| massive signalling from UE | SMF sets SM NAS related timer (e.g. back-off) with suggested time range for a selected set of Sessions. |
| massive signalling from UE | AMF/SMF sets suggested N1/N2 interface related ingress/egress threshold, or AMF triggers RAN to initiate overload control for a selected set of UEs in specific slice or priority as defined in clause 8.7.7 of TS 38.413 [8] to start overload control. The AMF may assign a abnormal slice to the UEs and initiate overload control for the specific slice. |
| NF abnormal signalling | NRF configures the local policy to prevent the source NF with abnormal signalling from being discovered or discovering others. |
| NF abnormal signalling | Source NF configures to (re)select other NFs instead of NF with abnormal signalling and may unsubscribes the NF with abnormal signalling. |
| NF abnormal signalling | Source NF configures to deprioritize the NFs/Services with abnormal signalling from being selected. |
| NF abnormal signalling | Source NF triggers UE Reregistration and/or Session Reestablishments to avoid NF with abnormal signalling. |

### 6.x.4 Procedures

The NWDAF can provide information on network signalling storm as follows. (Figure 6.x.4-1).



Figure 6.x.4-1: Procedure for NWDAF-assisted Network Signalling Storm Mitigation and Prevention

1. The consumer NF or e.g. MDAF/MDAS subscribes to or sends a request to NWDAF assistance information for the signalling storm analytics using either Nnwdaf\_AnalyticsSubscription\_Subscribe or Nnwdaf\_AnalyticsInfo\_Request service operation. The request additionally includes thresholds such as confidence level and accuracy of detection. The request may also include as analytic filters an indication of the use case for signalling storm (e.g. signalling storm due to UE mobility).

The Analytics ID is set to "NF signalling storm". The target for analytics reporting is set to be any NF or any UE. Analytic filters may be provided as shown in clause 6.x.1.

The Consumer NF can request statistics or predictions or mitigation or prevention or all for a given Analytics target period.

The consumer NF may subscribe NF load analytics as depicted in clause 6.5, and trigger the signalling storm analytics based on output of the NF load analytics, e.g. CPU usage is over 80%.

2. The NWDAF retrieves Input data from NFs, using Nnf\_EventExposure\_Subscribe, such as signalling exchange information, NF context, AF data, MDAF data and UE behavioural information to derive the required analytics as depicted in clause 6.x.2.

3. The NWDAF derives the required analytics based on the consumer NF request. The NWDAF can collect additional Input data from different NFs, e.g. including from MDAF/MDAS. The NWDAF collects input data from NFs taking into account the use case of signalling storm if provided in step 1.

4. The NWDAF invokes Nnwdaf\_AnalyticsSubscription\_Notify or Nnwdaf\_AnalyticsInfo\_Request response or response to the consumer NF for the Output data analytics as depicted in clause 6.x.3.

5. The consumer upon receiving the detection and/or prediction and/or mitigation may execute based on the example mechanisms as depicted in clause 6.x.3.

\* \* \* \* Second 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 |
|  | Unsubscribe |  | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF |
|  | Notify |  | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF, MFAF |
|  | Transfer | Request / Response | NWDAF |
| Nnwdaf\_AnalyticsInfo | Request | Request / Response | PCF, NSSF, AMF, SMF, NEF, AF, OAM, CEF, NWDAF, DCCF |
|  | 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-NWDAF, V-NWDAF |
|  | Unsubscribe |  | H-NWDAF, V-NWDAF |
|  | Notify |  | H-NWDAF, V-NWDAF |
|  | Request | Request / Response | H-NWDAF, V-NWDAF |
| Nnwdaf\_RoamingData | Subscribe | Subscribe / Notify | H-NWDAF, V-NWDAF |
|  | Unsubscribe |  | H-NWDAF, V-NWDAF |
|  | Notify |  | H-NWDAF, V-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. | | | |

Editor´s note: It is FFS whether separate Roaming Analytics and Roaming data services for inbound and outbound roaming scenarios are required.

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. |
| E2E 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 Behavior | Analytics ID: Movement Behavior | Statistics or predictions on movement behavior for an applicable area |
| NF Signalling Storm | Analytics ID: NF signalling storm | Statistics or predictions on controlling NF signalling storm for network abnormal behaviour mitigation or prevention. |

\* \* \* \* End of changes \* \* \* \*